Cityscape

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Affordable, Accessible, Efficient Communities
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Building a Research Agenda for Creating Sustainable and Inclusive Communities for All

Regina C. Gray
U.S. Department of Housing and Urban Development

The views expressed in this article are those of the author and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. government.

This symposium represents an attempt to aggregate the lessons learned from the U.S. Department of Housing and Urban Development (HUD), Office of Policy Development Research's (PD&R's) sponsored research program, the Sustainable Communities Research Grant Program (SCRGP). In fiscal year (FY) 2010, six SCRGP grants were awarded, two of which were sponsored by the HUD Office of Economic Resilience (OER; formerly the Office of Sustainable Housing and Communities, or OSHC). The research program was also funded in FY 2013, but funding has not since been renewed.

The term "sustainable communities" has become controversial in recent years. With the sensitive nature of this topic in mind, I first discuss the sorts of activities performed under related rubrics before the Obama Administration. I then discuss the coordinated efforts within the Obama Administration's interagency partnership between HUD, the U.S. Department of Transportation (DOT), and the U.S. Environmental Protection Agency (EPA) to promote integrated housing, transportation, and infrastructure planning to achieve more livable, sustainable communities. Finally, I briefly describe the symposium articles submitted by five of the SCRGP recipients and conclude with some thoughts on the future of sustainability research.

HUD's Sustainable Communities Agenda Prior to the Obama Administration

All PD&R's work in the growth management area has been to contribute to the knowledge base on growth management issues and, when appropriate, offer guidance and support to communities that pursue such initiatives. Local and regional governmental entities have historically been most active in this domain—utilizing practices such as growth containment strategies, zoning, and regulatory standards or implementing smart growth policies. Since its inception, PD&R has sponsored research activities on planning and development from a perspective that we would now call "sustainable." In 1974, PD&R joined with the Council on Environmental Quality and the EPA Office of Planning and Management to cosponsor the seminal *Costs of Sprawl* report (RERB, 1974), which warned of the potentially negative consequences of unplanned, uncoordinated land development on families, the local economy, housing choices for low-income communities, and the environment. Among the human costs the report cited were long commutes to work and other destinations; more time spent in traffic and less time spent with families; and costlier housing situated in the urban core, which often forces lower income families to drive further out in search of neighborhoods that offer less expensive housing choices, suitable job opportunities, quality schools, and other valuable amenities.

Throughout the 1980s and the following decades, PD&R helped to develop and improve cleanup standards for its Brownfields Redevelopment Program. PD&R's Regulatory Barriers to Affordable Housing initiative marked the beginning of efforts to demonstrate how outdated or burdensome zoning and land use standards contribute to the high cost of housing and might also place restrictions on certain housing types or development projects, such as mixed-use or mixed-income housing in walkable neighborhoods. By the late 1990s and early 2000s, concerned about how to meet the demands generated by a rapidly growing and aging population, PD&R supported important research efforts on smart growth and regional land use planning that resulted in the landmark reports, *Growing Smart* (APA, 2002) and *Regional Approaches to Affordable Housing* (APA, 2003). Both reports, published by the American Planning Association, have been disseminated widely and served as the framework for coordinated planning.

The U.S. General Accounting Office (now the Government Accountability Office), in its 2003 report, *Transportation-Disadvantaged Populations* (GAO, 2003), identified common barriers faced by low-income families, aging Americans, and people with disabilities who lack adequate access to reliable transportation. The report concluded that long distances between place of residence and service provider pose a major challenge faced by these underserved populations; however, uncoordinated activities among the U.S. Departments of Health and Human Services, Education, Housing and Urban Development, and Labor and the various DOT operating administrations were doing too little to address this burden. Discussions began between the Federal Transit Administration (FTA) and HUD on expanding quality transportation services to aging Americans, people with disabilities, and low-income families through select HUD programs and possible collaborative research efforts.

The following year, President George W. Bush issued Executive Order 1330 on Human Service Transportation Coordination.[1] The Order mandated that select federal agencies, including HUD, address and reduce program regulations that prevent coordinated activities; leverage funding mechanisms; and engage in research and other related activities to expand supportive services to low-income communities, aging Americans, and people living with disabilities. In response, through its competitive grant awards, HUD encouraged communities to undertake coordinated planning and identify programs, such as the Community Development Block Grant, or CDBG, that allow for the flexible use of departmental funds to support transportation services that support low-income and underserved communities.

[1] 69 *CFR* 9185, February 26, 2004. http://www.gpo.gov/fdsys/pkg/FR-2004-02-26/pdf/04-4451.pdf.

Congress codified these efforts effectively into law by directing FTA and HUD to address new and improved approaches to coordinated housing and transportation planning, recognizing that housing policies typically emanate from local housing authorities, whereas transportation decisions are often made at the regional or state level. In a 2007 House of Representatives Report, the Subcommittee on Transportation and Housing and Urban Development (T-HUD) emphasized that "transportation, housing and energy can no longer be viewed as completely separate spheres with little or no coordination throughout the different levels of government…better planning and coordination on the federal, state, and local level can ensure that affordable housing is located closer to public transportation and employment centers…and federal policies be instituted to reduce the amount of energy consumed by the transportation and housing sectors." To that end, the Committee urged the Department "to incorporate stronger sustainability standards into HUD's housing programs."[2]

HUD and FTA entered into an Interagency Agreement (IAA) later that year to pursue additional opportunities for joint collaboration on housing and transportation issues. The IAA provided support for a study, completed in April 2007 and entitled, *Realizing the Potential: Expanding Housing Opportunities Near Transit* (Center for Transit Oriented Development, 2007), which included case studies of potential transit-oriented developments (TODs) in select cities and recommendations for greater interagency and intergovernmental cooperation. PD&R initiated a five-city effort to assess the feasibility of TOD practices at the local level that would provide affordable housing choices near accessible transit stops.

In 2008, the joint HUD-FTA Action Plan responded to the congressional mandate with a report entitled *Better Coordination of Transportation and Housing Programs: To Promote Affordable Housing near Transit* (DOT FTA and HUD, 2008). The report outlines interagency strategies that encourage coordination between housing and transportation agencies to promote compact, mixed-income development and affordable housing near transit.

Congress earmarked $500,000 for PD&R to support the implementation of the report's recommendations.[3] Two major reports—Transportation I and Transportation II—were competitively awarded in 2009. *Transportation I: Coordinated Housing and Transportation: A Model Housing Transportation Plan* established a TOD plan for the Miami-Dade region that provides a prototype for integrated housing and transportation planning at an underused subway station (Newport Partners and Kimley-Horn, 2012). The resulting plan emphasizes the importance of a strong partnership among the Miami-Dade Metropolitan Planning Organization, the local housing authority, private investors, and various nonprofit organizations—all involved in the development of the Consolidated Plan. *Strategies for Expanding Affordable Housing Near Transit* (Newport Partners, 2012) involved further implementation of additional action items identified in the 2008 Action Plan, including an outreach and dissemination plan and further knowledge development.

[2] *H.R. Doc. No. 110-238*, 110th Cong., 1st Sess. (2008). http://www.gpo.gov/fdsys/pkg/CRPT-110hrpt238/html/CRPT-110hrpt238.htm.

[3] We treat this action as pre-Obama Administration because the funding was initially proposed by the Bush Administration.

The Obama Administration's Sustainable Communities Initiatives

While FTA and HUD continued to implement the HUD-FTA Action Plan, the Obama Administration spearheaded further interagency efforts to help communities better coordinate housing and transportation planning at the local and regional levels. The HUD-DOT-EPA Partnership for Sustainable Communities ("The Partnership") set out to ensure that affordable housing and transportation needs were achieved within the context of promoting more inclusive neighborhoods. The Partnership also established clear goals for reducing energy consumption and protecting the environment.

The Partnership introduced six guiding principles[4] that form the basis for creating a sustainable community or neighborhood. These six principles also provide the conceptual framework for HUD's sustainability agenda, for OSHC's Sustainable Communities Initiative (SCI) and for this sponsored research program. They are—

1. **Provide more transportation choices.** Develop safe, reliable, and physically accessible transportation choices to decrease combined household and transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions, and promote public health.

2. **Promote equitable, affordable housing.** Expand location and energy-efficient housing choices for people of all ages, incomes, and racial and ethnic groups that expand mobility and lower the combined costs of housing and transportation, while providing housing options for people with disabilities in the most integrated setting appropriate to improve access to jobs and expand educational opportunities.

3. **Increase economic competitiveness.** Enhance economic competitiveness through reliable and timely access to employment centers, educational opportunities, services, and other basic needs by workers and expanded business access to markets.

4. **Support existing communities.** Target federal funding toward existing communities to increase community revitalization and the efficiency of public works investments and to safeguard rural landscapes.

5. **Leverage federal investments.** Cooperatively align federal policies and funding to remove barriers, leverage funding and increase the accountability and cost effectiveness of all levels of government to plan for future growth.

6. **Value communities and neighborhoods.** Enhance the unique characteristics of all communities by investing in healthy, safe, and walkable neighborhoods—rural, urban, or suburban.

Congress created OSHC in 2010. OSHC's primary mission was to facilitate HUD activities related to the Administration's sustainability agenda. SCI sought to encourage communities to adopt a

[4] These six livability principles were first introduced at the June 16, 2009 Committee on Appropriations hearing and lifted from testimony given by HUD Secretary Shaun Donovan, DOT Secretary Ray LaHood, and EPA Administrator Lisa Jackson.

more integrated approach to planning—one emphasizing coordinated housing and transportation efforts at both the regional and local levels. SCI awarded $100 million in competitive grants in FY 2010 to promote regional planning. Many more than 400 applications were received from communities all across the country, and 74 of these applicants were selected.

Another $40 million in Community Challenge Grants were awarded to communities seeking to reform zoning standards and planning regulations that might prevent coordinated housing and transportation efforts at the local level. DOT provided another $35 million in TIGER II planning grants for winning communities to leverage HUD and DOT dollars to help facilitate joint planning projects. These funds may be used by a state, local, or municipality government, for instance, to direct investments for various downtown revitalization projects or for infill development, for Brownfields reuse or vacant property redevelopment, for TOD, or for small towns or rural community efforts to preserve historic buildings or protect farmland. The winners of HUD's Community Challenge Grants and DOT's TIGER II planning grants were announced alongside the winners of OSHC's Regional Planning Grants in October 2010. Thus, by the close of President Obama's first term, $175 million in awards had been made to support SCI.

The Research Community's Response to the Sustainable Communities Agenda

SCI reserved $10 million in FY 2010 to support major research activities, including program evaluation and demonstration projects developed jointly by the three partner agencies. HUD identified areas in which improvements in data sharing and technological capacity could occur and in which information exchange platforms and mapping and analytic tools could serve the needs of each agency and the research community at large. Strong emphasis was placed on more efficient ways to track housing and transportation expenditures by geographic location, to establish broader measures of affordability and location accessibility, and to develop standardized performance measures for sustainable communities-related programs and activities. HUD and its federal partners also worked to identify best practices or exemplary models of sustainable communities.

Two main research initiatives resulted from this exercise. First, the Location Affordability Portal[5] allows for the end user to utilize the information provided to make better informed decisions about the type of neighborhood that offers the greatest value, and it provides expanded access to desired community amenities.

The other research initiative is the FY 2010 SCRGP. PD&R requested proposals in three specific research categories and a fourth general category. The three specific areas were (1) affordable housing development and preservation, (2) coordinated housing and transportation planning, and (3) healthy community design. The fourth category allowed for a wide range of projects related to sustainability, including energy-related issues or green building practices.

For each category, we felt that more work needed to be done to close research gaps dating as far back as the *Costs of Sprawl* report and as recent as the HUD-FTA Action Plan. For example, for

[5] Downloadable housing and transportation data tool focused at the neighborhood level is available at http://www.locationaffordability.info.

the first research category, affordable housing development and preservation, HUD was primarily interested in how communities have adopted policies that not only expand the supply of affordable housing but preserve affordable housing stock the in long run. For the second research category, coordinated housing and transportation planning, HUD wanted to know what the challenges are to coordinated planning and, if those challenges could be met and overcome, what are the best approaches or tools available? Under healthy community design, we looked for rigorous analyses of the relationship between the built environment and the socioeconomic and health impacts on a community.

The Articles in This Symposium

Researchers from Arizona State University, Julia Koschinsky and Emily Talen, with assistance from scholars at the University of North Carolina at Chapel Hill, conducted an assessment of the supply of HUD-subsidized housing stock situated in neighborhoods with walkable access to amenities, such as grocery stores, retail, restaurants, banks, schools, and parks. The purpose of this research project was to take stock of the walkable neighborhood context of HUD-subsidized housing in all U.S. metropolitan areas. The issue was to assess the degree to which access to these community amenities is hindered by unfavorable local socioeconomic conditions, such as weak market strength, crime, race and income segregation, or poor school quality. Although the demand for walkable neighborhoods has increased in recent years, Koschinsky and Talen (2015) find that such neighborhoods remain in short supply. HUD-subsidized units are more likely to be located in accessible neighborhoods, varying by program. Multivariate regression results demonstrate that public and multifamily housing, for instance, are more likely to be located in accessible areas with average or stronger markets than in inaccessible areas in all regions except the Northeast. Crime, they find, is on the minds of most low- and moderate-income families. When considering how these families make tradeoffs on the benefits of sustainable elements versus the costs, concerns about crime—real or perceived—may take precedence.

The second and third articles in this symposium, authored by the Urban Institute, building on the discussion of the tradeoffs families make when deciding about the quality of neighborhoods and expanded opportunities provided by them. In a very ambitious and multilayered effort, Rolf Pendall, Christopher Hayes, Arthur (Taz) George, and their collaborators from the University of Maryland's National Center for Smart Growth, the University of California, Los Angeles' Luskin School of Public Affairs, and Rutgers University's Voorhees Transportation Center submitted complementary articles addressing the social and economic mobility of Moving to Opportunity and Welfare to Work voucher recipients as they search for quality neighborhoods, housing, schools, jobs, and other community amenities (Blumenberg, Pierce, and Smart, 2015; Pendall et al., 2015). The authors argue that these important family decisions are largely shaped by access to working cars. That is, choices about where to live, the availability of affordable housing, high-performing schools, and sustainable jobs are limited if families do not have access to a working automobile. Those with cars, they conclude, have greater discretion in selecting neighborhoods with lower crime rates, better schools, higher environmental quality, and access to higher paying jobs—and these families report higher satisfaction with the neighborhoods they have chosen. In addition to the articles, project activities also included the development of a National Sustainability Database, or NSD, where researchers can download valuable information on communities, housing, and transportation infrastructure and presentations at various national meetings. OSHC supported the articles by Koschinsky and Talen (2015); Blumenberg, Pierce, and Smart (2015); and Pendall et al. (2015).

In an effort to build on previous research on preserving affordable housing near transit, Todd Nedwick, Tracy Kaufman, and Mike Bodaken from the National Housing Trust, working with colleagues from Abt Associates Inc., set out to determine how committed states are to preservation efforts. They investigated incentive-based strategies designated in a highly competitive qualified allocation process for the Low-Income Housing Tax Credit Program. According to the authors, the key strategies for strengthening the incentives for expanding and preserving affordable housing near transit are to (1) prioritize gap financing for use in developments near transit, (2) address land use restrictions that impede housing development near transit and add to the cost of TOD projects, and (3) enable cross-collaboration between housing and transportation entities (Nedwick and Burnett, 2015).

The article by James Svara, Tanya Watt, and Katherine Takai presents the results of a joint effort by analysts at the International City/County Management Association (ICMA) and the University of North Carolina at Chapel Hill to update ICMA's 2009 survey on the sustainability policies and practices carried out by local governments. The updated 2012 survey results demonstrate that, on average, state and local government entities have made neither a strong commitment to equitable development nor a concerted effort to encourage citizen participation in the planning process. The researchers conclude that it is far easier for decisionmakers to adopt or implement policies or programs of a noncontroversial nature, such as energy conservation (Svara, Watt, and Takai, 2015). More complex or politically sensitive proposals, such as including affordable housing units in moderate- or high-income developments or pursuing strategies that have the effect of reducing race or income disparities, are less likely to be considered. The authors are optimistic, however, that local governments can encourage the acceptance of certain initiatives (for example, affordable housing or housing that is universally accessible, green jobs, or an increased number of healthy food outlets in the community) by well-designed incentives that avoid unintended barriers to desired projects.

In the final article, research engineers from Virginia Tech tell us how to promote more sustainable and affordable housing through the adoption and diffusion of green building practices (McCoy et al., 2015). They ask: What green products and product clusters have higher diffusion trajectories (that is, time to takeoff, rate of takeoff, and projected market penetration level)? The research team shows how understanding the diffusion process for innovations is essential for institutionalizing change in the homebuilding industry and for accomplishing HUD's broader policy goals related to sustainability. Their work involved the development of a series of published articles that explore the process of how innovative green and energy-efficient technologies transform the housing construction market. They find that innovation stems from a willingness to assume greater risk, often resulting in trial and error, in promoting a new and innovative product.

Harriet Tregoning, the former Director of OER, concludes the symposium with her thoughts on these articles, on the status of HUD's sustainability agenda, and finally on the broader role of the federal government as envisioned by The Partnership (Tregoning, 2015).

Forthcoming Research

I anticipate that this symposium will offer scholars and practitioners in the sustainable development community an opportunity to reflect on a number of issues raised by the authors. I also want to alert the research community about additional work that PD&R expects to publish in the next few years.

In FY 2013, another round of SCRGP grants were awarded to four recipients. HUD placed renewed emphasis on sponsoring cutting-edge research in affordable housing development and preservation; investments in transportation and infrastructure planning; and green, energy-efficient building practices. The awarded proposals seek to advance evidence-based research on the effectiveness of federal programs in these three areas. The specific topics chosen range from measuring the influence of anchor institutions in affordable housing siting decisions, a cost-benefit impact assessment of streetcar investments in selected communities, and the development of a benchmarking tool for measuring energy consumption and cost savings for HUD-assisted housing stock.

Recently, PD&R has sponsored two guidebooks focused on sustainable efforts in small and mid-sized cities or towns. The first (HUD PD&R, 2014), published in FY 2013, provided prescriptive recommendations for creating connected communities through effective transportation options. The most recent document, funded in FY 2014 and in progress, offers guidance for creating walkable and bike-friendly communities for populations of 250,000 or less.

Acknowledgments

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Author

Regina C. Gray is a social science analyst with the U.S. Department of Housing and Urban Development.

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Affordable Housing and Walkable Neighborhoods: A National Urban Analysis

Julia Koschinsky
Emily Talen
Arizona State University

Abstract

Demand for housing in walkable neighborhoods has been increasing rapidly in recent years, as has evidence of the benefits of walkable urban form and walking. These neighborhoods nevertheless remain in short supply, especially for low-income residents. Furthermore, crime, poor market strength, or racial segregation potentially compromise accessibility in lower income neighborhoods. We assess the nationwide supply of urban neighborhoods with walkable access and the extent to which U.S. Department of Housing and Urban Development (HUD)-assisted voucher and project housing enables tenants to live in these neighborhoods. For assisted tenants with walkable access, we analyze whether or not this access is compromised. We aggregated more than 20 million address-level records (2010 to 2012) to the neighborhood level from about a dozen sources to characterize walkable access (using Walk Score), HUD-assisted housing, potential compromising factors, and other neighborhood characteristics. More detailed data were also collected for Atlanta, Boston, Chicago, Miami, Phoenix, and Seattle. We use descriptive methods and logistic regressions to analyze patterns across metropolitan statistical areas, in regions, and between cities and suburbs. We find that only 14 percent of all neighborhoods and 13 percent of all housing units in U.S. metropolitan areas have good walkable access. Public housing has the most walkable access (37 percent), followed by project-based rental assistance (PBRA; 30 percent) and low-income housing tax credits (LIHTC) and housing choice vouchers (both about 23 percent). Accessibility is disproportionately compromised for all tenants (9 percentage points more for public housing and 2 to 3 percentage points more for vouchers, LIHTC, and PBRA) but especially so for public housing tenants in urban areas. For a disproportionate number of other tenants in public housing and PBRA (4 percentage points more than all rental units), accessibility is not compromised, especially in denser cores of suburban areas. Locating public housing and PBRA units in walkable suburbs is one of the mechanisms that work to provide both

Abstract (continued)

accessibility and affordability. In areas with more HUD-assisted housing, the quality of amenities and urban form is poorer and safety is worse than in other accessible neighborhoods, which is not captured by quantitative measures of walkable access. We conclude with a discussion of the implications of these findings.

Introduction

In the United States today, a significant danger exists that walkable neighborhoods with access to quality amenities are becoming scarce for low-income residents. For our purposes, *walkable* neighborhoods are those that offer walking access to services and amenities, including transit, and incorporate a pedestrian-oriented, interconnected street network. Our goal is to provide a foundation to better understand what kinds of strategies could be used to retain affordable housing in walkable neighborhoods. To do that, we need to know (1) where, and to what degree, walkability and affordability are in alignment; (2) whether the benefit of affordable housing in walkable neighborhoods is compromised by negative factors such as crime, poor market strength, and racial segregation; and (3) what other neighborhood factors are associated with walkability and affordability.

Although households in the United States walk the least of households in any industrialized nation (Bassett et al., 2010), the benefits of walkability and walking are well documented (for summaries, see Brown and Plater-Zyberk, 2014; Talen and Koschinsky, 2014b, 2013). Demand for living in neighborhoods with walkable access to amenities and work has been increasing simultaneously (Nelson, 2013; U.S. DOT 2011, 2009). The same research shows that the supply of housing in such neighborhoods has not kept pace, however. Although all households face price premiums for living near amenities, accessible neighborhoods are especially hard to afford for low-income households (Adkins, 2013). The problem is exacerbated when trying to preserve affordable housing within the context of a walkable neighborhood, because walkable and affordable are often at odds. No longer is the goal a matter of producing affordable housing wherever cheap land is found, but affordability is sought in places where land, because of its accessibility, is likely to be more expensive.

Assisted housing for low-income tenants could be one of the mechanisms to increase the accessibility of walkable neighborhoods. It is one of the goals of the U.S. Department of Housing and Urban Development (HUD), which administers the funding for some of the nation's largest subsidized housing programs (the U.S. Treasury administers others), to promote subsidized housing in so-called "sustainable communities;" that is, neighborhoods that are walkable, mixed use, diverse, and dense and that have good transit access. Recent HUD initiatives such as Choice Neighborhoods, financial support of the Center for Neighborhood Technology's Location Affordability Index, Office of Policy Development and Research studies on coordinating housing and transit, and Office of Sustainable Housing and Communities illustrate this focus.

A number of unresolved issues remain, however, and research on the link between affordable housing and walkable locations has uncovered a number of complexities (Been et al., 2010; Pendall and Parilla, 2011; Wen and Zhang, 2009). One issue is that neighborhoods can be walkable in terms of urban form dimensions like small block size and land use diversity, but such neighborhoods might not be the ones that offer the most employment access, the least crime, or the best schools. In some cases, the same indicators of walkability that are appreciated in higher income neighborhoods might not have the same value in neighborhoods where crime is prevalent (Talen and Koschinsky, 2011). Other studies found that the benefits of walkable access to amenities were not realized because of high levels of neighborhood crime (Cutts et al., 2009; Roman and Chalfin, 2008). What needs to be accounted for is whether the interaction between physical form and social disadvantage negates the positive effects of the built environment, or whether it results in some compromising factors that need to be mitigated. We stipulate that poor neighborhood quality lessens the potential benefits of walkability.

Accessibility per se turns out not to be linearly related to income, as we will demonstrate, because many suburban areas are characterized by higher incomes and less walkable access. Lower income neighborhoods in older inner-city areas, similarly, often have better accessibility whereas many less centrally located lower income neighborhoods have fewer amenities or poorer quality amenities. Better school quality, improved safety, larger home size, and more access to green space continue to represent important tradeoffs that keep suburban living attractive, especially for households with children (Knudtsen and Schwartz, 2013; NAR, 2013, 2011). These tradeoffs also explain tensions between fair housing advocates who have been promoting desegregation of subsidized housing in suburban neighborhoods and sustainable community advocates who want to site such housing near centrally located (but often more segregated) transit-oriented development (TOD). At the same time, the NAACP (National Association for the Advancement of Colored People) endorses improved walkability in poor African-American neighborhoods as a civil rights issue to help reduce higher obesity rates in these areas—reducing crime rates is a simultaneous goal to make walking less dangerous (Snyder, 2013). Lower crime rates in suburban areas compared with those in urban areas used to also be a pull factor for suburbs, although the suburbanization of poverty and crime is changing these dynamics (Kneebone and Berube, 2013).

Given the rising popularity of walkable neighborhoods that is reflected in rising home prices in these areas, gentrification pressures and the difficulty in preserving affordable housing in walkable neighborhoods also increase. One of the dilemmas that motivated this research has been that many walkable mixed-use developments and neighborhoods are supposed to be diverse in terms of income, housing types, and sociodemographics but often end up being in such high demand that housing values are driven up and affordability declines (Cortright, 2009; Davis, 1984; Ding and Knaap, 2003; Eppli and Tu, 1999; Pendall and Caruthers, 2003; Pivo and Fisher, 2011; Pollack, Bluestone, and Billingham, 2010; Song and Knaap, 2003; Talen, 2010; Tu and Eppli, 2001; U.S. DOT, FTA, and Reconnecting America, 2008).

Furthermore, research is confirming that demand for transit-served areas is rising, thus resulting in a decrease in affordability (Haughey and Sherriff, 2010; Pollack, Bluestone, and Billingham, 2010; Quigley, 2010). These studies are motivated by a desire to preserve affordable housing in transit-served areas and employment centers, suggesting that the development of affordable housing in outlying suburbs not served by transit is problematic (Haughey and Sherriff, 2010; Lipman, 2006). With a focus on TODs, studies have found that although a substantial number of affordable apartments are near public transit, affordability for more than two-thirds of those apartments will expire within the next 5 years (Harrell, Brooks, and Nedwick, 2009). A recent study funded by the U.S. Department of Transportation found that many TODs are becoming increasingly unaffordable (Pollack et al., 2010; U.S. DOT, FTA, and Reconnecting America, 2008).

We proceed with an overview of our research focus and questions, discuss existing research, present the data and methods we applied to address these questions, analyze our findings, and end with a conclusion that includes policy implications.

Research Focus

The purpose of this article is to take stock of the walkable neighborhood context of HUD-assisted housing in all U.S. metropolitan areas. We assess the supply of neighborhoods with walkable access to amenities such as grocery stores, retail, restaurants, banks, schools, and parks. We also compare different HUD programs in regards to their walkable access and analyze the extent to which negative factors such as poor market strength, crime, segregation, or poor school quality might compromise such access. Finally, we analyze walkable access in the context of units with expired use restrictions, neighborhood profiles, and zoning and street characteristics. We also compare different metrics of walkability, including walk scores (from https://www.walkscore.com) and the State of Place index of walkability (aggregated from the Irvine-Minnesota Inventory).

We look specifically at the location of HUD-assisted housing (projects and vouchers) in relationship to neighborhood walkability. Project-based housing includes public housing—traditional and HOPE VI (Housing Opportunities for People Everywhere)—project-based rental assistance (PBRA)—such as Section 8 New Construction and Rehabilitation, Section 202 Supportive Housing for the Elderly, and Section 811 Supportive Housing for Persons with Disabilities—low-income housing tax credits (LIHTC), and tenant-based assistance (housing choice vouchers, or HCVs). The following sections will explain the differences among these programs in more detail. Using a detailed measure of neighborhood walkability and locations of HUD-assisted housing, we address the following questions—

1. What is the supply of urban units and neighborhoods with walkable access nationwide? To what extent are affordable rental units in walkable neighborhoods?

2. Does HUD-assisted voucher and project housing enable tenants to live in urban neighborhoods with walkable access?

3. If so, do tenants make tradeoffs in terms of poor market strength, segregation, crime, or poor school quality?

Our analysis is the first to evaluate walkable access and affordability at a national urban scale, for current data (2010 to 2012), and at the address level. We analyze walkable access for the different HUD-assisted housing programs in urban and suburban areas, by region, and for weaker and stronger markets.

Current federal housing policy seeks to promote the development and preservation of affordable housing in sustainable locations. A key aspect of sustainability is the degree to which neighborhoods are walkable—close to services and transit and characterized by a well-connected street network. A fundamental question needs to be answered—to what degree are affordability and walkability at odds? Basic land economics would suggest that they would be, but virtually no research—on a comprehensive, national scale—analyzes this question.

Our article dovetails with existing research linking transit and affordable housing, but our focus is on the degree to which affordable housing is in neighborhoods that are walkable—that is, beyond being transit served, do residents have ready access within walking distance to services and amenities, and is the street network conducive to pedestrian travel? It is important to identify both transit and walkable access because locations can be adjacent to transit but still not walkable. Being truly walkable implies not only transit access but also proximity to amenities and services and street connectivity that facilitates pedestrian routes. Safety, measured by crime rate, is also an important factor, which we will factor in for the six cities of Atlanta, Georgia; Boston, Massachusetts; Chicago, Illinois; Miami, Florida; Phoenix, Arizona; and Seattle, Washington.

This focus—the neighborhood context of affordable housing—has been a significant concern among policymakers. Federal urban policy puts community context (often termed "sustainability") front and center, tying housing goals to the need for neighborhoods with good access to services, lower transportation costs, and a healthy, walkable, and safe environment. Affordable housing advocates increasingly recognize the need to preserve affordability in locations that have walkable access to amenities and services, expanding beyond the assumption that low poverty alone should be the key locational factor for affordable housing (Fraser and Kick, 2007; Joseph, Chaskin, and Webber, 2007). The federal Moving to Opportunity for Fair Housing demonstration program, in which public housing residents were relocated to low-poverty neighborhoods, was based on the idea that greater access to opportunities would be essential (Briggs, 2008; Orr et al., 2003; Popkin, Levy, and Buron, 2009). Results were mixed, but a strong consensus emerged that the fight against poverty requires "a major national commitment to make rental housing affordable in safe, livable neighborhoods" (Briggs, Popkin, and Goering, 2010: 16).

Existing Research

We summarize some of the literature in this report, focusing on three areas: (1) the growing popularity of walkable neighborhoods; (2) walkable access, walkability, and walking; and (3) the neighborhood context of HUD-assisted housing. Our more detailed reviews and discussion of this growing literature can be found in Talen and Koschinsky (2014b, 2013).

Growing Popularity of Walkable Neighborhoods

Substantial advances have been made in recent years in the theoretical development of sustainable communities and urban form, including in the areas of walkability and transit access (Clemente et al., 2005; Farr, 2008; Frey, 1999; Jabareen, 2006; Mazmanian and Kraft, 1999; Van der Ryn and Calthorpe, 2008; Wheeler, 2005; Williams, Burton, and Jenks, 2000). These approaches have gained significant political and developer support.

In fact, an urban renaissance trend has been popularized in several recent nonacademic books, which received broad press coverage, with titles indicating the high hopes associated with urbanism. Examples include *The Option of Urbanism: Investing in a New American Dream* (Leinberger, 2009), *Walkable City: How Downtown Can Save America* (Speck, 2012), and *The Metropolitan Revolution: How Cities and Metros Are Fixing Our Broken Politics and Fragile Economy* (Katz, 2013). Changing dynamics in suburbs are discussed in recent books such as *Confronting Suburban Poverty in America* (Kneebone and Berube, 2013) and *The End of the Suburbs: Where the American Dream Is Moving* (Gallagher, 2013).

Population growth rates have recently increased in urban areas, and exurbs have been losing population. The total number of residents living in suburban (as opposed to urban) neighborhoods remains greater (Frey, 2012), however. Critics of high-density, mixed-use, accessible urban living build on this fact and argue that low-density, residential suburban living remains a preference for a sizable subset of the population that should not be ignored by urban renaissance advocates (Kotkin and Cox, 2013).

Actual demand for housing in neighborhoods with walkable access has been increasing in recent years. In 2009, 60 percent more households than in 1995 wanted to walk or bike to complete errands within less than 1 mile and 45 percent more wanted to walk or bike to work within 1 mile (Nelson, 2013; U.S. DOT, 2011, 2009). Most households (58 percent) now prefer living within walking distance to amenities to living in a sprawled community (NAR, 2013, 2011). Younger households (55 percent of 18- to 34-year-olds) and households with lower incomes (58 percent of households with less than 80 percent of Area Median Income as opposed to 44 percent with more than 120 percent of Area Median Income) are more likely to prefer living in mixed-use walkable neighborhoods (Nelson, 2013). The Urban Land Institute also found that 18- to 34-year-olds (*Millennials*, or Generation Y) prefer living in denser walkable neighborhoods where they can walk more and drive less (Lachman and Brett, 2013; also see The Rockefeller Foundation, 2014, for similar results). Even in "poster child for sprawl" cities like Atlanta, where only 1 percent of all neighborhoods are walkable, those areas accounted for 60 percent of growth in commercial and landlord-operated real estate from 2008 to 2012 (Leinberger and Austin, 2013).

Such housing remains in short supply or too costly, however, especially for low-income households. Although slightly less than one-fourth of all households would like to walk or bike to work (23 percent)[1] or to errands (22 percent), only a fraction of this demand is actually met (4 and 10 percent, respectively) (Nelson, 2013; Knudtsen and Schwartz, 2013, also find supply shortages). Leinberger (2009) also estimated an average supply of 5 to 10 percent of housing in walkable places. Adkins (2013) found that only 27 percent of low-income households with a preference for accessible neighborhoods were able to move to a very walkable area (compared with 53 percent of higher income households)—60 percent of low-income households found a new home in a somewhat walkable area (compared with 76 percent of higher income households). Although a recent national survey estimated that 94 percent of people were convinced of the positive health benefits of walking, 40 percent lived in neighborhoods that were "not at all" or "not very" walkable. Only 8 percent of children walk to school and 2 percent bike there (Fleury, 2013).

[1] The results of the 2011 American Housing Survey are similar. For nearly 20 percent of recent movers, "convenience to job" is the most important criterion in neighborhood choice (U.S. Census Bureau, 2013a).

Reflecting this supply gap, home values in walkable neighborhoods tend to be higher (Cortright, 2009; Knudtsen and Schwartz, 2013). Furthermore, urban home values have been increasing faster than suburban ones (Leinberger and Alfonzo, 2012). The authors also found that residents with higher incomes and education are much more likely to be able to afford life in a walkable neighborhood in the Washington, D.C. metropolitan area because these neighborhoods are associated with better market strength, higher home values, lower transportation costs, and better transit access. By contrast, less affluent residents with less educational attainment were more likely to live in areas in the Washington, D.C. area with poor walkability.

Walkable Access, Walkability, and Walking

Walkable access needs to be distinguished from the quality of the walkable environment (walkability) and the propensity for people to actually walk in these environments. This article focuses primarily on walkable access to amenities. We refer to *accessible* neighborhoods as those with walkable access (defined by walk scores; see the Data subsection). This focus is extended to address the question of the quality of the walkable environment (walkability) through the comparison of Walk Score data with qualitative measures of walkability. An accessible neighborhood (one with walkable access to amenities) is not necessarily walkable if the quality of the walking environment is not pedestrian friendly (for example, if it has no sidewalks). We rely on other research that addresses to what extent people actually walk in these environments. Furthermore, even when people are walking in accessible neighborhoods, the amenities they can reach do not necessarily translate into opportunities that can be used, for example, because of poor amenity quality or because of other barriers beyond physical access. Nevertheless, given research on the localized lives of low-income residents (Allard, 2009; Galster, 2014; Small, 2009), accessibility is pertinent.

Walkable access to amenities, the quality of the pedestrian environment, and the act of walking have seen increased interest in recent research and planning efforts. More than 400 articles have been published on topics related to walkable access and walkability (for reviews of this literature, see, for instance, Brownson et al., 2009; Ding and Gebel, 2011; Dunton et al., 2009; Durand et al., 2011; Ewing and Cervero, 2010; Feng et al., 2010; Heath et al., 2006; Saelens and Handy, 2008; Talen and Koschinsky, 2014b, 2013).

We use walk scores as a measure for walkable access. Walk Score includes two proxies for pedestrian friendliness (intersection density and average block length), but we do not use it as a proxy for pedestrian walking behavior. Note, however, that several recent studies validated walk scores as a useful proxy for walkability and for walking (Weinberger and Sweet, 2011). For instance, Duncan et al. (2011) and Carr, Dunsinger, and Marcus (2011; 2010) found evidence of statistically significant correlations between walk scores and other measures of neighborhood walkability. Brown et al. (2013) documented a significant 19-percent increase in the chance of purposive walking and a 12-percent increase in the chance of meeting the physical activity recommendations of recent Cuban immigrants for every 10-point increase in walk scores. Manaugh and El-Geneidy (2011)'s results also showed strong correlations between higher walk scores and more walking behavior.

Carr, Dunsinger, and Marcus (2010) also found positive correlations between walk scores and crime, suggesting that factors that compromise walkability are not well captured by Walk Score's access measure. In addition, at least one study shows that neighborhood crime has an important negative association with health in low-income neighborhoods, whereas no association was found between crime and walkability in this study (DeGuzman, Merwin, and Bourguignon, 2013). Other evidence does show that residents in urban low-income housing, especially women, walk less in unsafe environments (Bennett et al., 2007). In other words, in neighborhoods where neighborhood quality is compromised, walkable access is less likely to represent opportunity access.

The Neighborhood Context of HUD-Assisted Housing

A comprehensive review of studies from the past two decades on the neighborhood context of HUD-assisted housing indicates that public housing residents have lived in the most disadvantaged neighborhoods, followed by tenants in project-assisted housing (such as LIHTC properties), followed by HCV holders (Galster, 2014). Early research (Newman and Schnare, 1997) is consistent with these more recent findings, showing that, despite the federal policy goal of providing a "suitable living environment" for HUD-assisted tenants, PBRA did not improve neighborhood conditions for low-income tenants, offered worse conditions for public housing residents, and only slightly improved the neighborhood context of voucher holders. Galster (2014) concluded that neither PBRA nor HCV significantly improved the neighborhood context compared with public housing tenants or unassisted tenants.

As we will show, HUD-assisted housing, especially project-based housing, creates advantages in terms of walkable access, with public housing being most accessible, followed by PBRA and HCVs. We then also examine the proportions of accessible neighborhoods that are and are not compromised by countervailing factors such as lower home values, racial segregation, and poor school quality. Galster (2014) also found few significant differences in the neighborhood context of HCV holders and tenants in project-based housing built and managed by private or nonprofit developers (subsidized, for example, through the LIHTC Program, Section 8 New Construction and Rehabilitation, or the Section 236 Mortgage Assistance Program). Furthermore, when voucher holders move out of their existing neighborhoods into low-poverty, less segregated neighborhoods, they often subsequently move back into worse neighborhoods than the ones in which they initially lived (Galster, 2014).

Even moreso than all low-income rental units, assisted rental units are more likely to be concentrated in neighborhoods with poor market strength, more racial segregation, and poor school quality, resulting in a spatial concentration of poverty (Basolo and Nguyen, 2005; Hirsch, 1998; Massey and Kanaiaupuni, 1992; Oakley and Burchfield, 2009). A combination of individual, structural, and programmatic reasons has contributed to this spatial concentration (Galster, 2014). Examples include the embeddedness of assisted tenants in highly localized social networks that restrict housing search information to the immediate disadvantaged surroundings, lower land prices in these areas, NIMBY (or "not in my backyard") opposition to assisted housing in wealthier areas, the reluctance of landlords to rent to subsidized tenants, racial discrimination, and housing program requirements to target high-need areas (Galster, 2014; Kawitzky et al., 2013; Khadduri, 2013; Oakley, 2008).

Traditional public housing projects built since the 1930s were constructed in a few areas as high-density superblock enclaves by local public housing authorities with federal funding. They tended to be isolated from commercial activity and wealthier parts of the city and reinforce existing patterns of racialized poverty (Hirsch, 1998; Sugrue, 2005; Vale, 2000). Small-scale scattered-site programs to decentralize public housing started in the late 1960s but represent a minimal proportion (8 percent) of all public housing units and were more driven by court-ordered desegregation than a strong federal commitment to deconcentrating poverty (Galster, 2014). From 1994 through about 2004, the most dilapidated public housing was demolished and replaced by new decentralized, mixed-income units and HCVs through the HOPE VI program. Some evidence points to improved neighborhood quality for HOPE VI tenants (Zielenbach, 2003) although living in mixed-income neighborhoods can come with new forms of exclusion (Chaskin, 2013; Joseph, 2013).

Section 8 vouchers (created in 1974), now called housing choice vouchers, have been another mechanism with the potential for improving the neighborhood context of HUD-assisted tenants. In this program, tenants can use the voucher to cover the difference between their rental payment (30 percent of their income) and the full rental amount. This amount is bound by a payment standard set by the local public housing authority unless the tenant chooses to pay more than this standard. Two formidable barriers to using HCVs are obtaining a voucher from a local housing authority in the first place, because the waiting lists in many cities span multiple years or are closed, and finding a private or nonprofit landlord who will accept the voucher. By contrast with public housing, where public authorities decide to site the housing in a few locations, HCVs require tenants to search for leasing opportunities among a much more dispersed set of private units. Some evidence exists that voucher holders do end up living in neighborhoods with lower poverty levels than those from which they moved (Basolo, 2013; Pendall, 2000). Many tenants with vouchers end up reconcentrating, however, in moderate- to high-poverty areas that are often still segregated (Briggs, Popkin, and Goering, 2010; McClure, 2010). This tendency is partly related to rent subsidy limits set through the Fair Market Rents, a limited supply of affordable rental housing in high-opportunity areas and strong-market cities (DeFilippis and Wyly, 2008), discrimination, and inadequate information about rental opportunities (Briggs, Popkin, and Goering, 2010; McClure, 2010; Varady and Walker 2007, 2003). Because vacancy rates in high-opportunity areas are tight, given strong higher income demand, and disadvantaged areas have higher vacancy rates, the incentives to accept HCVs are much greater for landlords in neighborhoods with low rather than high opportunities (Galster, 2014).

Finally, LIHTC and other PBRA (such as Section 8, Section 202, and Section 811) provide subsidies to private and nonprofit developers in financing, building, and maintaining affordable rental housing. Because these projects are often multifamily housing, they are also more spatially concentrated than voucher-assisted units. By contrast with public housing, however, private and nonprofit developers make the siting decisions by taking market considerations into account. Several project-based programs (including LIHTC) contain expiring low-income use restrictions (for example, after 15 years), which can provide private developers with incentives to develop housing in strong-market areas and convert the units to market-rate rental units after the use restrictions expire. From a perspective of providing long-term affordable housing, this policy creates problems for preserving affordable housing in lower poverty neighborhoods. At the same time, program incentives to locate LIHTC units in high-need areas (such as “qualified census tracts” or “difficult development areas”) or to provide setasides for nonprofits targeting disadvantaged neighborhoods reinforce the concentration of tenants in poor, segregated neighborhoods (Galster, 2014).

Although debates between proponents of dispersed and place-based housing assistance abound, it is important to keep in mind the strong overlap between project- and tenant-based assistance (Galster, 2014; Williamson, Smith, and Strambi-Kramer, 2009). For instance, LIHTC projects are often made affordable to low-income tenants by packaging deals with HCVs. Some traditional public housing was replaced through HOPE VI using HCVs to move tenants to other locations. Finally, tenants facing expiring low-income use restrictions in PBRA were often "vouchered out" through HCVs. Hence, vouchers are often used to replace project-based housing or to finance affordable rents within PBRA units. Especially in the latter case, the neighborhood context of LIHTC and vouchers will be identical because the same tenant is subsidized through both project- and tenant-based assistance.

The geographic distribution of HUD-assisted housing in our research reflects the dynamics described in previous research. Project-based housing in the 359 U.S. metropolitan statistical areas (MSAs)[2] is very concentrated in a minimal proportion of neighborhoods, namely in 10 to 13 percent of neighborhoods (9 percent LIHTC, 10 percent public housing, and 13 percent PBRA). As we will show, about 60 percent of neighborhoods with project-based units (public housing, LIHTC, or PBRA) are in urban areas compared with 40 percent in suburban areas. Nearly one-half of all public housing units (46 percent) are in high-density urban neighborhoods (4 or more units per acre) compared with 36 to 37 percent of HCV, LIHTC, and PBRA units. By contrast, HCVs are much more dispersed across MSAs; voucher holders live in 73 percent of neighborhoods in MSAs, and only 40 percent of these neighborhoods are in urban areas as opposed to 60 percent in suburban areas. Within suburban areas, however, a higher share of HCV units is concentrated in high-density neighborhoods (4 or more units per acre) than the share of projects (16 compared with 13 to 14 percent). More than one type of project-based housing is frequently in the same neighborhood. About one-fourth (26 percent) of neighborhoods contain public housing, LIHTC, or PBRA units or a combination of the three. On the other hand, three-fourths of neighborhoods in MSAs do not have any of these units.

Data and Methods

This section provides an overview of the data sources and variables used in this article, followed by a discussion of the methodology applied to analyze these data.

Data

To conduct this analysis, we assembled data on HUD-assisted project- and tenant-based housing and the neighborhood context of this housing, including its walkable access, walkability, and neighborhood quality. The comprehensive dataset we collected includes current (2010 to 2012) neighborhood-scale information for all 359 MSAs in the United States. These data were derived from about a dozen sources, including HUD; Walk Score; local police; planning and housing departments; the Environmental Protection Agency (EPA); GreatSchools; InfoUSA; CoreLogic, Inc.; the 2010 census; the Home Mortgage Disclosure Act (HMDA; Walker and Winston, 2009); and the Internal Revenue Service (IRS; via Brookings Institution, 2012).

[2] Based on the 2003 Office of Management and Budget definition of metropolitan statistical areas (OMB, 2003).

We aggregated more than 20 million address-level records to the neighborhood level. In this study, a neighborhood is defined as a 2010 census block group, and we use the two terms synonymously. We created more than 100 variables to characterize walkable access, HUD-assisted housing, potential compromising factors, and other neighborhood characteristics. In addition, we collected more detailed data for six cities across the United States with different levels of walkable access: Atlanta, Boston, Chicago, Miami, Phoenix, and Seattle. This section details what data were collected and how the variables used in the analysis were created. Exhibit 1 summarizes the data sources and variables.

We are assessing the neighborhood context of 5,797,058 HUD-assisted rental units in the 359 MSAs of the United States. Of these units, most (65 percent) are project-based assisted housing and 35 percent consist of HCVs, or tenant-based rental assistance (2,045,005 units). The project-based subsidies fall into three groups.

1. Housing funded under the LIHTC Program (28 percent, or 1,642,731 units) and administered by the U.S. Treasury.

2. Housing funded under PBRA, including Section 202 and Section 811 housing for elderly and disabled residents, Section 236, and Section 8 New Construction/Rehabilitation (20 percent, or 1,148,070 units).

3. Public housing (traditional and HOPE VI; 17 percent, or 961,252 units). We are not able to differentiate HOPE VI from traditional public housing with the data we have.

To characterize walkability, we purchased or collected five sets of data.

1. From Walk Score, 220,000 walk scores (Front Seat, 2010) to measure walkable access to amenities from the center of all 174,186 neighborhoods in the 359 MSAs (as of February 2012). More accessible neighborhoods have higher residential population, business, and amenity density in nearby locations (within 0.25 miles of street distance).

2. Also from Walk Score, 31,000 transit scores for 170 cities to measure access (0.5 miles straight-line distance) to rail and bus service from a home, in this case the center of a 2010 census block group (as of February 2012).

3. Parcel-based land use and building characteristics, zoning, street characteristics, open space, bike lanes, and public transit data for the cities of Atlanta, Boston, Chicago, Miami, Phoenix, and Seattle (2012). These results are summarized in more detail in Talen, Koschinsky, and Lee (2014).

4. A comprehensive set of indicators of walkability for selected neighborhoods in Washington, D.C., that includes qualitative dimensions of the walking environment. Mariela Alfonzo aggregated the 162 indicators of the Irvine-Minnesota Inventory into the 10 dimensions of the State of Place index, including density, connectivity, aesthetics, form, physical activity facilities, personal safety, traffic safety, pedestrian amenities, proximity of uses, public spaces, and parks. The Irvine-Minnesota Inventory, including Larry Frank's metrics (Boarnet et al., 2006; Day et al., 2006) includes widely used metrics for measuring the quality of the pedestrian environment. These data include measures collected manually for other studies and additional data collected specifically for this study (2010 to 2012). We compared these results with walk scores. Koschinsky et al. (2014) analyzed these data in more depth.

Exhibit 1

Data Sources and Variable Description

Variable	Description	Year	Original Scale	Source
Neighbor-hoods	2010 census block groups in 359 metropolitan areas (average 1,473 people).	2010	174,186 block groups	2010 census
Regions (West, South, Midwest, Northeast)	West: AZ, CO, ID, MT, NV, NM, UT, WY, AK, CA, HI, OR and WA. South: DE, DC, FL, GA, MD, NC, SC, VA, WV, AL, KY, MS, TN, AR, LA, OK and TX. Midwest: IL, IN, MI, OH, WI, IA, KS, MN, MO, NE, ND and SD. Northeast: CT, ME, MA, NH, RI, VT, NJ, NY and PA.			U.S. Census Bureau
Walkscore and Components	Score from 0–100 that indicates how acessible amenities are within 0.25 miles street network distance from the center of each block group.	2012	215,000+ addresses	Walk Score
% Low Income	Percentage of tax filers who were eligible for the Earned Income Tax Credit.	2008	38,000+ ZIP Codes	Internal Revenue Service, via Brookings Institution
# Jobs	Number of employees in businesses.	2010	11.8 million addresses	Infogroup/InfoUSA, via Esri Business Analyst
Distance to Reach Better vs. Worse School	Distance (meters) from block group centroid to closest high-performing school (ranking 9–10) minus distance (meters) from block group centroid to closest low-performing school (ranking 1–2).	2012	73,671 addresses	GreatSchools
Diversity	Simpson's diversity index for race/ethnicity (larger = more divese).	2010	174,186 block groups	2010 census
% Black, White, Hispanic	Number of African-Americans/population, Whites/population, and Hispanics/population.	2010	174,186 block groups	2010 census
Units	Housing units	2010	174,186 block groups	2010 census
Home Value	Estimated median single-family home values based on home loans.	2009	51,000+ 2000 census tracts	HMDA, via components of Urban Institute/LISC's market strength index
% HUD Housing	Number of HUD-subsidized vouchers, LIHTC, public housing, and projects (TRACS)/all housing units	2012	4.6 million addresses	HUD, U.S. Census Bureau
% Renter	Number of renter-occupied units/housing units.	2010	174,186 block groups	2010 census
% Vacant	Number of vacant units/housing units.	2010	174,186 block groups	2010 census
% Tenant Vouchers	Number of tenant vouchers/housing units.	2012	2.1 million units (addresses)	
% LIHTC	Number of LIHTC units/housing units.	2012	1.6 million units (addresses)	HUD, U.S. Census Bureau
% Public Housing	Number of public housing units (traditional and HOPE VI)/housing units.	2012	961,000+ units (addresses)	
% Developers	Number of project-based units (TRACS)/housing units.	2012	1.15 million units (addresses)	

HDMA = Home Mortgage Disclosure Act. HUD = U.S. Department of Housing and Urban Development. LIHTC = low-income housing tax credit. LISC = Local Initiatives Support Corporation. TRACS = Tenant Rental Assistance Certification System.

5. We conducted a LEED-ND (Leadership in Energy & Environmental Design for Neighborhood Development; USGBC, 2009) analysis for all parcels in Phoenix (as of 2012) and compared the results with walk scores. The results of this analysis were published in Talen et al. (2013).

To measure neighborhood accessibility, we rely on so-called "street smart" walk scores, which include walking distances of 0.25 miles along streets to amenities (rather than straight-line distances) and measures of pedestrian friendliness (intersection density and average block length). Scores are based on walking distance to nine amenity categories: (1) grocery stores, (2) restaurants, (3) shopping places, (4) coffee stores, (5) banks, (6) parks, (7) schools, (8) book stores, and (9) entertainment, which are weighted (for example, grocery stores weigh more than banks and the more amenities in the same category the less they are weighted). The amenity scores are standardized to range between 0 and 100. Penalties for low intersection density and long block lengths are then added to this score. Five intervals help interpret the score: (1) 0 to 24 *Car-Dependent* (nearly all errands require a car); (2) 25 to 49 *Car-Dependent* (a few amenities within walking distance); (3) 50 to 69 *Somewhat Walkable* (some amenities within walking distance); (4) 70 to 89 *Very Walkable* (most errands can be accomplished on foot); and (5) 90 to 100 *Walker's Paradise* (daily errands do not require a car). Previous research like Moudon et al. (2006) and Front Seat (2010) influenced the choices underlying the street-smart walk scores.

In our national analyses, *accessibility* is defined as having walk score of 70 or higher. Inaccessible neighborhoods have walk scores of between 0 and 69. For our six-city analysis, we nuance accessibility further by differentiating neighborhoods with excellent access (90 to 100) from those with good access (70 to 89). Exhibit 2 shows aerial and street-view images of our six cities to illustrate differences in walkable access. Accessible areas have a greater diversity of land uses (for example, residential and commercial) than inaccessible areas, which can be predominantly residential. Although the car-dependent neighborhoods look more similar in the image samples of the six cities, the lower density in accessible areas in cities such as Phoenix and Atlanta contrasts with the higher densities in accessible areas in Boston, Chicago, or Seattle.

Two key measurement challenges are the quality and the choice of amenities. For instance, Walk Score currently ignores the quality of amenities, which is relevant because the same amenity access score in a richer and poorer community is likely to provide access to very different levels of quality of amenities. For instance, stores can be classified as grocery stores in both cases but represent a fully stocked supermarket in one case and a gas station corner store with primarily junk food in the other case. More walkable access to the latter could actually contribute to a decrease rather than an increase in health. Walk Score also prioritizes more affluent consumption amenities such as coffee shops, restaurants, and bars in its scoring system, whereas jobs, daycare, or healthcare services are not included. Our comparison of walk scores and the State of Place index (Koschinsky et al., 2014) analyzes these dynamics in more detail.

The "five Ds" of built environments that enable transportation options beyond car travel are diversity of land uses, density, design, distance to transit, and destination accessibility (Ewing and Cervero, 2010). In our analysis, diversity of land uses is assessed through parcel-based land use information for our six cities and extracted from business types for all neighborhoods in the country. Population density is computed based on 2010 census estimates. Design is measured

Exhibit 2

Aerial and Street-View Image Examples of Inaccessible and Accessible Neighborhoods in Six Cities

Note: Extracted from http://walkableneighborhoods.org/explore/cbsa/.

Sources: U.S. Department of Housing and Urban Development; Walk Score; 2010 census through the manually collected Irvine-Minnesota Inventory and State of Place data for samples of neighborhoods in Washington, D.C. Distance to transit and destination accessibility are captured through walk scores, transit scores, and the LEED-ND analysis.

For a richer characterization of neighborhoods, we supplemented the measures of walkability with the following indicators of neighborhood quality.

1. **Home Values.** We purchased and obtained 1.5 million records of 2012 home sales addresses from CoreLogic. Because these data did not cover all neighborhoods, we also obtained 2009 median home values (2010 tract level) from HMDA (courtesy of Urban Institute).

2. **School Quality.** We purchased address-level school quality data from GreatSchools for public and private elementary, middle, and high schools across the United States (2012). These data contain performance scores for each school ranging from 1 (lowest score) to 10 (highest score). We computed the distance in meters from the block group centroid to the closest high-performing school (ranking 9 or 10) and to the closest low-performing school (ranking 1 or 2). For the national analyses, these distance variables were then recoded into 0-or-1 indicators for whether or not the closest school within 0.5 miles of a block group center was a low- or high-performing school.

3. **Businesses.** We used 11.8 million address-level records of businesses in the United States (2010) to create a national index of land use diversity (Simpson's index) and characterize the business context of neighborhoods.

4. **Housing Market Strength.** The Urban Institute used 2009 HMDA and other data to create an index of housing market strength at the 2010 census tract level and foreclosure risk at the 2011 ZIP Code level (Walker and Winston, 2009). We apply this housing market index to distinguish poorer market strength (the lowest quartile, 0 to 25 percent) from average or above average market strength (26 to 100 percent); that is, we would expect 25 percent of all neighborhoods to have poor market strength and 75 percent to have average or better market strength. Because we could not access these data at the block group level, block group centroids in the same tract or ZIP Code were assigned the same tract or ZIP Code value, which represents a limitation. In addition, we used 2010 census block group estimates for the percentage of rental units and vacant units.

5. **Socioeconomic Characteristics.** Reliable estimates of poverty and income unfortunately no longer exist at the block group level since the American Community Survey (ACS) replaced the 2000 census. ACS tract-level estimates (especially in poorer, more diverse urban areas) also have margins of errors that are greater than what we wanted to rely on in our analysis (see our separate working paper on uncertainty in ACS estimates—Folch et al., 2014). Home values and market strength characterize the economic conditions of a neighborhood to some extent but, because both data sources are based on sales of owner-occupied homes and urban lower income areas often have more rental units, these data sources are less accurate in exactly the neighborhoods at the heart of our analysis. Alternative sources are the percentage of tax filings with Earned Income Tax Credits (EITC) for IRS records (2008, via Brookings Institution, 2012) but these data are available only at the ZIP Code level and exclude households

without earned incomes.[3] We did use this variable in some analyses and assigned block group centroids to the EITC percentages of the ZIP Code they were in, which represents a limitation as in the case of the market strength and foreclosure risk variables. In addition, 2010 census block group data allowed for us to identify the percentages of African-American, Hispanic, Asian, and White residents in a neighborhood (and compute a Simpson's index of racial and ethnic diversity) and population density. We also collected data on violent and property crime from the police departments of the cities of Atlanta, Boston, Chicago, Miami, Phoenix, and Seattle.

6. **Environmental Disamenities.** We include the proximity to the center of a brownfield from the centroid of a census block group as a measure of the proximity to environmental disamenities. As with the school quality indicator, for the national analyses this distance variable was then recoded into a 0-or-1 indicator for whether or not a block group center was within 0.5 miles of a brownfield center.

Because we are interested in testing if walkable access is compromised by countervailing factors, we used the data sources described previously to create the following five variables in this context: (1) poor market strength (lowest quartile of distribution); (2) indicator of African-American segregation (40 or more percent African-American residents in a block group), (3) crime rates per thousand people, (4) proximity to low-performing schools, and (5) proximity to brownfields.

To differentiate urban, suburban, and rural areas, the following definitions are applied. The 2010 census defines 1,308 principal cities of MSAs or micropolitan statistical areas (U.S. Census Bureau, Geography Division, 2010: PCICBSA10 variable). These principal cities include cities, towns, villages, boroughs, and other municipalities. This analysis is based on the subset of 1,187 principal cities that the 2010 census identifies as cities; that is, excluding towns or villages (U.S. Census Bureau, Geography Division, 2010: LSAD10 variable). For purposes of this analysis, all other neighborhoods outside these cities but within the MSA or micropolitan statistical area are identified as suburban unless they contain rural housing units (U.S. Census Bureau, Geography Division, 2010: H2 variable).

Methods

This research sought to (1) provide a current national analysis of the walkable neighborhood context of project- and tenant-based HUD-assisted housing; (2) test if walkable access is compromised in low-income neighborhoods by countervailing factors such as poor market strength, poor school quality, segregation, crime, or environmental disamenities; and (3) compare automatically generated metrics of walkable access with more nuanced measures of the quality of the walkable environment. To characterize the neighborhood context, we used standard descriptive methods such as frequency tables, histograms, and other charts that enable us to compare the different housing programs for accessible and inaccessible neighborhoods (nationally, regionally, and for cities versus suburbs). To test for the presence of countervailing factors, we compute the proportion of units in each assisted housing program as opposed to all rental units in each of four categories—accessible or not and potentially compromised or not—for different geographic areas. We then statistically

[3] We also tested the percentage of low-wage workers (residential locations) from EPA's Smart Location Database (EPA, 2013) but ended up not including it because it was only weakly correlated with the EITC variable and had a spatial distribution in our six cities that did not match the patterns of poverty well. We are, however, using the workplace location of low-wage workers from this database.

test for differences between assisted and all rental units in each of these categories. Finally, to compare Walk Score's walkable access score with more qualitative measures of walkability, we collected detailed data for Phoenix (LEED-ND) and Washington D.C. (State of Place) and compared the results of onsite surveys with Google Street View inspections (Lee and Talen, 2014).

Given the variability between the 359 MSAs, we displayed the relationships of more than one dozen variables at the neighborhood and MSA levels for each MSA at a project website that allows for viewers to explore a particular urban area in more detail (http://walkableneighborhoods.org/explore/). Besides cross-tabulated maps of walkable access and neighborhood characteristics (including HUD-assisted housing), the website provides a new so-called *correlation circle* to visualize statistically significant bivariate correlations, for example among accessibility, HUD-assisted housing, and neighborhood quality for each MSA. It also contains street-view images of these combinations and aerial images of different combinations of access and housing programs for each MSA.

To distinguish when accessibility might have been compromised, we create a variable to identify neighborhoods that (1) have lower home values (less than the local MSA median), (2) are segregated (at least 40 percent African-American or Hispanic), and (3) have poor school quality (nearest school within 0.5 miles has a ranking of 1 or 2). About 6.4 percent of all neighborhoods fall into this group (the results were robust to different specifications). This variable allows for us to distinguish areas with lower and higher neighborhood quality, which can then also be compared with whether or not a neighborhood is accessible. Hence we generate four groups (good or poor access and compromised or not). We then calculate the number and percentage of units in each HUD program in each of the four categories (and compare this number with all renters and units because the baseline numbers are not equal in each of the four categories). We then run a simple *t*-test on proportions to test for significant differences between the proportions of assisted units as opposed to all rental units in each of the four categories for different geographic areas. These areas include all MSAs, the four census regions, urban and suburban areas, and our six selected cities.

In performing the analysis of the six cities (Talen and Koschinsky, 2014a), we focus on the subset of neighborhoods with greater proportions of HUD-assisted housing and then differentiate between accessible and inaccessible locations within this group (as the dependent variable). We estimate a model using binary logistic regression with independent variables that include neighborhood characteristics (including crime rate), as outlined in Talen and Koschinsky (2014a).

Results

In this section we present selected highlights of our findings. More detailed results can be found in Talen and Koschinsky (2014a); Koschinsky and Talen (2015); Koschinsky et al. (2014); and Talen, Koschinsky, and Lee (2014).

The Supply of Accessible Neighborhoods

Although demand for walkable neighborhoods has been increasing in recent years, such neighborhoods remain in short supply. The higher demand for accessible neighborhoods in our analysis based on 2010 census and Walk Score data is also reflected in lower vacancy rates in accessible areas (8 percent) than in inaccessible areas (11 percent). Consistent with existing survey research, we also find that by far most neighborhoods are inaccessible. Only 14 percent of all neighborhoods (24,220) and 13 percent of all housing units (13.5 million) in MSAs have good walkable access (defined as having a walk score of at least 70). Given the strong relation between density (4 or more units per acre) and walkable access, this proportion is greater for rental units, at 23 percent (7.6 million), especially in the Northeast and West, and much less for owner units, at 7 percent (4.2 million). This difference reflects the greater proportion of owner-occupied units in less accessible suburbs and the greater number of rental units in more accessible urban locations.

The relationship between walkable access and income is not linear (accessibility increases with income) but bimodal (concentrations of access are found in both higher and lower income neighborhoods). To illustrate this point, we compare three levels of accessibility in neighborhoods with low- and high-income neighborhoods. We specifically distinguish poor access (walk scores of 0 to 69), good access (70 to 89), and excellent access (90 to 100) and group neighborhoods by the percentage of low-wage workers that are below and above the local MSA median; that is, 50 percent of all neighborhoods are in each group.[4] It turns out that the proportion of neighborhoods with excellent access is equal in both groups (2 percent), but higher income neighborhoods have a slightly higher proportion of good access than lower income areas (6 compared with 4 percent). In other words, of the 14 percent of neighborhoods that are accessible, 6 percent are in neighborhoods with more low-wage workers and 8 percent are in areas with more high-wage workers. The same result holds when other proxies of income are used, for example home values or market strength. As we will show, however, walkable access is more likely to be compromised in weak-market areas, which also contain more HUD-assisted housing.

Furthermore, in the six cities, we analyzed neighborhoods with higher neighborhood quality, defined as (1) above median housing market strength, (2) less racial segregation (less than 40 percent African-American), and (3) below median rates of property and violent crime (Talen, Koschinsky, and Lee, 2014). In addition, we used street characteristics, land use information, and zoning information to characterize the walkability of neighborhoods beyond walkable access. Overall, block groups with higher neighborhood quality are not necessarily walkable neighborhoods. HCVs generally have higher neighborhood quality than assisted project-based units. As the second most walkable city in the United States, Boston is the only city of the six we studied in depth where most of the areas with higher neighborhood quality are also walkable. This condition is also true for walkable neighborhoods with projects and vouchers in Boston (for example, in walkable residential or bikeable residential, mixed-use clusters). The Western and Southern cities of Miami, Phoenix, and Seattle have fewer walkable neighborhoods to begin with. In these cities, a, greater proportion of higher quality neighborhoods with projects and vouchers is inaccessible rather than accessible.

The Northeast and West are most accessible (31 and 15 percent of all neighborhoods, respectively), with the South and parts of the Midwest lagging (5 and 9 percent, respectively). Because the Northeast and West have more accessible neighborhoods, these regions also account for greater proportions of accessible HUD-assisted housing, particularly in the largest U.S. cities, New York City and Los Angeles, California. In all four census regions, walkable access is greatest (in both

[4] We use the variable *Percent Low Wage Workers* (E_PctLowWage) of EPA's Smart Location Database (EPA, 2013), which is based on workplace locations of workers earning $1,250 or less per month. Because the residential location variable is missing Massachusetts, we were unable to use this variable for our remaining national analysis.

cities and suburbs) in neighborhoods with more than 4 units per acre. Across all MSAs, 45 percent of all units in dense urban neighborhoods (4 or more units per acre) are accessible compared with 20 percent of these units in suburban areas. In the Northeast (where New York City dominates the results), 77 percent of units in dense areas are accessible in cities and 39 percent are accessible in suburbs. This proportion is by far the greatest in the country. In the West, 37 percent of units in dense cities and 17 percent in dense suburbs are accessible, with lesser proportions in the Midwest and South.

Older MSAs in the Northeast and Midwest are more walkable than newer ones in the South and West. These older MSAs also have been growing at lower rates than newer but less accessible MSAs, however; of the 100 largest MSAs in the United States, we analyzed walkable access in the 10 with the fastest and slowest population growth.[5] The slower growing MSAs in the Midwest and Northeast are twice as accessible as the faster growing MSAs in the South and West (15 compared with 7 percent of all rental units).

The five MSAs with the greatest proportion of accessible neighborhoods in the country are New York-Newark-Edison, NY-NJ-PA; San Francisco-Oakland-Fremont, CA; Los Angeles-Long Beach-Santa Ana, CA; Boston-Cambridge-Quincy, MA-NH; and Chicago-Naperville-Joliet, IL-IN-WI. In this group, New York-Newark-Edison has the greatest proportion of HUD-assisted units in accessible areas (79 percent), followed by Boston-Cambridge-Quincy (58 percent). Of the six cities we analyzed in more depth, Boston has the greatest proportion of walkable neighborhoods and HUD-assisted housing in walkable areas (31 and 58 percent, respectively), followed by Chicago (27 and 38 percent), Seattle (17 and 36 percent), and Miami (13 and 22 percent). In all these cities, public housing is the most accessible, followed by PBRA and HCV housing. Given that Atlanta and Phoenix are among the most sprawled MSAs in the country, they have few accessible neighborhoods and therefore also few HUD-assisted units in walkable areas (3 and 10 percent in Atlanta compared with 3 and 6 percent in Phoenix). In these two MSAs, PBRA units are more accessible than public housing, followed by HCVs.

Nationwide, the most accessible areas are positively, strongly, and significantly (at the .05 level) correlated with housing market strength and negatively correlated with HUD-assisted housing, low income, foreclosure risk, and distance to schools (with stronger correlations to the best schools). These areas are also positively correlated with percent White and percent Asian-American but negatively correlated with percent African-American (strongly) and percent Hispanic (weakly). Finally, across all MSAs, HUD-assisted housing is positively correlated with car-dependent and not very accessible areas, percent low income, and foreclosure risk and negatively correlated with high accessibility, housing market strength, and distance to schools (that is, closer distances, especially to the worst schools).

[5] The 10 MSAs with slowest population growth were Akron, OH; Buffalo-Cheektowaga-Tonawanda, NY; Cleveland-Elyria-Mentor, OH; Detroit-Warren-Livonia, MI; New Haven-Milford, CT; Providence-New Bedford-Fall River, RI-MA; Scranton--Wilkes-Barre, PA; Syracuse, NY; Toledo, OH; and Youngstown-Warren-Boardman, OH-PA. The 10 MSAs with fastest population growth were Austin-Round Rock, TX; Cape Coral-Fort Myers, FL; Charleston-North Charleston, SC; Dallas-Fort Worth-Arlington, TX; Houston-Baytown-Sugar Land, TX; McAllen-Edinburg-Pharr, TX; Orlando, FL; Provo-Orem, UT; Raleigh-Cary, NC; and San Antonio, TX. MSA population estimates were obtained from U.S. Census Bureau (2013b). Edits based on 2009 OMB definitions.

Accessibility of Project- and Tenant-Based HUD Programs

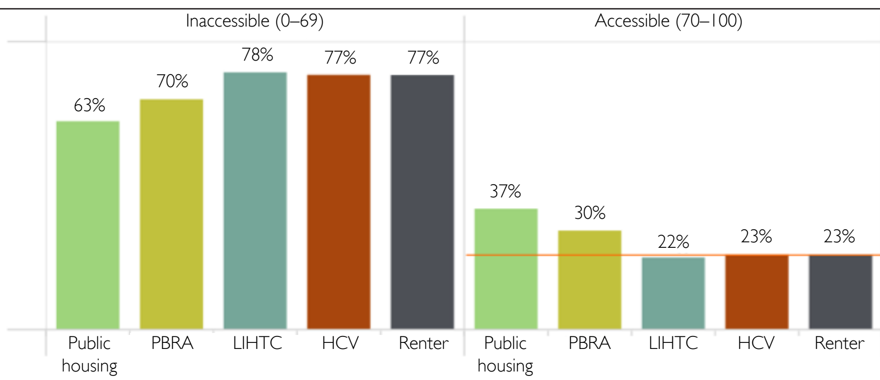
As mentioned previously, tenant-based voucher units are much more geographically dispersed than HUD-assisted project-based units. Whereas three-fourths (74 percent) of all neighborhoods in MSAs contain at least one HCV unit, only 9 to 13 percent of neighborhoods in MSAs contain at least one project-based unit. This distribution is related to the fact that about 60 percent of voucher holders live in suburban neighborhoods compared with 40 percent in principal cities. This proportion is exactly reversed for public housing (60 percent urban and 40 percent suburban) and evenly split (50 percent each) for PBRA and LIHTC units.

As the literature review demonstrated, public housing has historically been in the most disadvantaged neighborhoods, followed by other project-based housing (PBRA and LIHTC) and HCVs. Walkable access of HUD-assisted housing is more prevalent for public and PRBA housing than for LIHTC and HCV units. On average, a greater proportion of public housing units (37 percent) and PBRA housing units (30 percent) are accessible than LIHTC units and tenant-based vouchers. By comparison, the latter two programs are closer to the average percentage (23 percent) of all accessible rental units (exhibit 3). The same is true for transit access for those cities with transit data, where 53 percent of public housing tenants and 41 percent of PBRA tenants have good access (transit score of 70 to 100) compared with 37 percent LIHTC tenants and 31 percent of HCV tenants, which is closer to the transit access of all renters (33 percent). HCV-subsidized rental units, however, actually represent the greatest number (as opposed to proportion) of HUD-assisted units with walkable access (463,335 compared with about 340,000 to 360,000 project-based units with walkable access).

As is the case with all rental units, however, most HUD-assisted units are in inaccessible neighborhoods (63 percent for public housing, 70 percent for PBRA, and 77 to 78 percent for HCVs and LIHTC), especially in the South and Midwest. MSAs with more accessible neighborhoods unsurprisingly also tend to have more HUD-assisted housing with walkable access.

Exhibit 3

Walkable Access by HUD-Assisted Housing Type and All Renters



HCV = housing choice voucher. HUD = U.S. Department of Housing and Urban Development. LIHTC = low-income housing tax credit. PBRA = project-based rental assistance.

Notes: 359 metropolitan areas. The horizontal line on the right side of the exhibit represents the 23-percent share of all renter-occupied units in the United States with walkable access.

Sources: HUD; Walk Score; 2010 census

Tradeoffs With Walkable Access

In this section, we examine accessible neighborhoods with HUD-assisted housing in relation to tradeoffs such as poor market strength, crime, segregation, poor school quality, and environmental disamenities. We described previously that a greater proportion of tenants in place-based HUD-assisted housing live in walkable neighborhoods as compared with HCV holders. For all HUD-assisted tenants, a significant proportion of units in these walkable neighborhoods is not compromised by the countervailing factors we identified (17 to 24 percent compared with 20 percent for all rental units). At the same time, a subset of HUD-assisted housing is generally more likely than all rental units to be in areas with lower home values, more segregation, and poorer school quality (5 to 12 percent compared with 3 percent for all rentals). We first discuss accessibility in regards to separate compromising factors and then analyze it in relation to three combined factors.

Weaker Housing Markets

How do accessible neighborhoods with HUD-assisted housing fare economically? Not surprisingly, given findings from previous studies, the proportion of residents with low incomes (measured by the percentage of tax filings with EITC) is greater in neighborhoods with HUD-assisted housing than in areas without such housing. Median home values, and housing market strength generally, are correspondingly lower in neighborhoods with HUD-assisted housing than in those without it. They are lowest in neighborhoods with public housing, particularly in inaccessible neighborhoods. Across all housing programs, home prices are also higher in accessible than in inaccessible neighborhoods (a finding that is consistent with our analysis of six cities; see Talen and Koschinsky, 2014a). Accessible neighborhoods with HCV units have the highest median home values ($212,000), followed by neighborhoods with PBRA ($206,271), LIHTC ($192,000), and public housing ($164,000) units. Neighborhoods with HCV units have the lowest share of accessible neighborhoods in urban areas of all housing programs (75 percent for HCV neighborhoods compared with 80 to 84 percent for project areas). As shown previously, however, the relationship between walkable access and income or market strength is more bimodal than linear, with concentrations of accessible neighborhoods found in higher and lower income areas. Furthermore, areas that are most accessible (urban cores) and inaccessible (such as outer-ring suburbs) have higher home values, fewer low-income residents, and better market strength (exhibit 4 reflects some of these dynamics; see the percent EITC and market strength variables for accessible as opposed to inaccessible areas without assisted housing).

To address this question further, we sorted all neighborhoods from poor to good housing market strength and then grouped them into two categories: (1) poor market strength (weakest 25 percent of all areas) and (2) average-to-good market strength (remaining areas; that is, 25 to 100 percent). We would therefore expect 25 percent of all neighborhoods (accessible and inaccessible) to be in the poor market strength category and 75 percent in the average-to-good market strength group. All HUD-assisted units unsurprisingly have greater proportions in poor market strength areas than this expected 25-percent threshold. Public housing has the greatest proportion in these neighborhoods (47 percent), followed by HCV (43 percent), LIHTC (37 percent), and PBRA (36 percent) units. Public housing also has the greatest proportion of units in accessible neighborhoods among those programs (37 percent), and 24 percent of these neighborhoods have average or better

Exhibit 4

Characteristics of Neighborhoods With and Without HUD-Assisted Housing, by Program Type and Access Level (1 of 3)

	Neigh-bor-hoods (#)	Neigh-bor-hoods (%)	Subs Units (#)	Subs Units (%)	Median Home Value ($)	Housing Market Strength	Avg. Units/ Acre	% Urban
HCV in neighborhoods that are—								
Accessible with vouchers	20,126	12	463,335	23	212,000	– 0.21	20.2	75
Accessible without vouchers	4,109	2	—		300,000	0.62	32.8	80
Inaccessible with vouchers	107,624	62	—		134,000	– 0.16	3.3	39
Inaccessible without vouchers	42,327	24	1,581,670	77	180,000	0.56	1.9	22
Project-based rental assistance in neighborhoods that are—								
Accessible with project-based housing	5,593	3	344,411	30	206,271	– 0.14	23.3	80
Accessible without project-based housing	18,642	11	—		232,000	– 0.05	22.1	75
Inaccessible with project-based housing	17,919	10	—		124,000	– 0.29	3.5	44
Inaccessible without project-based housing	132,032	76	803,659	70	148,000	0.09	2.8	33
Public housing in neighborhoods that are—								
Accessible with public housing	3,657	2	353,935	37	164,000	– 0.42	19.7	84
Accessible without public housing	20,578	12	—		238,000	– 0.01	22.8	74
Inaccessible with public housing	13,398	8	—		105,000	– 0.52	3.7	59
Inaccessible without public housing	136,553	78	607,317	63	150,000	0.10	2.8	32
LIHTC in neighborhoods that are—								
Accessible with LIHTC	3,805	2	358,586	22	192,000	– 0.23	24.3	83
Accessible without LIHTC	20,430	12	—		233,000	– 0.04	22	75
Inaccessible with LIHTC	12,268	7	—		121,000	– 0.33	3.4	44
Inaccessible without LIHTC	137,683	79	1,284,145	78	148,000	0.07	2.9	33
All HUD housing in neighborhoods that are—								
Accessible with subs housing	20,935	12	1,551,883	27	214,000	– 0.18	20.7	75
Accessible without subs housing	3,300	2	—		319,000	0.62	32.8	79
Inaccessible with subs housing	110,921	64	—		134,000	– 0.15	3.2	38
Inaccessible without subs housing	39,030	22	4,301,498	73	183,000	0.59	1.9	22
Accessible (WS = 70–100)	24,220	14			225,000	– 0.07	22.3	76
Inaccessible (WS = 0–69)	149,933	86			145,000	0.04	2.9	34

Exhibit 4

Characteristics of Neighborhoods With and Without HUD-Assisted Housing, by Program Type and Access Level (2 of 3)

	Within 0.5 Miles of LP School (#)	Within 0.5 Miles of LP School (%)	Within 0.5 Miles of HP School (#)	Within 0.5 Miles of HP School (#)	Within 0.5 Miles of Brownfield (#)	Within 0.5 Miles of Brownfield (%)
HCV in neighborhoods that are—						
Accessible with vouchers	9,085	45	3,407	17	4,146	21
Accessible without vouchers	1,295	32	1,569	38	466	11
Inaccessible with vouchers	15,712	15	7,016	7	6,984	6
Inaccessible without vouchers	1,021	2	5,360	13	615	1
Project-based rental assistance in neighborhoods that are—						
Accessible with project-based housing	3,044	54	995	18	1,617	29
Accessible without project-based housing	7,336	39	3,981	21	2,995	16
Inaccessible with project-based housing	3,530	20	1,143	6	1,822	10
Inaccessible without project-based housing	13,203	10	11,233	9	5,777	4
Public housing in neighborhoods that are—						
Accessible with public housing	2,307	63	570	16	3,657	34
Accessible without public housing	8,073	39	4,406	21	20,578	16
Inaccessible with public housing	3,618	27	708	5	13,398	14
Inaccessible without public housing	13,115	10	11,668	9	136,553	4
LIHTC in neighborhoods that are—						
Accessible with LIHTC	2,334	61	638	17	1,292	34
Accessible without LIHTC	8,046	39	4,338	21	3,320	16
Inaccessible with LIHTC	2,478	20	567	5	1,364	11
Inaccessible without LIHTC	14,255	10	11,809	9	6,235	5
All HUD housing in neighborhoods that are—						
Accessible with subs housing	9,487	45	3,662	17	4,311	21
Accessible without subs housing	893	27	1,314	40	301	9
Inaccessible with subs housing	15,916	14	7,327	7	7,116	6
Inaccessible without subs housing	817	2	5,049	13	483	1
Accessible (WS = 70–100)	10,380	43	4,976	21	4,612	5
Inaccessible (WS = 0–69)	16,733	11	12,376	8	7,599	19

Exhibit 4

Characteristics of Neighborhoods With and Without HUD-Assisted Housing, by Program Type and Access Level (3 of 3)

	% African-American	African-American Segregated (40%+) (#)	African-American Segregated (40%+) (%)	% Hispanic	% White	Median EITC (%)
HCV in neighborhoods that are—						
Accessible with vouchers	20	3,867	19	18	52	21
Accessible without vouchers	8	229	6	12	71	10
Inaccessible with vouchers	16	16,017	15	11	68	17
Inaccessible without vouchers	5	843	2	7	84	10
Project-based rental assistance in neighborhoods that are—						
Accessible with project-based housing	25	1,417	25	17	48	23
Accessible without project-based housing	16	2,679	14	17	57	18
Inaccessible with project-based housing	22	4,316	24	10	63	19
Inaccessible without project-based housing	12	12,544	10	10	74	15
Public housing in neighborhoods that are—						
Accessible with public housing	32	1,263	35	17	45	23
Accessible without public housing	16	2,833	14	17	57	18
Inaccessible with public housing	25	3,739	28	11	59	22
Inaccessible without public housing	12	13,121	10	10	74	15
LIHTC in neighborhoods that are—						
Accessible with LIHTC	29	1,183	31	18	45	24
Accessible without LIHTC	16	2,913	14	17	57	18
Inaccessible with LIHTC	22	3,186	26	10	61	20
Inaccessible without LIHTC	12	13,674	10	10	74	15
All HUD housing in neighborhoods that are—						
Accessible with subs housing	20	4,034	19	18	52	20
Accessible without subs housing	5	62	2	11	76	9
Inaccessible with subs housing	15	16,241	15	11	69	17
Inaccessible without subs housing	5	619	2	7	84	10
Accessible (WS = 70–100)	2	4,096	17	2	6	19
Inaccessible (WS = 0–69)	11	16,860	11	9	64	15

Avg. = average. EITC = Earned Income Tax Credit. HCV = housing choice voucher. HP = high-performing. HUD = U.S. Department of Housing and Urban Development. LIHTC = low-income housing tax credit. LP = low-performing. PBRA = project-based rental assistance. Subs = subsidized.

market strength (compared with 16 percent in this category for all renters). It also has the greatest proportion of all programs in inaccessible poorer market-strength areas (34 percent), however. By contrast, all other programs' greatest proportion of units is in areas that are inaccessible but with average or better market strength (44 percent HCV and PBRA and 49 percent LIHTC) compared with 55 percent for all rental units.

Crime

Our descriptive analysis reveals that, on average, accessible neighborhoods in general tend to have higher rates of violent and property crime than inaccessible areas (except in Chicago) but that these rates are significantly higher in accessible neighborhoods with HUD-assisted housing. In other words, evidence exists that walkable access is compromised by crime for HUD-assisted households—except in Chicago, where much HUD-assisted housing is concentrated in inaccessible neighborhoods. In the five cities (excluding Chicago), violent crime rates per 1,000 people are highest in neighborhoods with any LIHTC units (23.1 for accessible areas compared with 13.4 for inaccessible areas) or any PBRA units (21.5 compared with 11.5), followed by those with any HCVs or public housing (15.3 compared with 7.9). The same pattern emerges for property crimes.

Controlling for other neighborhood characteristics in a multivariate regression context, however, another story emerges. Talen and Koschinsky's (2014a) logit regression model finds that Chicago is the only city where violent crime is strongly associated with high-access, high-subsidized locations. This association, importantly, is not true for public housing residents in Chicago, however. The same study of the six cities found that, in Atlanta, HUD-assisted units in high-access locations have higher crime rates. For all cities combined, the violent crime rate is lower in areas with excellent (walk score of 90 to 100) and poor (walk score of 0 to 69) access and higher in areas with good access (walk score of 70 to 89). For property crime, high-access areas have a lower crime rate than low-access areas.

Segregation

In all neighborhoods with HUD-assisted housing, the proportion of African-American residents is at least twice as great as in neighborhoods without such housing. This African-American concentration is especially true for neighborhoods with public housing. The share of Hispanic residents in neighborhoods with and without HUD-assisted housing is similar (in both accessible and inaccessible areas), although slightly greater proportions of Hispanic residents are present in neighborhoods with than without HCV holders. The proportion of White residents is less in neighborhoods with any type of HUD-assisted housing (exhibit 4).

To address the extent to which walkable access is compromised by segregation, we look at the proportion of accessible neighborhoods that are segregated (defined as 40 or more percent African-American) and that contain HUD-assisted housing of the different types (exhibit 4). For all HUD programs, accessible neighborhoods with assisted housing are the most segregated; that is, they have higher shares of segregation than accessible areas without assisted housing and inaccessible neighborhoods with or without subsidies. Neighborhoods with public housing are the most segregated (35 percent for accessible and 28 percent for inaccessible areas), and neighborhoods with HCV holders are the least segregated (19 and 15 percent, respectively), with LIHTC closer to public housing and PBRA more similar to HCVs. As before, because the number of inaccessible neighborhoods is so much greater than the number of accessible ones, more segregated neighborhoods are inaccessible than accessible.

The six-city regression results of Talen and Koschinsky (2014a) found that segregation compromises good access in Atlanta, Boston, and Chicago, but not in Miami, Phoenix, and Seattle.

Lower School Quality

Accessible rental units will by definition be closer to both better and worse schools than units in inaccessible areas. Walkable neighborhoods with HUD-assisted housing have disproportionately more access to low-performing schools (with scores 1 or 2) than accessible neighborhoods without HUD-assisted housing (exhibit 4), however. Furthermore, a comparison between project- and tenant-based housing programs shows that this problem is greater for projects than for HCVs. Most walkable neighborhoods with project units are near low-performing schools (63 percent for neighborhoods with public housing, 61 percent for LIHTC, and 54 percent for PBRA compared with 39 percent of neighborhoods without any project housing). Although accessible neighborhoods with HCV units are still closer to low-performing schools than those without HCV units (45 compared with 32 percent), this 45-percent share is notably less than that of accessible neighborhoods with projects. Even when both accessible and inaccessible neighborhoods are considered, 90 percent of neighborhoods with public housing are within 0.5 mile of a low-performing school compared with 82 percent of neighborhoods with LIHTC and 74 percent of neighborhoods with PBRA units but a comparatively less 60 percent of accessible or inaccessible neighborhoods with HCV units. Nevertheless, when it comes to proximity to high-performing schools (with scores of 9 or 10), little difference exists between neighborhoods with HCV units and projects, whether they are accessible (about 17 percent) or not (5 to 7 percent). As expected, neighborhoods without assisted housing do have better access.

Environmental Disamenities

Finally, residents in accessible neighborhoods with HUD-assisted housing are more likely than residents in accessible neighborhoods without such housing to live near environmental disamenities like brownfields. This likelihood is true more for accessible neighborhoods with project-based assistance (29 percent for PBRA and 34 percent for public and LIHTC housing) than for those with HCV units (21 percent, like all neighborhoods), which are more dispersed. Of the four HUD programs we are comparing, LIHTC and public housing residents are most likely to live near brownfields (exhibit 4).

Combined Compromising Factors

As mentioned previously, we also compare a combined measure of multiple compromising factors with neighborhood accessibility. We assume neighborhood quality is compromised in areas with home values below the median, high rates (40 or more percent) of African-American or Hispanic segregation, and where the closest school within 0.5 miles is of poor quality. As before, neighborhoods with walkable access have walk scores of at least 70. We compare the proportion of units, in accessible as opposed to inaccessible neighborhoods with and without compromising factors, for HUD-assisted units with those of all rental units. All the differences between assisted and all rental units in the following discussion are statistically significant at the .001 level and refer to results presented in exhibits 5 and 6.

Exhibit 5

Proportions of Units, by Accessibility, Compromised or Not, for Different Areas (1 of 2)

All MSAs

Number of units in each of four compromise-access categories

Compromised?	Walk Score	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	482,330	699,830	1,137,043	1,375,655	24,306,040	89,615,275
No	Accessible	235,076	272,595	281,934	360,456	6,650,436	11,976,775
Yes	Inaccessible	124,987	103,829	147,102	206,015	1,576,760	3,510,451
Yes	Accessible	118,859	71,816	76,652	102,879	963,001	1,560,023

Percent of units in each of four compromise-access categories

Compromised?	Walk Score	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	50%	61%	69%	67%	73%	84%
No	Accessible	24%	24%	17%	18%	20%	11%
Yes	Inaccessible	13%	9%	9%	10%	5%	3%
Yes	Accessible	12%	6%	5%	5%	3%	1%

All MSAs—Cities and Suburbs

Number of units in each of four compromise-access categories

Compromised?	Walk Score	City-Suburb	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Suburb	209,337	379,498	627,534	724,736	14,632,491	62,863,824
No	Inaccessible	City	272,993	320,332	509,509	650,919	9,673,549	26,751,451
No	Accessible	Suburb	40,978	55,346	45,238	87,790	1,476,719	2,889,730
No	Accessible	City	194,098	217,249	236,696	272,666	5,173,717	9,087,045
Yes	Inaccessible	Suburb	18,448	22,870	36,725	55,383	420,129	985,004
Yes	Inaccessible	City	106,539	80,959	110,377	150,632	1,156,631	2,525,447
Yes	Accessible	Suburb	8,276	10,921	6,581	16,008	148,978	240,384
Yes	Accessible	City	110,583	60,895	70,071	86,871	814,023	1,319,639

Percent of units in each of four compromise-access categories

Compromised?	Walk Score	City-Suburb	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Suburb	76%	81%	88%	82%	88%	94%
No	Inaccessible	City	40%	47%	55%	56%	58%	67%
No	Accessible	Suburb	15%	12%	6%	10%	9%	4%
No	Accessible	City	28%	32%	26%	23%	31%	23%
Yes	Inaccessible	Suburb	7%	5%	5%	6%	3%	1%
Yes	Inaccessible	City	16%	12%	12%	13%	7%	6%
Yes	Accessible	Suburb	3%	2%	0.9%	2%	0.9%	0.4%
Yes	Accessible	City	16%	9%	8%	7%	5%	3%

All MSAs—Regions

Number of units in each of four compromise-access categories

Compromised?	Walk Score	Regions	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Midwest	2,963	4,520	5,184	7,041	76,371	224,891
No	Inaccessible	Northeast	58	2,366	1,673	1,571	16,830	36,476
No	Inaccessible	South	4,039	4,031	11,599	5,554	77,980	195,897
No	Inaccessible	West	4,373	3,841	7,390	7,523	234,760	671,168
No	Accessible	Midwest	9,317	15,459	13,120	10,338	358,396	724,530
No	Accessible	Northeast	5,789	12,356	11,893	6,132	105,038	172,911
No	Accessible	South	3,660	4,150	7,336	3,501	86,854	158,212
No	Accessible	West	4,734	3,378	9,923	3,040	113,476	217,931
Yes	Inaccessible	Midwest	2,277	5,660	5,736	9,964	62,896	139,866
Yes	Inaccessible	Northeast	574	616	1,139	1,751	7,667	14,365
Yes	Inaccessible	South	2,787	2,025	8,469	3,848	25,984	51,376
Yes	Inaccessible	West	578	88	1,031	405	7,022	16,366
Yes	Accessible	Midwest	903	2,613	4,070	7,449	57,263	105,929
Yes	Accessible	Northeast	3,482	5,865	5,409	5,479	32,009	47,661
Yes	Accessible	South	502	226	2,430	385	7,325	10,997
Yes	Accessible	West	102	0	552	83	1,057	2,204

Percent of units in each of four compromise-access categories

Compromised?	Walk Score	Regions	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Midwest	19%	16%	18%	20%	14%	19%
No	Inaccessible	Northeast	1%	11%	8%	11%	10%	13%
No	Inaccessible	South	37%	39%	39%	42%	39%	47%
No	Inaccessible	West	45%	53%	39%	68%	66%	74%
No	Accessible	Midwest	60%	55%	47%	30%	65%	61%
No	Accessible	Northeast	58%	58%	59%	41%	65%	64%
No	Accessible	South	33%	40%	25%	26%	44%	38%
No	Accessible	West	48%	46%	53%	28%	32%	24%
Yes	Inaccessible	Midwest	15%	20%	20%	29%	11%	12%
Yes	Inaccessible	Northeast	6%	3%	6%	12%	5%	5%
Yes	Inaccessible	South	25%	19%	28%	29%	13%	12%
Yes	Inaccessible	West	6%	1%	5%	4%	2%	2%
Yes	Accessible	Midwest	6%	9%	14%	21%	10%	9%
Yes	Accessible	Northeast	35%	28%	27%	37%	20%	18%
Yes	Accessible	South	5%	2%	8%	3%	4%	3%
Yes	Accessible	West	1%	0%	3%	1%	0.1%	0.1%

Exhibit 5

Proportions of Units, by Accessibility, Compromised or Not, for Different Areas (2 of 2)

Six Cities

Number of units in each of four compromise-access categories

Compromised?	Walk Score	Six Cities	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Atlanta	2,858	3,149	10,911	4,702	55,221	148,502
No	Inaccessible	Boston	58	2,366	1,673	1,571	16,830	36,476
No	Inaccessible	Chicago	2,963	4,520	5,184	7,041	76,371	224,891
No	Inaccessible	Miami	1,181	882	688	852	22,759	47,395
No	Inaccessible	Phoenix	2,368	3,222	4,592	5,041	196,918	557,283
No	Inaccessible	Seattle	2,005	619	2,798	2,482	37,842	113,885
No	Accessible	Atlanta	1,120	2,112	3,732	382	21,945	46,523
No	Accessible	Boston	5,789	12,356	11,893	6,132	105,038	172,911
No	Accessible	Chicago	9,317	15,459	13,120	10,338	358,396	724,530
No	Accessible	Miami	2,540	2,038	3,604	3,119	64,909	111,689
No	Accessible	Phoenix	6	594	859	210	12,660	24,468
No	Accessible	Seattle	4,728	2,784	9,064	2,830	100,816	193,463
Yes	Inaccessible	Atlanta	951	1,777	7,087	2,812	16,694	35,331
Yes	Inaccessible	Boston	574	616	1,139	1,751	7,667	14,365
Yes	Inaccessible	Chicago	2,277	5,660	5,736	9,964	62,896	139,866
Yes	Inaccessible	Miami	1,836	248	1,382	1,036	9,290	16,045
Yes	Inaccessible	Phoenix	578	88	667	267	6,424	15,533
Yes	Inaccessible	Seattle	0	0	364	138	598	833
Yes	Accessible	Atlanta	161	5	884	8	1,347	2,029
Yes	Accessible	Boston	3,482	5,865	5,409	5,479	32,009	47,661
Yes	Accessible	Chicago	903	2,613	4,070	7,449	57,263	105,929
Yes	Accessible	Miami	341	221	1,546	377	5,978	8,968
Yes	Accessible	Phoenix	0	0	0	10	718	1,707
Yes	Accessible	Seattle	102	0	552	73	339	497

Percent of units in each of four compromise-access categories

Compromised?	Walk Score	Six Cities	PubHsg	PBRA	LIHTC	HCV	Renters	Units
No	Inaccessible	Atlanta	56%	45%	48%	59%	58%	64%
No	Inaccessible	Boston	1%	11%	8%	11%	10%	13%
No	Inaccessible	Chicago	19%	16%	18%	20%	14%	19%
No	Inaccessible	Miami	20%	26%	10%	16%	22%	26%
No	Inaccessible	Phoenix	80%	83%	75%	91%	91%	93%
No	Inaccessible	Seattle	29%	18%	22%	45%	27%	37%
No	Accessible	Atlanta	22%	30%	17%	5%	23%	20%
No	Accessible	Boston	58%	58%	59%	41%	65%	64%
No	Accessible	Chicago	60%	55%	47%	30%	65%	61%
No	Accessible	Miami	43%	60%	50%	58%	63%	61%
No	Accessible	Phoenix	0%	15%	14%	4%	6%	4%
No	Accessible	Seattle	69%	82%	71%	51%	72%	63%
Yes	Inaccessible	Atlanta	19%	25%	31%	36%	18%	15%
Yes	Inaccessible	Boston	6%	3%	6%	12%	5%	5%
Yes	Inaccessible	Chicago	15%	20%	20%	29%	11%	12%
Yes	Inaccessible	Miami	31%	7%	19%	19%	9%	9%
Yes	Inaccessible	Phoenix	20%	2%	11%	5%	3%	3%
Yes	Inaccessible	Seattle	0%	0%	3%	2%	0.05%	0.03%
Yes	Accessible	Atlanta	3%	0%	4%	0%	1%	1%
Yes	Accessible	Boston	35%	28%	27%	37%	20%	18%
Yes	Accessible	Chicago	6%	9%	14%	21%	10%	9%
Yes	Accessible	Miami	6%	7%	21%	7%	6%	5%
Yes	Accessible	Phoenix	0%	0%	0%	0%	0%	0%
Yes	Accessible	Seattle	1%	0%	4%	1%	0.03%	0.02%

Colored cell — Significant difference percent HUD housing compared with percent all rental units at .05 level (uncolored = nonsignificant difference)

Percent HUD housing lower than percent all rental units

Percent HUD housing higher than percent all rental units

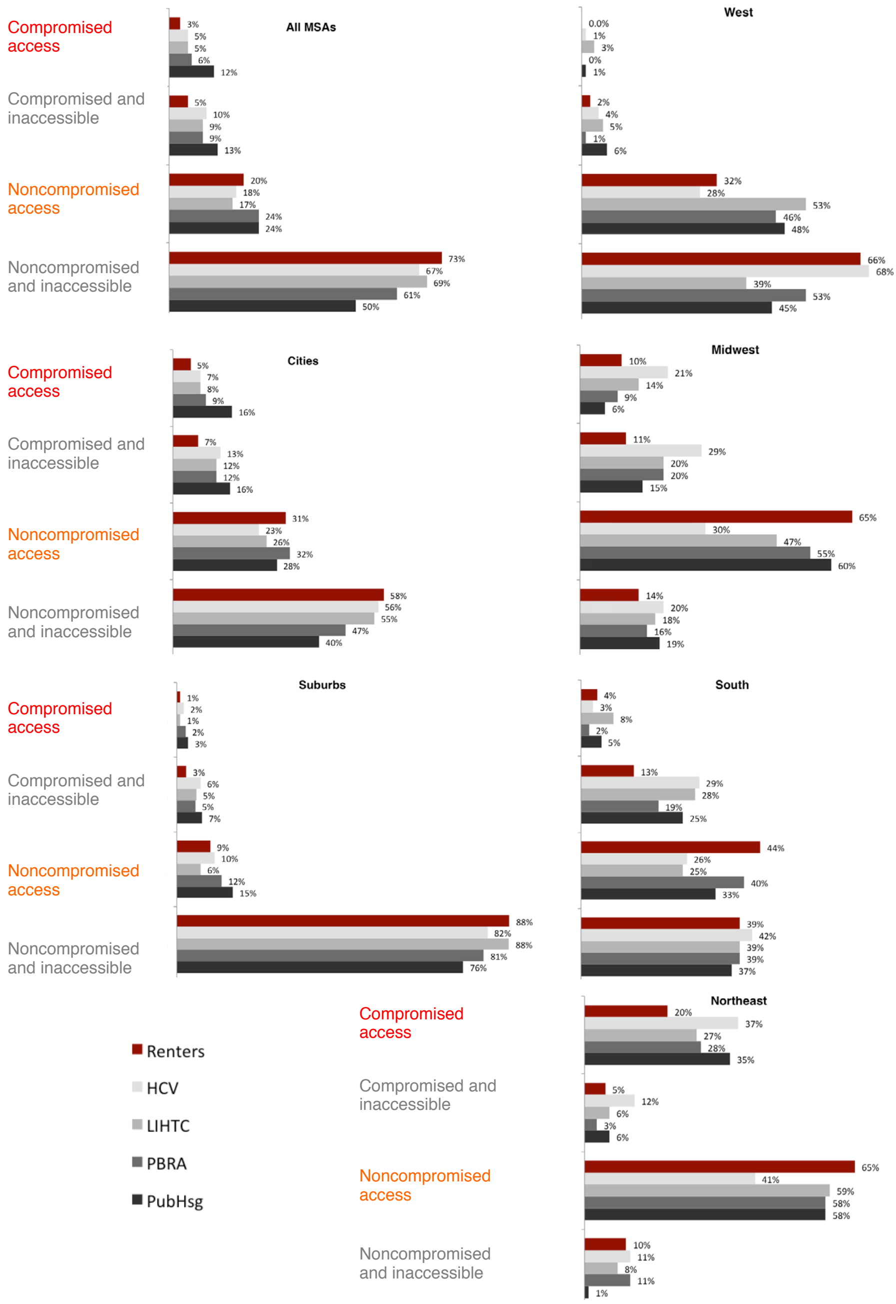
Compromised (6.4%) — African-American or Hispanic segregation ≥ 40%
Nearest school within 0.5 miles is low performing
Below median home values (MSA median)

Not compromised (93.6%) — African-American or Hispanic segregation < 40%
Nearest school within 0.5 miles is not low-performing or no school is within 0.5 miles
Above median home values (MSA median)

HCV = housing choice voucher. LIHTC = low-income housing tax credit. MSA = metropolitan statistical area. PBRA = project-based rental assistance. PubHsg = public housing.

Exhibit 6

Proportions of Units, by Accessibility, Compromised or Not, for Different Areas



HCV = housing choice voucher. LIHTC = low-income housing tax credit. MSA = metropolitan statistical area. PBRA = project-based rental assistance. PubHsg = public housing.

On the one hand, an above average proportion of project-based housing is in accessible, noncompromised, suburban areas. In all MSAs, walkable access that is not compromised is 4 percentage points more for public housing and PBRA units than for all rental units. This share contrasts with HCV and LIHTC units, which have 2 to 3 percentage points less than the average proportion of rental units in regards to noncompromised accessibility. Suburban neighborhoods drive this result for public housing and PBRA units. Compared with all rental units, noncompromised access is 2 percentage points less for public housing in urban areas but 6 percentage points more for public housing in suburban areas than for all rentals. For PBRA units, the respective results are 1 percentage point more in urban and 3 percentage points more in suburban areas. Project-based housing in walkable suburbs is one of the mechanisms that work to provide both accessibility and affordability.

For other neighborhoods with any HUD-assisted housing, walkable access is also compromised at above average proportions, especially in urban areas and for public housing. The proportion of HCV, LIHTC, and PBRA units with compromised walkable access is 2 to 3 percentage points more than for all rental units. It is even 9 percentage points more for public housing units than for all rental units. Most areas with compromised walkable access are in cities as opposed to suburbs.

The proportion of units in inaccessible neighborhoods with compromised neighborhood quality is greater for all four types of HUD-assisted housing than for all rental units; 4 to 5 percentage points more for HCV, LIHTC, and PBRA units and 8 percentage points more for public housing. These differences are also greater in cities than suburbs. Finally, the greatest differences between HUD-assisted and all rental units exist in regards to inaccessible neighborhoods without compromised neighborhood quality. These areas have 23 percentage points fewer public housing units than all rental units compared with 12 percentage points fewer PBRA units and 4 to 6 percentage points fewer LIHTC and HCV units. These differences are stronger for project-based units in cities and for HCV units in suburbs.

Of the 37 percent of all public housing units in accessible neighborhoods, neighborhood quality is compromised for 12 percent and not compromised for 24 percent (compared with 3 and 20 percent, respectively, for all rental units). By comparison, 30 percent of PBRA units are accessible—for 6 percent of these units access is compromised, but for 24 percent it is not. Hence PBRA units are comparable with public housing in terms of their proportion of noncompromised access but have a lesser proportion of compromised access (but still greater than that of all rental units). For HCV and LIHTC units, the rates of having noncompromised accessibility are below average (17 to 18 percent compared with 20 percent for all rentals) but the rates for compromised access are above average (5 compared with 3 percent for all rentals, although these rates are lower than for the other two project-based units). Nevertheless, of the 22 to 23 percent of HCV and LIHTC units in accessible neighborhoods, access is not compromised for 17 to 18 percent and is compromised for 5 percent. Note that the number of HCV units in accessible, noncompromised neighborhoods is actually more than that of public housing (360,456 compared with 235,076).

Regional variation exists within these national patterns. In the Midwest and Northeast, 65 percent of all rental units are in accessible, noncompromised areas. The proportions for HUD-assisted units are comparatively less but still sizable; 58 to 59 percent of all project-based units and 41 percent of HCV units in the Northeast have uncompromised accessibility. By comparison, 60 percent of public housing, 47 to 55 percent of LIHTC and PBRA units, and 30 percent of HCV units are in accessible, noncompromised areas in the Midwest. The proportions of rental units in such areas are less in the South (44 percent) and West (32 percent), but above average proportions of project-based units (46 to 53 percent) are in these neighborhoods in the West. As compared with all rental units, accessibility is compromised more than average for LIHTC units in all regions and for public housing and HCV units in all regions except for the South.

A similar pattern holds at the city level; although often less than average as compared with all rental units, a sizable proportion of assisted units are in noncompromised accessible neighborhoods; for example, 47 to 60 percent for LIHTC, PBRA, and public housing units and 30 percent for HCV units in Chicago (compared with 65 percent all rental units). In Boston, 58 to 59 percent of all project-based assisted housing and 41 percent of HCV housing are in noncompromised accessible neighborhoods (compared with 65 percent of all rental units). In most of the six cities, however, above average proportions of LIHTC and HCV units especially are also in accessible areas with compromising factors.

Our quantitative comparison of Walk Score's accessibility metric with State of Place's index of walkability generally shows that areas with more HUD-assisted housing fare worse in terms of amenity quality, urban form, and safety (Koschinsky et al., 2014) than accessible areas without such housing. The State of Place index captures qualitative features of the walking environment, including the quality of amenities and safety, which are not captured by Walk Score. In other words, Walk Score, as a measure of walkable access to quality amenities, is more accurate in higher income neighborhoods than lower income ones. Walkable access means different things in these neighborhoods and is more likely to be compromised in lower income areas. These findings underscore the results of tradeoffs for HUD-assisted tenants between walkable access and compromising factors presented in this section. They support other research on tradeoffs (Neckerman et al., 2009) and related results discussed in the literature section.

Conclusion and Policy Implications

In this concluding section, we discuss some of the key implications of these findings for increasing the supply of walkable neighborhoods, changing program rules to improve walkable access, and measuring accessibility.

We discussed the growing demand for walkable neighborhoods throughout this report. Indeed, when residents with lower incomes are asked about their preference for living in walkable neighborhoods, their preference is as great if not more than that of residents in other income groups (Adkins, 2013; Nelson, 2013). As expected given increasing demand for walkable areas, however, their ability to realize this preference is less than that of higher income groups (Adkins, 2013) for the host of reasons that constrain choices of low-income tenants that we discussed in the review of existing studies. As a result, most residents do not choose their place to live based on perceived walkability (Fleury, 2013) but make housing choices based on information from their localized social networks and the availability of cheap rental housing (Skobba and Goetz, 2013). As in the case of Moving to Opportunity for Fair Housing demonstration program tenants (Briggs, Popkin, and Goering, 2010), “moving to safety” is often a more immediate and realistic motivation than “moving to opportunity.” In addition, as for the unsubsidized housing market, where about one-half of residents prefer to live in less walkable suburban settings (Nelson, 2013), walkability is likely more important for some but not all assisted tenants. For instance, for assisted tenants with mobility restrictions (who are elderly or disabled), walkability might be key whereas, for households with children, school quality might be more important, and if tradeoffs between walkability and school quality must be made, the latter might be a higher priority.

Besides these constraints, previous research empirically assessed the goal of using HCVs to enable tenants to move to higher opportunity neighborhoods and concluded that not enough rental units are available in these areas at given rent-subsidy levels (McClure, 2010). Neighborhoods with walkable access to high opportunities such as quality schools, employment, parks, and infrastructure are an even smaller subset of high-opportunity neighborhoods. Because only 14 percent of all MSAs are accessible, and given the recent increased demand for such neighborhoods from affluent residents, landlords in these areas have a comparative disincentive to rent to assisted tenants. In this context, planners and other stakeholders have been promoting changes in underwriting rules to accommodate more mixed-use development (such as the Federal Housing Administration’s recently revised caps for commercial space in mixed-use condos), densification, complete streets, and other retrofitting approaches to increase the supply of accessible neighborhoods in urban and suburban areas.

One mechanism for enabling an expanded supply of walkable neighborhoods is a reform of zoning codes and land use regulations. Our analysis of accessibility and land use and zoning in the six cities (Atlanta, Boston, Chicago, Miami, Phoenix, and Seattle), found that more accessible areas are, not surprisingly, associated with greater land use diversity and with zoning that enables walking between different types of land uses (for example, multifamily and mixed use, flexible, walkable, and commercial) as opposed to zoning codes that isolate single-family uses from others (Talen, Koschinsky, and Lee, 2014). Cluster maps that group similar land use, zoning and urban form characteristics in neighborhoods with HUD-assisted housing for the six cities illustrate different ways in which cities do or do not mix land uses and achieve different levels of housing unit density. For instance, the strong mixing of pedestrian-friendly characteristics across neighborhoods in Boston make it one of the most walkable cities in the United States with the second greatest proportion of HUD-assisted housing in walkable urban areas in the country, preceded by only New York. By contrast, the spatial isolation of land uses, zoning, and urban form characteristics by neighborhood makes Atlanta one of the least walkable cities in the country with subsequent minimal proportions of HUD-assisted units in walkable areas. Land uses, zoning, and urban form characteristics in the city of Phoenix are also relatively mixed but not pedestrian friendly (as in the case of industrial uses). By comparison, Seattle, which is more accessible than Phoenix and Atlanta but less accessible than Chicago and Boston, consists of many residential neighborhoods that are, however, in close proximity to multifamily residential and commercial pockets along corridors and in so-called urban villages (densification related to urban growth concentration within city boundaries).

Given the current undersupply (and associated price premiums) of accessible neighborhoods even for higher income households, we see few alternatives to increasing the supply of these neighborhoods as a prerequisite for locating more assisted housing or tenants in these areas. As the review of studies on affordable housing preservation near transit illustrated, however, efforts to increase walkable or transit access are soon reflected in land and home price premiums, which then tend to translate to increased rents, gentrification, and displacement. To avoid this result, targeted upzoning (densification) for only affordable housing can be an effective tool in tight housing markets. The goals of affordability and accessibility have to remain coupled when seeking to increase the supply of accessible neighborhoods for assisted tenants to avoid unintended consequences of displacement and loss of affordability (Chapple, 2009; Harrell, Brooks, and Nedwick, 2009; Haughey and Sherriff, 2010; Quigley, 2010). For instance, several state housing agencies have started to include transit access or higher walk scores as scoring criteria to fund LIHTC projects. Without other goals, such as desegregation or proximity to higher quality schools, these access criteria can run the risk of reconcentrating assisted housing in high-poverty neighborhoods, albeit walkable ones.

We argued that increasing the supply of neighborhoods with walkable access to amenities needs to be balanced with safeguards to preserve affordability and avoid displacement of low-income tenants. We contend that the emphasis on accessibility by foot similarly needs to be balanced with accessibility by other modes of transportation, including bikes, buses, and cars. Integrating walkable access with multimodal transportation approaches avoids locking tenants into being captive walkers when they would need other transportation options to, for example, access daycare, jobs, or health services that cannot be reached by walking. This need is especially great in lower density MSAs in the South and Southwest, where we have shown that only a minimal proportion of neighborhoods are walkable and where public transit service is often infrequent and with limited geographic coverage. Challenges with multimodal transport remain, however, including limited evidence that bike use is less frequent among assisted tenants (Moses, 2013). For instance, the Rockefeller Foundation also discontinued funding for a pilot bike program for public housing residents because too few tenants were considering it as a viable transportation option. On the other hand, access to cars has been found to be a key factor in securing and maintaining employment for assisted tenants (Pendall et al., 2014).

We found that measures of walkable access to amenities such as Walk Score's work better in higher income neighborhoods because they ignore problems in the quality of the walking environment, such as poor-quality amenities and urban form and lacking safety, that were more prevalent in lower income neighborhoods. The implication for measuring walkability, particularly in lower income neighborhoods, is that measures of accessibility need to be supplemented with socioeconomic indicators to capture potential tradeoffs that threaten to compromise the benefits of walkability.

These findings therefore suggest that the priority of walkable access needs to be weighted in the context of potential countervailing socioeconomic neighborhood characteristics. In terms of criteria for identifying sustainable neighborhoods, urban form characteristics (such as walkability) should be used in conjunction with socioeconomic indicators. Poverty likewise should not be used as a sole criterion, ignoring accessibility to relevant amenities such as jobs or daycare. From a conceptual standpoint, this criterion means integrating two notions of neighborhood. One notion prioritizes neighborhood as a social environment and one as a built environment. Each notion developed as relatively separate literatures in disciplines ranging from economics and sociology to urban planning. We argue that this disconnect has problematic consequences for neighborhood research and practice, because built environment research often ignores social context and the potential differential meaning and importance of urban form in rich and poor neighborhoods.

In practice, the tensions between fair housing advocates—who aim for greater race and income equality—and sustainable communities proponents—who seek to improve sustainable urban form (Goetz, 2013)—illustrate the difficulties that arise when accessibility and socioeconomics are considered separately. On the one hand, the argument to develop and preserve more affordable housing near transit is consistent with the goal of promoting greater accessibility. Because accessible weak market areas likewise are also often more segregated (as we also demonstrated), more affordable housing in these areas might inadvertently lead to a confounding of concentrated and segregated poverty. Debates between proponents and skeptics of using the Center for Neighborhood Technology's Location Affordability Index for decisions related to HUD-assisted housing exhibit similar tensions between "driving to less segregated opportunity" and revitalizing accessible places with greater prevalence of poverty and segregation. Finally, prioritizing walkable access (for example, also in the case of extra points for LIHTC applications) without simultaneous regard for socioeconomic indicators, such as better school quality or market strength, could also create a higher risk of inadvertently supporting exclusionary zoning policies in suburbs (Schwartz, 2011).

Based on our results, we argue against the dichotomy between accessible, more segregated urban areas and inaccessible, less segregated suburban areas that often characterizes the fair housing versus sustainable communities policy debates. Instead, we see the more important distinction between noncompromised accessible as opposed to inaccessible areas, whether they are urban or suburban. We showed that, compared with all rental units in noncompromised accessible areas, a greater proportion of public housing and PBRA units is actually in denser suburban cores as opposed to urban parts of these areas. We did find evidence of less segregation in accessible suburban than in accessible urban areas. Rather than recommending that federal efforts be directed at low-density suburban locations rather than urban ones, however, we would recommend targeting accessible locations in both urban and suburban areas, especially those with less segregation, higher home values, and better schools. In this context, promoting project-based housing in walkable suburbs seems to be one of the strategies that work to achieve the joint goals of affordability and accessibility.

We find that accessibility is disproportionately compromised for all HUD-assisted tenants, but especially so for public housing tenants in urban areas. For a disproportionate number of other tenants in public housing and PBRA, however, accessibility is not compromised, especially in suburban areas. Given these different dynamics in accessible neighborhoods with HUD-assisted housing, we recommend different federal strategies for the areas that fall into one of the four categories of access and compromising factors (noncompromised or compromised accessible areas and noncompromised or compromised inaccessible areas).

1. Accessible neighborhoods with HUD-assisted housing and no compromising factors. Use these neighborhoods (in both urban and suburban areas) as best practices benchmarks, strengthen what works in these areas, and expand these practices to other areas. For instance, tie federal funding to the continued strengthening of local pedestrian- and transit-friendly zoning and land use and continue to support the development or preservation of affordable housing near transit.

2. Accessible neighborhoods with HUD-assisted housing and compromising factors. Target development and preservation resources in the subset of these urban and suburban neighborhoods that is near areas where accessibility is not or is less compromised. This targeted development could leverage the strength of these neighboring accessible areas and increase the income mix in accessible neighborhoods through a better integration of accessible neighborhoods with and without compromising factors.

3. Inaccessible neighborhoods with HUD-assisted housing and no compromising factors. These neighborhoods are where car ownership or sharing programs proposed by Pendall et al.'s (2014) research supposedly make most sense. We would not recommend, however, subsidizing project-based housing in these locations within a framework of sustainable communities because they are not accessible.

4. Inaccessible neighborhoods with HUD-assisted housing and compromising factors. Except for public housing, the greatest relative difference between HUD-assisted units and all rental units is actually in this category, which contains the worst of both worlds (inaccessible and compromised, which is reflected in lower land and home values). We recommend refocusing federal investments away from these areas toward more accessible neighborhoods.

Several extensions of our research could shed light on additional aspects of the relationship between walkable access and HUD-assisted housing. One would be to compare walkable access for different subgroups of tenants (such as tenants who are elderly, disabled, or with families) because walkability might matter more to residents with mobility restrictions, for example, seniors or children who cannot drive. A related question in this context is which subsidized tenant groups value access to amenities most and how they prioritize access given the tradeoffs with compromising factors that we identified in some neighborhoods. Furthermore, it would be very useful to be able to differentiate traditional public housing from HOPE VI in regards to accessibility, which we were unable to do because of data limitations. We found that public housing is disproportionately located in accessible neighborhoods as compared with other HUD programs and all rental units. One of the limitations is that we do not know whether this finding is driven by the newer decentralized HOPE VI developments, the older traditional public housing developments, or both. The difference is relevant because HOPE VI projects were often designed with walkable, mixed-income goals in mind and as alternatives to the isolated superblocks of traditional public housing. Finally, the lack of reliable neighborhood-level census data on low-income residents or low-income rental units has frustrated our efforts to compare HUD-assisted units in accessible neighborhoods with unsubsidized low-income rental units in accessible neighborhoods. This comparison would allow for us to more directly address the question of whether HUD-assisted housing is more likely—as opposed to all renters in our current comparison—to enable tenants to live in accessible neighborhoods (with and without compromising factors) as compared with unsubsidized low-income tenants. We are collaborating to address this question in the near future.

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Authors

Julia Koschinsky is an associate research professor at the Arizona State University School of Geographical Sciences and Urban Planning and is the Research Director of the GeoDa Center for Geospatial Analysis and Computation.

Emily Talen is a professor at the Arizona State University School of Sustainability and School of Geographical Sciences and Urban Planning.

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Driving to Opportunities: Voucher Users, Cars, and Movement to Sustainable Neighborhoods

Rolf Pendall
Christopher Hayes
Arthur (Taz) George
Urban Institute

Casey Dawkins
Jae Sik Jeon
Elijah Knaap
University of Maryland

Evelyn Blumenberg
Gregory Pierce
University of California, Los Angeles

Michael Smart
Rutgers University

Abstract

Tenant-based rental vouchers have expanded housing choice for millions of low-income households, yet assisted households still face hurdles when trying to secure housing in high-opportunity neighborhoods with desirable economic, social, and environmental characteristics. Although inadequate transportation is arguably one of the most important hurdles to securing housing in high-opportunity neighborhoods, existing studies of voucher users' location choices have n ot yet explored the connections between transportation access and residential location outcomes. This article discusses the results from a recent study that attempts to close that gap. Our study draws on data from the Moving to Opportunity for Fair Housing demonstration program and the Welfare-to-Work Voucher Program, two residential mobility initiatives that randomly assigned rental vouchers to low-income households seeking housing assistance. Using a variety of approaches—including cluster analysis, bivariate comparisons, and multivariate analysis—we find evidence of important connections between automobile access and improved neighborhood conditions. We also find that neighborhoods with similar levels

Abstract (continued)

of poverty exhibit a wide array of other characteristics that matter differently for different kinds of households. Our findings suggest a need for more integrated and holistic planning and program development to account for the importance of both cars and transit to low-income households' well-being.

Introduction and Overview

Research on the linkages between tenant-based housing assistance and residential outcomes suggests that households receiving vouchers choose to live in a wider range of neighborhoods than public housing residents and unassisted renters (Schwartz, 2010). In the long term, however, voucher holders still face hurdles when trying to secure housing in high-opportunity neighborhoods—those with low poverty rates, high labor force participation rates, high-quality public services, convenient access to employment, and safe and healthful surroundings (Turner et al., 2011). Although transportation plays a widely recognized—even central—role in shaping residential location decisions, studies of voucher users' housing choices curiously have neglected explorations of how cars and transit contribute distinctively to neighborhood choices.

This article reports partial results of a larger study designed to close that gap. It uses data from two major experiments sponsored by the U.S. Department of Housing and Urban Development (HUD) in the 1990s and 2000s to test whether housing choice vouchers propelled low-income households into greater economic security. The Moving to Opportunity (MTO) for Fair Housing demonstration program and the Welfare to Work Voucher (WtWV) program sought to learn whether low-income families benefited from housing mobility through improved neighborhood conditions and better economic and health outcomes.[1]

Our study finds important, previously unreported connections between automobiles and positive outcomes in these experiments. Automobiles increase the likelihood that voucher participants will live and remain in high-opportunity neighborhoods, a result on which this article reports in depth. Our research also shows in work published elsewhere and in a research note in the current volume of *Cityscape* that automobiles are associated with greater neighborhood satisfaction and improved economic outcomes.

We begin our article by showing that most studies on voucher users' residential locations assess a limited number of indicators of distress and segregation and by suggesting a broader framework—based on other studies—for assessing the dimensions of neighborhood quality (which we call *neighborhood sustainability*). After discussing our data and methods, we present the results of two main analyses. First, we show that in the MTO and WtWV study areas, neighborhoods with similar levels of poverty have a wide array of other characteristics that matter differently for different kinds

[1] For more information on both programs, see Briggs, Popkin, and Goering (2010); Orr et al. (2003); Patterson et al. (2004); and Sanbonmatsu et al. (2011).

of households. Second, we show using bivariate and multivariate methods that households with access to cars consistently live in neighborhoods with greater neighborhood sustainability on some variables than transit-dependent households—but that these neighborhoods have less sustainability on other important measures, especially those related to walkability and transit access. Our findings suggest a need for more integrated and holistic planning and program development to account for the importance of both cars and transit to low-income households' well-being.

Voucher Users and Neighborhood Sustainability: Background and Research Questions

Past research shows that assisted households live in neighborhoods with higher levels of distress (for example, poverty, joblessness, and dropouts) and higher concentrations of racial minorities than unassisted households (Been et al., 2010; Galvez, 2010). Assisted tenants with the widest array of neighborhood choices, those with housing choice vouchers, live in about four-fifths of metropolitan area census tracts, and most of them live in tracts in which only a small share of other households hold vouchers (Galvez, 2010). Even so, voucher users are less evenly distributed across metropolitan neighborhoods than one would expect based on the supply of affordable housing. They live in neighborhoods with somewhat lower distress and higher opportunity than other low-income households, but on average their neighborhoods are still inferior to those of nonpoor metropolitan households (Cunningham and Droesch, 2005; Galvez, 2010). Hispanic and Black voucher users are more likely to live in distressed neighborhoods than non-Hispanic White voucher users (Pendall, 2000).

Numerous qualitative studies attest that voucher households prefer quiet, safe neighborhoods and are willing to make many sacrifices to find a safe place to live. The centrality of freedom from extreme violence even has led some observers to suggest retitling Moving to Opportunity as "Moving to Security" (Briggs, Popkin, and Goering, 2010: chapter 5). Some voucher users wish to stay near kin and friends, although many MTO households moved to avoid problematic kin and acquaintances (Briggs, Popkin, and Goering, 2010). Inner-city voucher users also worry about living in the suburbs, where they fear discrimination and the potential for being stranded if the voucher program ended (Galvez, 2010). Hence the search for security can sometimes mean moving within a few blocks.

Policymakers and researchers have recently broadened their perspective on the quality of voucher users' neighborhoods beyond measures of distress to include opportunity and livability. The Kirwan Institute, for example, focuses on *opportunity* metrics including neighborhood variables (many of the socioeconomic characteristics used in other studies), education and school-related variables, and health and environmental indicators (see Baek, Lee, and Gambhir, 2011, for example). HUD has recently developed national neighborhood opportunity data that include similar indicators of racial segregation and concentrated poverty and opportunity metrics including neighborhood school proficiency, job access, labor market engagement, environmental health hazard exposure, and transit access.[2] Other observers add *livability*—features of the built environment and amenities

[2] In our research, we use early versions of these metrics, which HUD first developed for its Sustainable Communities Regional Planning Grant recipients to use as they developed Regional Fair Housing and Equity Assessments.

that make neighborhoods pleasant for residents and visitors—to the list of desirable neighborhood characteristics (Appleyard and Lintell, 1972; Clark et al., 2013). Efforts to quantify livability have borne fruit in the measurement of *walkability*, which emerges from such concrete measures as the completeness of the sidewalk network, the length of blocks, and the number of destinations that can be reached within a given walk time (Ewing et al., 2006; Koschinsky and Talen, 2015; Leslie et al., 2007). Livability measurement also can include the mix of land uses and the completeness of transportation infrastructure within and around the neighborhood.

Together, opportunity and livability features constitute what we think of as the ingredients of *sustainable* neighborhoods. To date, published efforts to measure sustainability by both opportunity and livability characteristics are limited to a paper by Been et al. (2010), which measures "environmental sustainability" on the one hand and "opportunity and inclusion" on the other. Their indicators of environmental quality include measures of common chemical releases from the U.S. Environmental Protection Agency (EPA) Toxics Release Inventory (TRI) and the estimated total respiratory risk from air toxics from the EPA National Air Toxics Assessment. Been et al. (2010) grouped these environmental hazards with measures of neighborhood opportunity, including indicators of education, crime, and economic opportunity. In two case study metropolitan areas—Seattle, Washington, and New York City—the authors found that opportunity measures and walkability/transit accessibility measures are inversely correlated.

Been et al. (2010) showed that a high proportion of HUD-assisted households live in neighborhoods with low opportunity but high walkability/transit accessibility. This finding is especially true of households living in project-based units; two-thirds of people living in Seattle's assisted projects lived in low-opportunity, high-walkability neighborhoods compared with only about one-third of all Seattle residents. In New York, nearly 80 percent of assisted-project dwellers lived in low-opportunity, high-walkability neighborhoods, again more than twice the average rate for the metropolitan area. Even voucher users, however, gravitate toward neighborhoods with low opportunity and high walkability, as Been et al. (2010) defined them.

Subsidized households have far fewer location choices than unsubsidized ones. Waiting lists for affordable housing are long, and searches are seriously constrained. If it is offered a housing unit, a household will simply have to take it or give up the chance for a subsidy, and those that finally receive a housing voucher have to secure a unit as soon as possible (within a 60- to 120-day time limit). Not all landlords accept vouchers, but some actively recruit voucher users; often these landlords operate in specific geographic areas where assisted households can pay more than unassisted ones. Moreover, these households live within support networks of friends and kin who offer many reasons to stay nearby, even if some people in these networks also threaten harm (Briggs, Popkin, and Goering, 2010).

Transit-dependent households naturally are constrained in their housing search based on both the reality and their perception of the quality of suburban public transportation (Clampet-Lundquist, 2004, reviewed in Varady et al., 2010; see also Varady and Walker, 2007). About 15 percent of mothers interviewed by Briggs, Popkin, and Goering (2010) identified giving up convenient access to transit as a price they had paid to live in safer neighborhoods. The lack of transit options in their new neighborhoods subsequently presented a major obstacle to those who had moved and did not have cars. Voucher users who own cars, conversely, have a wider array of choices than those who depend entirely on transit. Access to a car or a driver's license increased the likelihood that MTO program participants successfully found and secured a lease using their housing voucher (Shroder, 2002). Families who relocated under MTO were more likely to successfully lease up in a low-poverty neighborhood if they had consistent access to a car (Briggs, Popkin, and Goering, 2010). On the other hand, MTO experimental-group households with automobiles were less likely to move to racially integrated neighborhoods than experimental-group households without cars, and access to automobiles did not influence the likelihood of using a voucher to move (Clampet-Lundquist and Massey, 2008).[3]

This article extends the work begun by Been et al. (2010) and the mostly qualitative work on transportation factors in voucher users' location decisionmaking, addressing two key questions. First, how do neighborhood sustainability dimensions correlate and combine in different kinds of metropolitan areas? Second, how does automobile access associate with the attainment of sustainable neighborhoods? These two questions are part of a broader exploration of transportation and opportunity in the MTO and WtWV experiments that has also yielded a stream of research by Blumenberg and Pierce (2014) that is summarized in a companion article in this volume.

Data and Methods: Households and Neighborhoods

We focus on two HUD experiments, MTO and WtWV.[4] MTO tested whether public housing households with children benefited from living in low-poverty neighborhoods (Orr et al., 2003; Sanbonmatsu et al., 2011). MTO randomly assigned public housing residents in Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Los Angeles, California; and New York City to (1) a treatment group that received Section 8 housing vouchers[5] useable only in areas with a poverty rate of less than 10 percent, (2) a comparison group that received Section 8 vouchers without geographic restrictions, and (3) a control group that remained in project-based public housing. Baseline surveys were administered to 4,604 families from 1994 through 1998. An interim survey was conducted in 2002 including 4,252 of those households, and a final survey was conducted in 2008 on all participating families. Our analyses make use of data from all three surveys.

The WtWV experiment studied low-income households in Atlanta, Georgia; Augusta, Georgia; Fresno, California; Houston, Texas; Los Angeles; and Spokane, Washington to learn the effect of

[3] The interim and final MTO evaluations examined the effect of voucher access and living in a low-poverty neighborhood on *transportation access* (Orr et al., 2003; Sanbonmatsu et al., 2011). These evaluations defined transportation access as the share of adults with a working car or the share that lives less than a 15-minute walk to public transit. Using this measure, nearly everyone in both samples—95 percent of the interim sample and 94 percent of the final sample—had access to transportation. With little variation and the conflation of modes with very different characteristics, the evaluations unsurprisingly found no statistically significant relationship between transportation access and location. Transportation also did not factor into a family's decision to move. In the interim evaluation, participants were asked to state their most important reason for moving (Orr et al., 2003). Less than 1 percent (0.2 percent) of participants cited a desire to move to obtain "better transportation."

[4] Although Los Angeles, California, also hosted a WtWV demonstration, no followup data were collected there, so we exclude it from our analyses. Participants in these experiments could move to other metropolitan areas; we did not include any households in our analysis that moved to locations outside the 10 case study regions.

[5] In 1998, HUD's Section 8 voucher and certificate programs were merged into the newly named Housing Choice Voucher Program.

receiving housing assistance on households' neighborhood locations, obtaining and retaining employment, and welfare dependency (Patterson et al., 2004). All the recipients of WtWV vouchers had already applied for housing vouchers from local public housing agencies but had been placed on the waiting list. Most housing agencies that implemented WtWV did not provide counseling on mobility, housing search, or employment to experimental households beyond the level normally provided to their tenants (Patterson et al., 2004: 33). Baseline WtWV data were gathered in 2000 and 2001, when 7,684 households were assigned to a treatment group that received housing vouchers and a control group that did not. A followup survey was conducted in 2002. We exclude Los Angeles from our analysis because no followup data were collected there.

We concentrate in particular on the differences in neighborhood locations between *driving households*, those in which at least one member is both a licensed driver and has access to a running car, and *nondriving households*. Questions about car access in the MTO surveys changed from the baseline to the interim survey—to account for car ownership among household members other than the survey participant—from, "Do you have a car that runs?" at baseline to, "Does anyone in your household own a car, van, or truck that runs?" in the interim survey. All WtWV households were asked at baseline, "Do you have a car that runs?" The followup survey regrettably employed a skip pattern in which only employed household heads were asked about cars and driver licenses. It is therefore impossible to ascertain precisely how access to cars changed between the baseline and followup surveys in WtWV.

In addition to the MTO and WtWV surveys, we rely on publicly available data provided for census tracts from many sources to characterize the sustainability dimensions of neighborhoods. Based on our review of the literature on neighborhood opportunity, livability, and sustainability, we operationalize neighborhood sustainability with reference to six major dimensions: natural environment, functional environment, social environment, economic vitality, security, and access to opportunity. We identified indicators related to five of the six dimensions using the 2000 census, the National Land Cover Database, and indices produced by other organizations; for the sixth, security, we collected data from local sources but were able to obtain data only for central cities of most of the 10 metropolitan areas in our study area. Some sets of indicators were highly correlated and could be replaced by a single representative indicator. For others that were strongly related but not easily represented by a single measure, we used principal components analysis to produce a single factor score. Each dimension includes between two and four subdimensions (exhibit 1).

The *natural environment* dimension includes four subdimensions. Three reflect environmental hazards: (1) percentage of the tract's area within 1 mile of a facility listed in EPA (2000); (2) an index of cancer risk from EPA (2002); and (3) proximity to major highways, calculated as the percentage of land in a census tract lying within 200 meters of major highways as georeferenced in the 2000 census TIGER (Topologically Integrated Geographic Encoding and Referencing) files (U.S. Census Bureau, n.d.). For the fourth subdimension, urbanization, we chose to use the percentage of tract developed for urban uses, calculated from the 2001 National Land Cover Database (MRLC, n.d.), because it correlated well with other measures of development and open space.

The neighborhood's *functional environment* conveys features of the neighborhood's built environment that make it livable for residents, even if they have financial, mobility, and other limitations.

Exhibit 1

Dimensions and Subdimensions of Neighborhood Sustainability

Dimension	Subdimension
Natural environment	• Urbanization • Highway proximity • Health outcomes • Environmental hazards
Functional environment	• Housing market strength • Housing diversity • Transit access
Social environment	• Level of household distress • Socioeconomic status of residents
Economic vitality	• Level of household distress • Housing market strength • Presence of neighborhood work opportunities • Density of income
Security	• Incidence of violent and property crime • Public perceptions of safety
Access to opportunity	• Access to high-quality elementary schools

Source: Authors' data

We used principal components analysis to extract a single factor representing the neighborhoods' housing-market strength from three measures in the 2000 decennial census summary file 3 (SF3): vacancy rate, percentage of owner-occupied housing units, and median gross rent (U.S. Census Bureau, 2000).[6] We similarly extracted a single factor to represent housing diversity based on measures from the 2000 SF3 on the diversity of residential structures, average of residential density, and percentage of very old and very new housing. Our single indicator of transit access is the Fair Housing Equity Assessment (FHEA) transit access index created by HUD.[7] This index used data from public transit agencies to assess relative accessibility to amenities within metropolitan areas. Because of uniformly low index values for nearly all tracts in three of the five WtWV metropolitan areas (Atlanta, Augusta, and Spokane), we chose not to use this indicator for the neighborhood analysis for the WtWV group.

The *social environment* dimension, which expresses important aspects of the social and demographic makeup of the neighborhood, includes two subdimensions, household distress and social status. We analyzed year-2000 labor market participation rate, number of households on public assistance, poverty rate, and median household income as measures of distress and chose

[6] To control for variation in the rental market across our sites, we standardized median gross rent by metropolitan area and used the resulting *z*-score as the indicator. The standardization process means that the resulting indicator reflects a given neighborhood's median rent relative to other neighborhoods in that metropolitan area.

[7] In 2012, HUD created a database to support grantees of the Sustainable Communities Regional Planning Grant program in the preparation of their FHEAs. The data file included indicators for a wide array of neighborhood conditions at the block-group level, using 2010 census tract boundaries. HUD provided a readable version of the national file to the research team for use in this project. We imputed these values to 2000 census tract boundaries.

poverty rate as a single measure of this subdimension because it has the strongest relationship with the other indicators and is most clearly associated with household distress in the literature. We extracted a single factor score to indicate social status from the percentage of non-Hispanic White households, the percentage of population age 25 and older with a high school diploma, and the percentage of female-headed households.[8]

A neighborhood's *economic vitality* comes from a composite of characteristics that include both the presence of work opportunities in the neighborhood and the density of population and income in that area. Our measures for this dimension come from the 2000 SF3. Household distress and housing market strength are part of a neighborhood's economic vitality. In addition, economic activity and income density matter to neighborhood vitality. For economic activity, we calculated job density as total jobs per square mile, as reported in the 2000 Census Transportation Planning Products (FHWA, n.d.). We computed aggregate income density using the estimated aggregate income from the 2000 SF3, and then standardized the results by metropolitan area to control for differences among sites.

A neighborhood's sense of *security* is measured by the incidence of violent crime and public perceptions of safety in the neighborhood. For Atlanta, Baltimore, and Chicago, we used publicly available point-level crime records for varying years. We calculated the number of violent crime incidents in a given year for each census tract and divided by the estimated population of the tract in the year the crime data were collected to create a measure of number of violent crimes per 100,000 inhabitants at the census tract level. For Boston, Houston, and Los Angeles, we used data from the National Neighborhood Crime Study (Peterson and Krivo, 2010), which provided census tract-level statistics for those three sites, including the sum of violent crimes from 1999 through 2001. Within each metropolitan area, we ranked the census tracts for which crime data were available by violent crime rate and categorized them by quartile to establish low-, low- to moderate-, moderate- to high-, and high-crime neighborhoods. We were unable to secure reliable crime data for these six metropolitan areas or for any places in the other four metropolitan areas. To gauge perceptions of neighborhood safety, we used questions from the interim and final surveys for MTO and WtWV, respectively. The survey data were available only for tracts where survey respondents lived.

The neighborhood's *access to opportunity* is a function mainly of what the neighborhood is close to rather than what it contains. We include only one subdimension for this dimension, school quality, as represented by HUD's FHEA school quality index. The school quality index uses elementary school data on the performance of students in state exams to produce a score for each tract, based on the closest elementary schools.

When households decide where to live, they often make tradeoffs among characteristics based on their needs and preferences. Households with similar incomes may have different preferences based, for example, on whether they have children and how old the children are or whether they are transit dependent. To provide more clarity about how the MTO and WtWV households made these tradeoffs, we developed a neighborhood typology. Using all these subdimensions except

[8] We standardized percentage non-Hispanic White by metropolitan area to control for variations in racial composition across our sites.

crime rates (the availability of which was limited), we used hierarchical cluster analysis to group tracts into sets based on their relative similarity to one another.[9] Subdimensions that appear under more than one dimension enter the cluster analysis only once.[10]

Results

We discuss our results in two main sections. First, we describe the results of our neighborhood sustainability analysis and the neighborhood typology in the MTO and WtWV metropolitan areas, concentrating on the reasonably high number of neighborhoods with medium poverty levels but widely ranging values of other characteristics. Second, we describe how driving and nondriving MTO and WtWV households sort into these neighborhoods according to the sustainability dimensions. Our broad, descriptive overview and our multivariate approach both show that on most dimensions with positive or negative outcomes, driving households live in better neighborhoods than nondriving households.

Neighborhood Sustainability in the MTO and WtWV Metropolitan Areas

The MTO and WtWV metropolitan areas differ in a series of important ways that stand out when reviewing the sustainability dimensions (exhibit 2). First, the MTO metropolitan areas have many more tracts than the WtWV metropolitan areas. The WtWV metropolitan areas stand out for being generally less urban than the MTO metropolitan areas. MTO metropolitan areas also have higher cancer-risk scores, average shares of tracts within 200 meters of a major highway, and average shares of tracts developed for urban uses. The MTO metropolitan areas, in general, have lower vacancy and homeownership rates and higher gross rents than the WtWV metropolitan areas (exhibit 2). The MTO tracts also score higher on average housing diversity and density. The FHEA transit index is also generally higher in the MTO metropolitan areas than in the WtWV areas. In economic vitality, the MTO metropolitan areas stand out because they are larger, older, and denser than those in WtWV, starting with New York—the clear outlier, with an average of nearly $630 million in household income per square mile in 1999 and more than 12,400 jobs per square mile in 2000. Even excluding New York, however, the income and job density in the MTO metropolitan areas consistently exceed those of the WtWV metropolitan areas. The metropolitan areas do not fall as cleanly into MTO versus WtWV groups in terms of their average social environments. The components of social status do vary substantially among the metropolitan areas, but not in ways that distinguish MTO from WtWV systematically.

[9] Cluster analysis is a method in which cases' similarity to one another on an assortment of variables is used to place them into groups. Hierarchical cluster analysis begins with each case as its own cluster, uniting cases into clusters according to their proximity in *N*-variable space. We linked groups based on squared Euclidean distances.

[10] For job density we use the natural log of the indicator, and for aggregate income density we use the natural log standardized by metropolitan area (that is, the measure used is the *z*-score of the natural log). These changes caused distributions in the variables that more closely approximated a normal curve, eliminating dramatic skewing effects of extreme values on the construction of clusters.

Exhibit 2

Mean Levels of Sustainability Subdimensions and Their Factor-Score Contributors, MTO and WtWV, 2000–2001 (1 of 2)

	MTO					WtWV				
	Baltimore	Boston	Chicago	Los Angeles	New York City	Atlanta	Augusta	Fresno	Houston	Spokane
Number of tracts	601	832	1,958	2,564	4,307	675	94	154	864	104
Natural environment										
Land within buffer of TRI site (%)	16.6	64.6	65.5	24.2	57.3	28.9	24.9	26.2	38.4	37.2
Natural log of cancer risk score	3.8	3.8	3.8	4.1	4.0	3.8	3.4	3.5	3.7	3.5
Land within 200 meters of major highway (%)	27.5	24.0	17.5	13.4	22.7	17.3	16.9	10.3	11.0	10.2
Land developed for urban uses (%)	68.6	72.4	87.7	93.2	87.5	57.2	45.9	66.9	75.3	71.4
Functional environment										
Housing market strength factor	0.1	0.1	0.1	0.0	– 0.1	0.1	– 0.1	0.0	– 0.1	0.1
Vacancy rate (%)	7.9	4.0	6.4	4.0	5.4	5.9	10.2	6.1	7.9	6.6
Owner-occupied housing units (%)	66.8	59.9	61.6	52.7	51.2	66.1	69.1	57.7	62.5	67.7
Median gross rent ($)	669	803	700	857	836	727	505	572	637	582
Housing diversity factor	– 0.3	0.2	– 0.1	– 0.3	0.2	– 0.1	– 0.2	0.1	0.1	0.2
Diversity index of structure type	0.5	0.6	0.6	0.6	0.6	0.4	0.4	0.5	0.4	0.4
Housing density (dwellings/acre)	7.9	8.8	9.3	8.2	21.2	3.0	2.3	3.3	3.9	3.4
Housing ≥ 50 years old (%)	12.4	7.6	10.2	7.9	6.3	25.5	20.3	17.5	17.5	16.9
Housing < 11 years old (%)	30.6	45.5	36.3	21.5	42.8	10.4	13.6	15.2	10.5	27.4
FHEA transit index	45.4	41.2	52.6	49.4	32.8	1.8	1.0	1.0	36.2	44.2
Social environment										
Poverty rate (%)	12.0	10.0	13.5	16.2	14.5	12.1	17.9	22.5	14.9	13.1
Social status factor	0.02	0.09	0.02	– 0.05	– 0.01	0.02	– 0.06	– 0.11	– 0.01	0.15
Non-Hispanic White (%)	63.4	78.4	52.9	36.6	50.8	56.3	58.2	41.1	46.9	89.4
Female-headed households (%)	34.5	31.7	32.9	28.4	33.4	31.4	33.7	28.2	27.5	28.9
Adults with college degree (%)	25.9	36.1	26.3	24.7	27.6	28.6	19.3	16.9	23.9	24.4

Exhibit 2

Mean Levels of Sustainability Subdimensions and Their Factor-Score Contributors, MTO and WtWV, 2000–2001 (2 of 2)

	MTO					WtWV				
	Baltimore	Boston	Chicago	Los Angeles	New York City	Atlanta	Augusta	Fresno	Houston	Spokane
Economic vitality										
Aggregate income per square mile ($ millions)	113.0	194.6	218.0	195.7	629.3	51.1	21.8	52.9	75.1	50.2
Natural log of job density per square mile	6.65	7.19	7.25	7.50	7.90	5.84	4.99	6.10	6.25	5.98
Job density per square mile	2,570	4,179	4,188	3,521	12,403	1,754	951	1,460	1,726	1,631
Access to opportunity										
FHEA school performance index	48.6	50.2	44.2	49.7	49.1	50.3	43.8	39.6	51.4	54.0

FHEA = Fair Housing Equity Assessment. MTO = Moving to Opportunity for Fair Housing demonstration program. TRI = Toxics Release Inventory. WtWV = Welfare to Work Voucher program.

Note: For details on variable construction, see appendix A in Pendall et al. (2014).

Source: Authors' calculations

Neighborhood Typology

Analysis of the MTO sites produced 4, 6, 8, 10, 12, and 15 cluster solutions; we identified solutions of 5, 6, 10, and 13 members for the WtWV sites.[11] We use the 15- and 13-member cluster solutions, respectively, because they provide the most convincing and useful grouping of neighborhood types. These solutions consisted of a mix of identifiable neighborhood types; poverty and relative affluence were important sorting factors, but our other dimensions demonstrated variations. To simplify the interpretation of the many clusters produced, we divide the clusters into groups based on the average poverty rate of the cluster to which they are assigned, creating low-poverty (L), medium-poverty (M), and high-poverty (H) clusters. This method also addresses the problem that cluster analysis produces several clusters with very low tract counts, which can be analyzed more efficiently in combination with broadly similar clusters.

In broad terms, the clusters with the lowest average poverty levels rate favorably on other factors, whereas those with the highest average poverty levels have many other deficits. The high-poverty neighborhoods are densely developed areas with little open space and weak economic activity, and they are occupied mainly by highly distressed households. The low-poverty neighborhoods are less dense spaces with stronger commercial and economic growth and better performing schools.

The WtWV sites have 2 low-poverty, 4 medium-poverty, and 7 high-poverty clusters (exhibit 3). The 2 low-poverty clusters include 893 tracts in which, compared with tracts in other clusters, less of the neighborhood's land area is urban, less area is within 200 meters of a highway, schools have

[11] We exclude the FHEA transit index in the WtWV cluster analysis because so many tracts had no transit access or had missing data.

Exhibit 3

Cluster-Factor Average Values, WtWV Clusters

	WtWV Cluster													
	L1	L2	M1	M2	M3	M4	H1	H2	H3	H4	H5	H6	H7	Total
Number of tracts	443	450	183	328	228	11	71	109	40	3	15	6	4	1,891
Buffer of TRI facilities (%)	0.18	0.25	0.26	0.35	0.47	0.66	0.71	0.57	0.64	0.91	0.65	0.72	0.71	0.33
Natural log of cancer risk	3.62	3.63	3.69	3.64	3.71	3.88	3.97	3.79	4.07	4.16	4.01	3.82	4.17	3.68
Buffer of major highways (%)	0.09	0.12	0.16	0.13	0.14	0.16	0.23	0.19	0.24	0.16	0.37	0.40	0.13	0.13
Land area developed for urban uses (%)	0.59	0.58	0.68	0.65	0.73	0.95	0.91	0.84	0.92	0.99	0.88	0.81	0.92	0.66
Housing market strength factor	0.55	0.19	– 0.14	– 0.06	– 0.35	– 0.50	– 0.64	– 0.77	– 1.01	– 1.25	– 1.12	– 1.32	– 1.39	0.00
Housing diversity factor	– 0.46	– 0.22	0.18	0.06	0.30	0.36	0.66	0.69	0.82	1.00	0.85	1.04	1.38	0.00
Poverty rate (%)	5.47	8.50	13.40	13.46	21.46	22.27	29.75	35.68	42.47	46.04	54.29	65.05	71.20	14.58
Social status factor	0.84	0.42	– 0.45	– 0.12	– 0.53	– 0.43	– 1.12	– 1.16	– 1.41	– 1.78	– 1.65	– 1.70	– 1.90	0.00
FHEA school performance index	83.49	57.71	12.36	28.95	42.62	90.22	67.65	13.09	40.05	97.00	24.62	7.92	46.77	49.79
z-score of the natural log of aggregate income density, by MSA	0.11	– 0.10	0.16	– 0.14	– 0.11	0.24	0.27	0.09	0.20	0.57	0.09	0.00	0.15	0.00
Natural log of job density per square mile	5.73	5.69	6.01	5.79	6.26	7.69	7.29	6.74	7.66	7.44	7.31	6.53	7.36	6.01

FHEA = Fair Housing Equity Assessment. MSA = metropolitan statistical area. TRI = Toxics Release Inventory. WtWV = Welfare to Work Voucher program.

Source: Authors' calculations using data from sources detailed in Pendall et al. (2014), appendix A higher test scores, and social status is higher than in the average neighborhood. Most of the land area of the WtWV metropolitan areas, by far, is in low-poverty tracts, but those tracts account for only about 47 percent of the tracts we classified into clusters. The high-poverty WtWV tracts have a higher than average share of land developed for urban uses, very weak housing markets, much lower than average expected social status, and school performance that ranges from average to very poor.

The middle-poverty group of WtWV clusters includes a variety of environments that sorted into 4 main groups. The 2 largest clusters are M2 (328 tracts) and M3 (228 tracts). Compared with M3, M2 has lower poverty rate (13 versus 21 percent), exposure to TRI facilities, cancer risk, income density, job density, developed land, and housing diversity, but it also has lower average FHEA school performance scores. The average poverty rate of M1 (183 tracts) is about the same as that of M2, but its social status is lower, its housing market is weaker and more diverse, its income and job density are higher, and its school performance is much worse. Cluster M4, the average poverty rate of which is highest in the group, includes only 11 tracts, all of them in either Atlanta or Houston. It is the most urban of the 4 clusters, with the highest exposure to TRI facilities, cancer risk, percentage of land developed for urban uses, housing diversity, income density, and job density, and the lowest average housing market strength. Its social status factor, however, is not as low as those of M1 or M3.

Of 15 clusters of the 10,262 MTO metropolitan census tracts we analyzed, 2 clusters are low poverty, 5 are medium poverty, and 8 are high poverty, although one-half of the high-poverty clusters contain fewer than 10 tracts (exhibit 4). The 2 low-poverty clusters account for 30 percent of the total tracts. Like the low-poverty WtWV clusters, these tracts have high social status, strong housing markets, and above average school performance. They differ from one another in their portion of land developed for urban uses and their income and job density, however, suggesting that cluster L1 represents wealthy suburban and exurban neighborhoods, whereas cluster L2 represents wealthy urban areas. The high-poverty clusters include only 2.3 percent of the total tracts. Contrasting sharply with the low-poverty clusters, these tracts are almost exclusively composed of densely developed neighborhoods with weak housing markets and low social status.

Of the 5 medium-poverty MTO clusters, 4 have more than 1,000 tracts, and M4 has more than 2,000. The fifth cluster, M3, has 710 tracts. All 5 clusters have job density near or greater than the average for all tracts and have about the same average exposure to highways (20 to 23 percent of the land area, on average, is within 200 meters of a highway). M1, M2, M3, and M4 have very slight differences in average poverty rates, whereas M5 has a substantially higher average poverty rate. M5 shares some traits with most of the high-poverty clusters, such as very low social status, poor school performance, a high portion of land developed for urban uses, and weak housing markets. The lowest average poverty rate among the high-poverty clusters is 41.1 percent, however, much higher than that of M5, the comparatively high income density and transit access of which also make it different from most of the high-poverty neighborhood clusters. The average income and job density of M5 are lower than those of either M1 or M3; its relatively high FHEA transit score is, however, comparable with those of M1 and M3. Few indices distinguish M1 and M3 from one another, but M1 has lower FHEA school performance scores, higher TRI exposure, and slightly higher cancer risk. M2 and M4, meanwhile, are less urban medium-poverty clusters with low school performance indices, social status, and income and job density, with M4 distinguished from M2 mainly by its very low average score (3.0) on the FHEA transit index.

Exhibit 4

Cluster-Factor Average Values, MTO Clusters

	MTO Cluster															
	L1	L2	M1	M2	M3	M4	M5	H1	H2	H3	H4	H5	H6	H7	H8	Total
Number of tracts	2,403	622	1,663	1,014	710	2,125	1,494	19	32	97	8	7	65	2	1	10,262
Buffer of TRI facilities (%)	0.28	0.29	0.58	0.50	0.46	0.59	0.63	0.50	0.51	0.84	0.78	0.08	0.73	1.00	1.00	0.49
Natural log of cancer risk	3.72	3.92	4.11	4.01	4.08	3.96	4.08	4.30	4.34	4.33	4.23	4.01	4.10	4.22	4.44	3.96
Buffer of major highways (%)	0.15	0.17	0.23	0.20	0.23	0.21	0.21	0.18	0.17	0.25	0.49	0.10	0.20	0.25	0.95	0.20
Land area developed for urban uses (%)	0.66	0.90	0.96	0.93	0.97	0.86	0.98	0.94	0.96	0.98	0.98	0.95	0.99	1.00	0.98	0.87
Housing market strength factor	0.55	0.57	– 0.08	– 0.06	– 0.06	– 0.19	– 0.50	– 0.92	– 1.10	– 1.16	– 1.31	– 0.45	– 1.41	– 0.96	– 0.94	0.00
Housing diversity factor	– 0.58	– 0.40	0.37	– 0.08	0.36	0.11	0.41	0.31	0.37	0.24	0.42	– 0.38	0.22	0.18	0.71	0.00
FHEA transit access index	4.65	46.47	82.08	46.22	86.59	3.00	87.50	54.31	68.74	2.53	35.84	77.67	92.64	1.00	1.00	42.13
Poverty rate (%)	5.03	5.47	12.48	14.96	15.06	16.90	24.45	41.10	42.41	44.57	52.73	61.53	62.67	93.97	100.00	14.25
Social status factor	0.79	0.76	– 0.04	– 0.31	0.08	– 0.22	– 0.89	– 0.93	– 1.31	– 1.40	– 1.44	0.18	– 1.43	– 2.02	– 1.65	0.00
FHEA school performance index	75.99	79.05	45.38	28.29	77.35	31.66	17.35	79.47	45.81	78.00	20.27	96.50	11.47	29.97	69.90	48.36
z-score of the natural log of aggregate income density, by MSA	– 0.65	0.08	0.57	– 0.01	0.61	– 0.16	0.40	0.12	0.03	0.33	0.01	– 0.36	– 0.43	– 3.08	– 5.24	0.01
Natural log of job density per square mile	6.37	7.30	8.39	7.50	8.45	7.54	8.03	8.78	8.28	9.17	7.73	8.99	8.27	8.98	7.59	7.55

FHEA = Fair Housing Equity Assessment. MSA = metropolitan statistical area. MTO = Moving to Opportunity for Fair Housing demonstration program. TRI = Toxics Release Inventory.

Source: Authors' calculations using data from sources detailed in Pendall et al. (2014), appendix A

Crime and Neighborhood Clusters

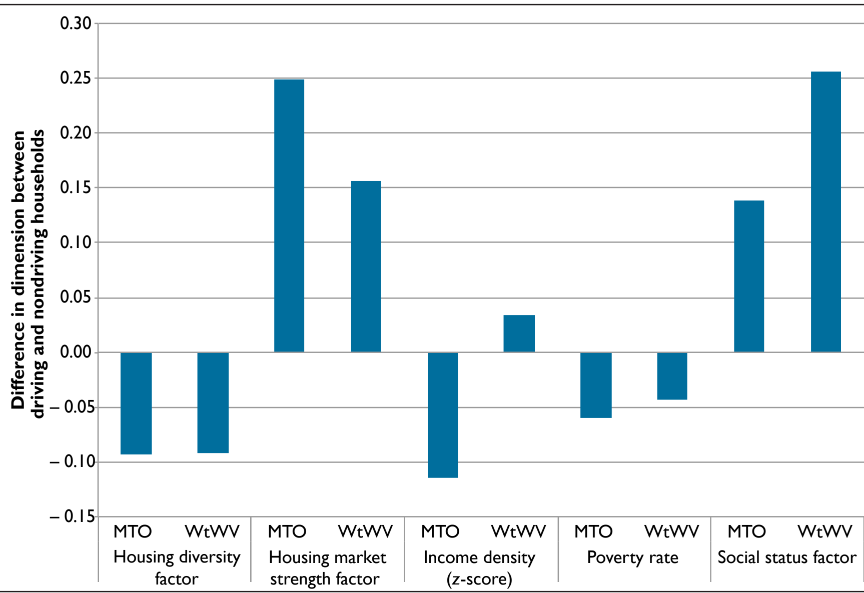
In an additional step, we calculated the share of MTO or WtWV households in each cluster that reported in the interim survey that they perceived their neighborhood as highly safe. We were not surprised to learn that households in lower poverty clusters tended to report feeling safer on their streets at night. Among all WtWV households, slightly less than 50 percent felt safe at night but, in the lowest poverty cluster, 70 percent felt safe and, in the highest poverty cluster, only 27 percent felt safe. The relationship was similar, although less consistent, among MTO clusters. In particular, high-poverty MTO clusters varied substantially in their share of households that felt safe at night. More than one-half of households felt safe in clusters H2 and H6, but in clusters H1 and H3 only 41 and 32 percent, respectively, felt safe. Furthermore, the lowest poverty MTO cluster had only a slightly greater share of households that reported feeling safe at night than did two of the medium-poverty clusters.

Car Ownership and Residential Sorting

Access to a car clearly associates with access to better neighborhood locations on most dimensions to which normative values can be ascribed—stronger housing markets, lower poverty rates, and higher social status (exhibit 5).[12] The relationship between driving and income density differs

Exhibit 5

Differences Between Driving and Nondriving Households in Neighborhood Social Dimensions, MTO and WtWV Experiments



MTO = Moving to Opportunity for Fair Housing demonstration program. WtWV = Welfare to Work Voucher program.
Note: Locations are as of 2002.
Source: Authors' data

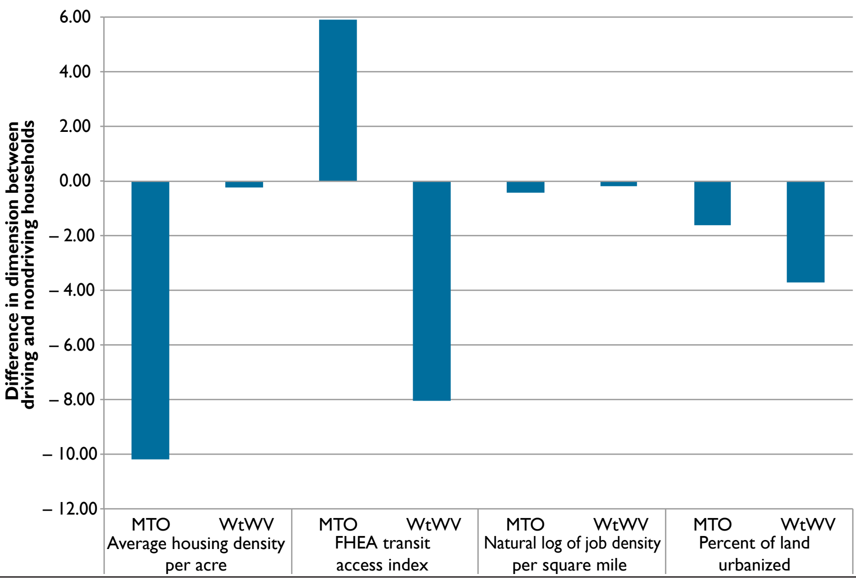
[12] We geocoded MTO households' locations in 2002 (the interim survey date). WtWV households' car-ownership status is as of the baseline survey (2000 to 2001), and their location is measured six quarters (18 months) after randomization. In both cases, we report the neighborhood locations of all households in the experiment for whom data are available.

between MTO (in which the neighborhoods had generally higher population densities), in which access to a car associated with lower income density, and WtWV, in which the reverse was true. These neighborhoods also had less diverse housing stock than the neighborhoods of nondriving households. Combined with other information about neighborhood quality, this result reinforces the idea that, although a diverse housing stock may be favored by urban designers and planners, the neighborhoods with the most diverse housing in these 10 metropolitan areas may also have counterbalancing negative aspects that will need to be addressed before they work well for families.

Driving households in MTO lived in neighborhoods with much lower housing density than did nondriving households, whereas the difference for WtWV households was less but still statistically significant (exhibit 6). Neighborhood job density and percentage of urbanized land were also significantly lower for driving than for nondriving households. We found it curious that driving households in MTO had better access to transit than nondriving households, which is opposite the result of the WtWV experiment. The MTO metropolitan areas, in general, have much better transit than the WtWV metropolitan areas; it would be intriguing to learn that MTO households with cars could find neighborhoods that were more convenient for both their transit users and their drivers.

Exhibit 6

Differences Between Driving and Nondriving Households in Neighborhood Natural and Functional Environment Dimensions, MTO and WtWV Experiments



FHEA = Fair Housing Equity Assessment. MTO = Moving to Opportunity for Fair Housing demonstration program. WtWV = Welfare to Work Voucher program.

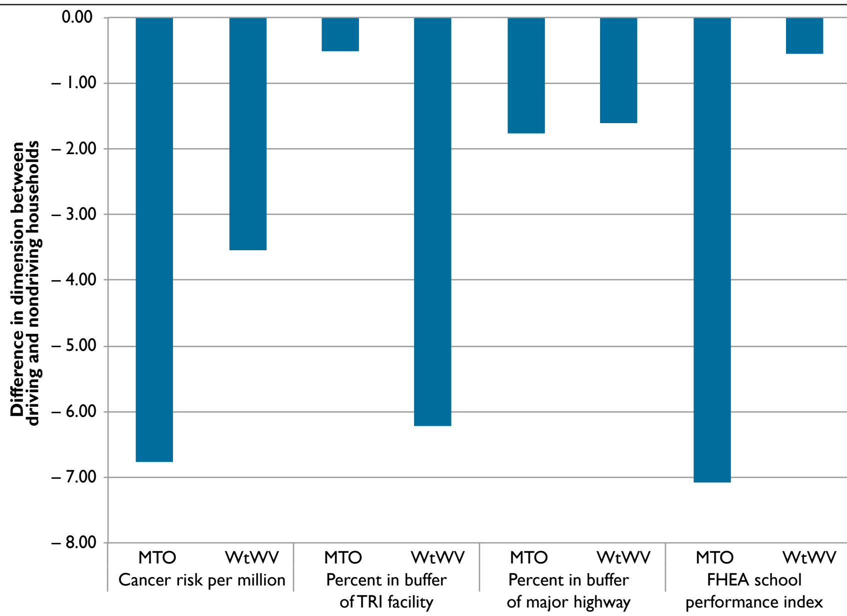
Note: Locations are as of 2002.

Source: Authors' data

Having a car also associated fairly consistently with lower exposure to neighborhood harms and hazards (exhibit 7). In both experiments the average cancer risk was lower for driving households than for nondriving households, and in WtWV driving households lived in neighborhoods that had less exposure to TRI facilities and highways. The neighborhoods of nondriving households outperformed those of driving households on only one dimension: nondriving households lived in neighborhoods with significantly better school quality than driving households. This result was statistically significant and large in the MTO experiment but not large enough to be significant at conventional levels in WtWV.

Exhibit 7

Differences Between Driving and Nondriving Households in Neighborhood Pollution Exposure and School Quality Dimensions, MTO and WtWV Experiments



FHEA = Fair Housing Equity Assessment. MTO = Moving to Opportunity for Fair Housing demonstration program. TRI = Toxics Release Inventory. WtWV = Welfare to Work Voucher program.

Note: Locations are as of 2002.

Source: Authors' data

Cars and Clusters: Driving Households Live in More Sustainable Neighborhoods—Up to a Point

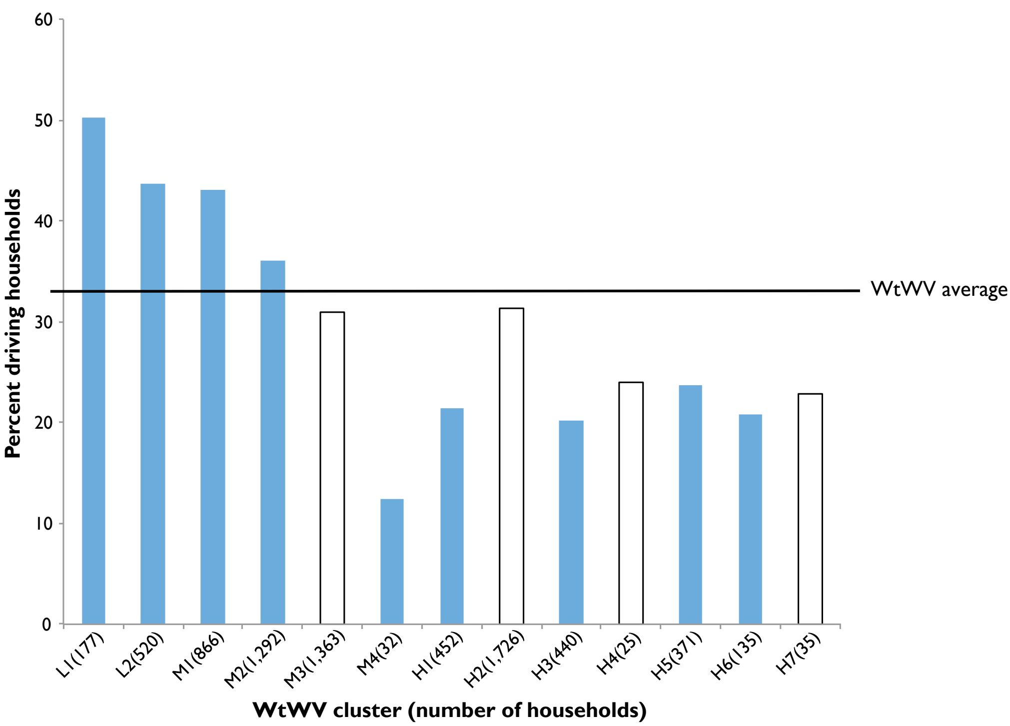
In both experiments, driving households were less likely than nondriving households to live in the least sustainable and most hazardous neighborhoods in their metropolitan areas. In WtWV, driving households were disproportionately likely to live in the low-poverty band neighborhoods and less likely to sort into the higher poverty clusters (exhibit 8). About 33 percent of all WtWV households had access to a car at baseline; 18 months after randomization, 45 percent of WtWV households in low-poverty neighborhoods were driving households compared with 36 percent of those in medium-poverty clusters and 27 percent of those in high-poverty clusters. Whereas

47 percent of nondriving WtWV households lived in high-poverty clusters 18 months after randomization, only 35 percent of driving WtWV households did; about 13 percent of the driving households lived in low-poverty clusters compared with only 8 percent of nondriving households.

At the finer grained level of individual clusters, we learned that 36 percent of WtWV households lived in three clusters near the sustainable end of the neighborhood quality spectrum. Driving households were 3 to 10 percentage points more likely than nondriving households to live in these neighborhoods six quarters after randomization ($p < 0.01$; exhibit 8). These low- to medium-poverty neighborhoods were predominantly outside city centers, with low job and income density, shares of land developed for urban uses, and exposure to highways; relatively high social status; and relatively poorly performing schools. Another 18 percent of WtWV households lived in cluster M3, in the middle of the sustainability spectrum. As with the more sustainable clusters, driving households were more likely to live in this cluster ($p < 0.01$). These 228 fairly dense, urban neighborhoods had medium to high poverty, decent schools, and low average social status. Nearly one-fourth of the WtWV households—more than 1,700 in all—lived in H2, a cluster with

Exhibit 8

Percent Driving Households, WtWV Households, by Cluster



H = high poverty. L = low poverty. M = medium poverty. WtWV = Welfare to Work Voucher program.

Notes: Shaded bars represent clusters in which drivers are overrepresented or underrepresented in the cluster by a statistically significant amount at the 95-percent or greater confidence level. Unfilled bars represent clusters in which drivers are not significantly overrepresented or underrepresented.

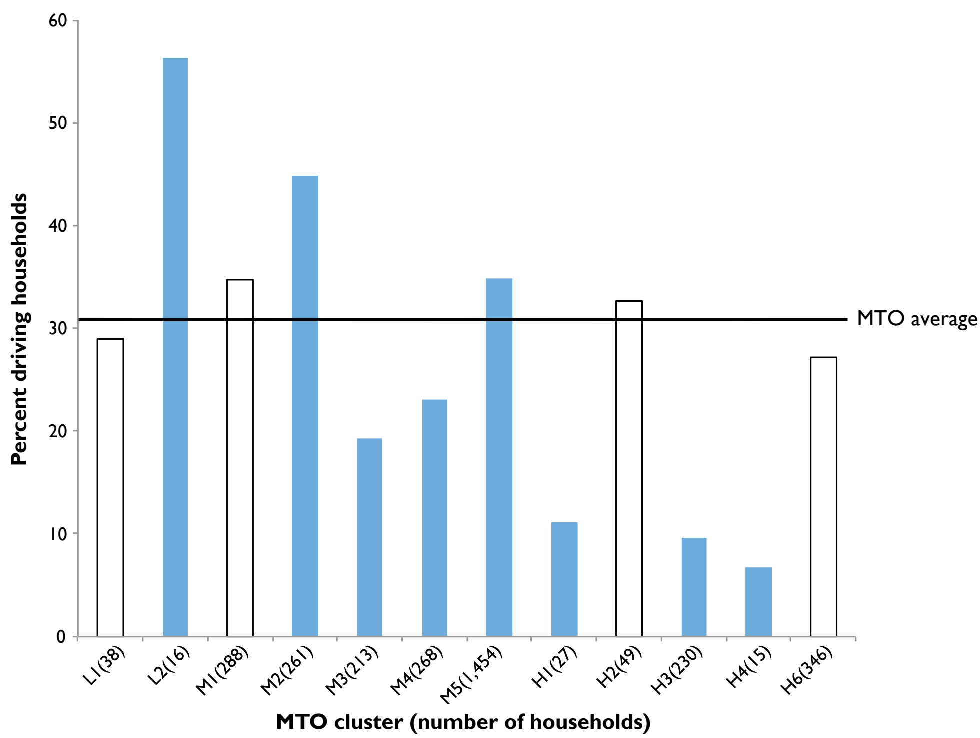
Source: Authors' data

high-poverty, high-density, low-social-status neighborhoods. These 109 tracts have poorly performing schools and low income and job density, closely representing traditionally understood inner-city, unsustainable neighborhoods. Households with access to cars were only 1 percentage point less likely to live in these neighborhoods than nondriving households, a statistically insignificant difference.

The same overall pattern held true, although less markedly so, among MTO households. Slightly less than 31 percent of MTO interim-survey respondents had a driver's license and access to a car. About 37 percent of MTO households in the two low-poverty clusters were driving households compared with 33.2 percent of those in the five medium-poverty clusters and 20.4 percent of those in the high-poverty clusters (exhibit 9). Only 14 percent of driving households in MTO lived in high-poverty clusters compared with 24 percent of nondriving households, with 84 percent of the driving households and 75 percent of nondriving households living in the medium-poverty band.

Exhibit 9

Percent Driving Households, MTO Households, by Cluster



H = high poverty. L = low poverty. M = medium poverty. MTO = Moving to Opportunity for Fair Housing demonstration program.

Notes: Shaded bars represent clusters in which drivers are overrepresented or underrepresented in the cluster by a statistically significant amount at the 95-percent or greater confidence level. Unfilled bars represent clusters in which drivers are not significantly overrepresented or underrepresented.

Source: Authors' data

Substantial numbers of MTO driving households sorted into a few clusters with relatively favorable conditions. For example, driving households were significantly more likely than nondriving households to live in the L2 neighborhoods, the more urban of the two low-poverty neighborhood types, but only 16 MTO households lived in these neighborhoods. Driving households also comprised a disproportionate 45 percent of the 261 MTO households in cluster M2, a medium-poverty cluster that had reasonably good transit; average levels of urban development, social status, and income and job density; and low school performance. On the other hand, driving households also were significantly more likely than nondriving households to live in M5 neighborhoods, which occupy the border between the medium and high poverty bands. With 1,454 MTO households, nearly one-half of the total, these high-density urban tracts have an average poverty rate of 24 percent—10 points higher than the other medium-poverty neighborhoods—and are more urbanized by our indicators. They have poorly performing schools, low social status, and weak housing markets, but they also have relatively high density of jobs and aggregate income. It is possible that driving households that sorted out of the high-poverty clusters ended up in this cluster.

The remaining four clusters with more than 50 MTO households had neighborhood characteristics near the middle across the dimensions, with the exception of school quality; they tended to have poorly performing schools. The quality of schools emerged as a largely noncorrelated indicator; the highest ranking tracts with respect to school quality were often in lower quality neighborhoods, perhaps because that indicator was collected nearly a decade after randomization.

Car Access, Crime, and Perceptions of Neighborhood Safety

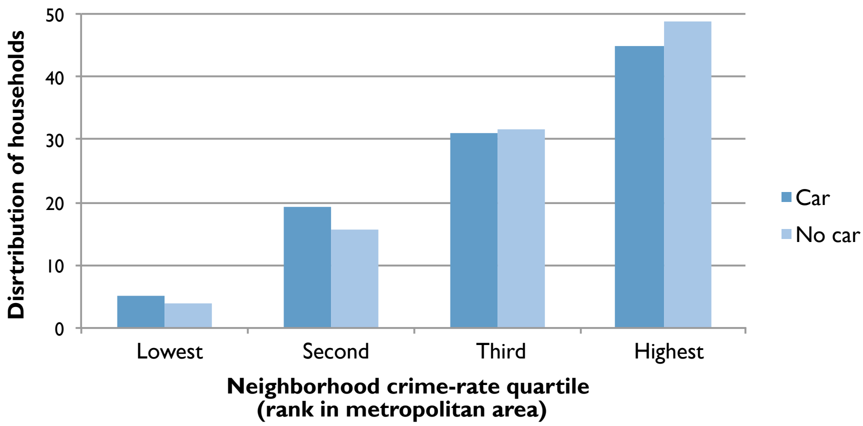
Driving households also lived in neighborhoods with lower objective levels of violent crime (in six central cities, as discussed previously) and higher subjective sense of security than nondriving households. The plurality of households—with or without cars—lived in the highest crime neighborhood quartile; very few lived in the lowest crime quartile (exhibit 10). Driving households were significantly less likely ($p < .05$) to live in the highest crime quartile, however. Whereas 49 percent of nondriving households lived in this quartile, 45 percent of driving households lived there. Driving households were also somewhat less likely to live in the second highest quartile (although this difference was not statistically significant) and about 3 percentage points more likely than nondriving households to live in the second lowest crime quartile.

In every site for which crime data were available, the share of households with no car access that lived in the highest crime quartile exceeded the share of households with car access that lived in the highest crime quartile. Summing the top two crime quartiles, the pattern persists. In each site, nondriving households were more likely than driving households to live in neighborhoods with above median violent crime levels. Finally, in Baltimore, Chicago, and Houston, driving households were about twice as likely as nondriving households to live in the lowest crime quartile. In the other three sites, driving and nondriving households had similar probabilities of living in the lowest crime quartile.

We also examined perceptions of crime using the MTO and WtWV survey responses, emphasizing the percentage of respondents who felt safe at night, again comparing driving with nondriving households by metropolitan area. For all sites, a higher percentage of driving households reported feeling safe than did nondriving households, a difference that was statistically significant in all sites except Los Angeles (exhibit 11). MTO households were more likely to feel safe than WtWV households, but the perceived safety gap of about 10 percentage points was persistent across both groups.

Exhibit 10

Driving Households Are Less Likely Than Nondriving Households To Live in Highest Crime Neighborhoods



Source: Authors' data

Exhibit 11

Share of Households Reporting High Neighborhood Safety, by Car Access

	With Car		Without Car	
	Percent	n	Percent	n
All MTO	69	738	59	1,364
Baltimore	78	108	61	243
Boston	69	234	61	251
Chicago	77	183	66	360
Los Angeles[a]	56	140	52	136
New York City	72	73	54	374
All WtWV	53	1,357	42	2,182
Atlanta	46	153	29	233
Augusta	66	231	52	212
Fresno	49	472	43	713
Houston	44	171	39	644
Spokane	65	330	59	380
All sites	**58**	**2,095**	**48**	**3,546**

MTO = Moving to Opportunity for Fair Housing demonstration program. WtWV = Welfare to Work Voucher program.

[a] Los Angeles is the only site in which a chi-squared test found no statistically significant difference between groups.

Source: MTO and WtWV surveys

Multivariate Results: Car Access Associates Independently With Positive Neighborhood Outcomes

These correlations show that driving households sort into neighborhoods that on average are better and safer, and feel more secure, than the neighborhoods that nondriving households live in. Personal characteristics of the households, however, likely explain some of the tendency both to secure a license and a car and to find safe neighborhoods. To control for some of those personal characteristics, we estimate several *locational attainment* models, in which the dependent variable is a census tract characteristic associated with a household's chosen neighborhood and independent variables include household-level determinants of location choice. A few examples of studies employing versions of this type of empirical approach are Alba and Logan (1992); Bayer, McMillan, and Rueben (2002); Dawkins (2005); Freeman (2008); and Woldoff (2008).

The dependent variable in our locational attainment models the neighborhood quality of MTO and WtWV households at the time of the final surveys (that is, 2002 for WtWV and 2008 for MTO), using the neighborhood opportunity dimensions outlined in the previous section. We add access to jobs as a final measure of neighborhood desirability.

We include three measures of automobile access. The first is an indicator variable equal to 1 if anyone in the household owned a car, van, or truck that ran or had access to a valid driver's license at the time of the interim survey (for MTO households) or at the time of the baseline survey (for WtWV households). For the MTO sample, we also include two indicator variables that measure whether the household had gained or lost access to cars or licensing since the interim survey. Change in automobile access could not be calculated for the WtWV sample, because a change in the wording of the question between the baseline and followup surveys limited the variable's coverage to only those who were employed at the time of the followup survey. We include access to a driver's license in our definition of automobile access, because even if a household does not own a car, access to a driver's license may enable a household member to rent a car or borrow one from a friend or family member. All these variables except the automobile access variables were measured contemporaneously with the date of the final survey. In addition, in each regression model we include the lagged measure (as of the baseline surveys) of the same neighborhood characteristic used to construct the dependent variable. All models are restricted to those who had moved from their baseline neighborhood to a new census tract by the final survey.

The independent variables in each model include household-level factors shown by previous studies to be associated with neighborhood choice. We also include measures of the randomly assigned treatment group for each sample, interacted with whether the household was still relying on voucher assistance at the time of the final survey. For the WtWV final sample, the voucher status variable is defined in terms of those who used the voucher to lease up in their current location. In the MTO final sample, because of data constraints, our measure of voucher status captures not whether the household leased up in their current location using a voucher but whether the household is receiving voucher assistance in their current location. We also include indicators of the household's metropolitan location, with Boston omitted as the reference category for the MTO sample and Augusta omitted as the reference category in the WtWV sample. Households living in Los Angeles were excluded from the WtWV sample because they were dropped from the followup survey.

Other household characteristics include income, income squared, and number of children in the household. Income is defined slightly differently for the two samples. In the MTO sample income is defined as the total household income earned during the previous year, whereas in the WtWV sample income is defined simply using a dummy variable indicating whether the household's income is above or below the poverty threshold. A measure of income based on annualized earnings for the WtWV sample proved to be unreliable because of missing data. Characteristics of the household head include age, age squared, race and ethnicity, marital status, gender, education, and employment status.

Automobile access has significant effects across a variety of locational outcomes ($p < 0.05$), whether access is measured in terms of having a car or license at an earlier period or gaining access during the survey period (summary of results in exhibit 12). Those with access to cars or licenses gain

Exhibit 12

Summary of Vehicle Access Regression Coefficients From Locational Attainment Models

Variable Description	MTO Sample			WtWV Sample
	Car Access at Interim	Car Access Gained	Car Access Lost	Car Access at Baseline
Functional environment				+
Median gross rent	+	+	–	–
Vacancy rate	–	NS	+	+
Owner occupied (%)	+	+	–	NS
Vouchers (% of rental housing)	NS	NS	NS	–
FHEA transit access index	NS	NS	+	
Social environment				–
Poverty rate	–	–	+	+
Median household income	+	+	–	+
Labor force participation rate	+	+	–	–
Unemployment rate	–	–	+	NS
Minority population (%)	–	–	+	–
Female-headed households (%)	–	–	+	NS
Age 25 or older with high school diploma or GED (%)	+	+	–	
Natural environment				NS
Open space (%)	+	+	–	+
Average block length	+	+	–	–
Population density	NS	–	+	NS
Buffer of major highways (%)	NS	NS	NS	–
Cancer risk per million	NS	NS	NS	NS
Buffer of TRI facilities (%)	NS	NS	NS	
Economic vitality				NS
Job density	NS	NS	+	–
Aggregate income density	NS	NS	NS	
Access to opportunity				+
FHEA school performance index	+	NS	NS	NS
Number of jobs within 30 minutes	NS	NS	NS	

FHEA = Fair Housing Equity Assessment. GED = general educational development. MTO = Moving to Opportunity for Fair Housing demonstration program. NS = not significant at the .05 level. TRI = Toxics Release Inventory. WtWV = Welfare to Work Voucher program.

Notes: + indicates positive and significant at the .05 level. – indicates negative and significant at the .05 level.

Source: Authors' data

access to neighborhoods with a more highly valued housing stock, higher school performance, lower poverty and unemployment rates, and, among MTO households, a more educated adult population.

These results reinforce the evidence from the bivariate correlations that households make tradeoffs among environmental conditions, economic vitality, and access to opportunity and that driving and nondriving households make different kinds of tradeoffs. Households with vehicles live in areas with more desirable environmental amenities, including more access to open space and less exposure to cancer risk (WtWV households only). Having a vehicle or license, however, also encourages moves to neighborhoods that are less accessible to transit (among WtWV households) and less conducive to walking. Thus, when it comes to measuring opportunity, one must recognize that the spatial distribution of opportunities is heterogeneous. When faced with an uneven distribution of opportunity structures, households often make tradeoffs and choose the opportunities they value most highly. Although our approach does not allow us to distinguish between the effect of household preferences versus spatial supply constraints as they influence the residential outcomes observed, we find that automobile access has fairly consistent effects across a range of housing market, social, economic, and environmental outcomes and that accessing one particular dimension of neighborhood opportunity often comes at the expense of other dimensions of opportunity.

Conclusions and Policy Implications

Our analysis of neighborhood clusters and residential sorting patterns advances the measurement of neighborhood quality, especially as it relates to the residential environments of low-income residents of metropolitan America, by identifying factors that matter in different ways for household outcomes. Our analysis of neighborhood sustainability dimensions has important implications.

Summary of Key Findings

Distressed neighborhoods have many serious problems, but only a small minority of tracts in U.S. metropolitan areas have crushing crime rates, failing schools, high levels of environmental degradation, and deep poverty. These tracts accommodate a disproportionate share of voucher users, however. Meanwhile, many tracts have lower moderate poverty levels, less distressed conditions, and enough housing to accommodate many voucher users. These neighborhoods, the poverty rates of which range between 10 and 30 percent, offer an assortment of combinations of desirable and undesirable characteristics. Our analysis suggests, therefore, that it is limited to characterize neighborhoods as offering either opportunity or environmental quality but not both, as found by Been et al. (2010). We found little or no relationship between poverty and income density, for example, meaning that whereas some high-poverty neighborhoods also have little economic vitality others have enough income circulating per square mile to justify greater investment by the public and private sectors. The correlation between poverty and measures of exposure to hazardous conditions, although troubling, generally did not exceed 0.50. On average, high-poverty neighborhoods had higher job density and better transit service than lower poverty neighborhoods. These differences are important enough to yield a mosaic of choices among medium-poverty neighborhoods, as our cluster analysis shows.

We have shown that households with access to cars found housing in neighborhoods where environmental and social quality consistently and significantly exceeded those of the neighborhoods of households without cars. In both experiments, households with cars lived in neighborhoods with significantly lower poverty, higher social status, stronger housing markets, lower cancer risk, and—as far as we have data to demonstrate it—lower crime rates than those without cars. They also felt safer than nondriving households. Our findings on neighborhood quality hold up in multivariate models (apart from findings on crime and security, which we did not test). Compared with nondriving households, driving households located in areas with lower concentrations of poverty and higher concentrations of households that are employed or participating in the workforce—even holding constant respondents' income, race, household size, and other characteristics. These areas also had higher median rents, more owner-occupied housing, lower vacancy rates, and better performing schools at the time of the final survey.

In analyses not included in this article, we found that access to vehicles influences neighborhood satisfaction interactively with transit access (Dawkins, Jeon, and Pendall, 2015). Estimates from an ordered probit model suggest that access to automobiles and a driver's license matters most in neighborhoods with low transit accessibility. In areas with the highest levels of transit access, households with and without access to cars or licenses are each moderately satisfied with their neighborhoods, although predicted neighborhood satisfaction levels are slightly higher for those without access to cars or licenses. In areas with the lowest levels of transit access, driving households are about 1.6 times more satisfied with their neighborhoods. Considering different levels of car and transit access together, those households living in areas with the least accessible public transit and that have access to cars or licenses exhibit the highest levels of neighborhood satisfaction.

Driving households must accept some less desirable neighborhood conditions as they find neighborhoods they can afford, however. The bivariate analysis shows that, in 2002, driving households in WtWV and MTO lived in neighborhoods with lower income density and less diverse housing stock. MTO households at that time also lived in neighborhoods with lower school performance scores. The multivariate analysis shows that vehicle owners lived in areas with more access to open space and less exposure to cancer risk and toxic facilities but with lower levels of transit access and urban environments that are potentially less conducive to walking. Those who lost access to cars also compensated by choosing neighborhoods that have higher levels of job accessibility.

Taken together, these findings suggest that having access to vehicles facilitates mobility to low-poverty neighborhoods over time and eventual satisfaction with the neighborhood chosen. Geographically targeted housing assistance also has measurable effects that persist over time, but the magnitude and significance of the effect varies after the geographic requirement is lifted.

Policy Implications

We do not conclude based on our analysis that voucher users or other low-income families simply should be provided with automobiles. A full accounting of the effects of car ownership on neighborhood choices would require a methodological approach accounting as fully for self-selection into car ownership as MTO tried to do for self-selection into low-poverty neighborhoods. Families with access to cars undoubtedly differ in unmeasured ways from those without access to cars.

Neither experiment "treated" voucher-assisted households with automobile access, denying access in an experiment to a control group. Many of the factors that would lead a household to secure access to a car could also motivate moves to good neighborhoods and to get and keep jobs. For the present, therefore, our results on car access must be treated as preliminary and promising.

Even so, this study and others provide enough information to justify new initiatives to improve voucher users' car access and to study the costs and benefits of car access (and car access programs) while doing so. Happily for policymakers seeking to improve neighborhood opportunity for low-income households, we are at the threshold of a new era in automobile access that opens up a series of alternatives that could be deployed immediately and, under the right conditions, explored in experimental research. Subsidies for automobile purchases still are likely to be the most popular approach to expanded car access, but short-term car rental services such as Zipcar and Car2Go also have the potential to address the travel needs of some low-income adults at a lower cost. (See, for example, McCarthy, 2012, and Ortega, n.d.) These services may be particularly useful to households with at least one licensed driver that do not have sufficient assets to own and maintain a car. Coordination of housing voucher assistance with nonprofit car donation services and rideshare services is a third possibility.[13] Of course, the tradeoffs of such policies are that additional car-based travel will exacerbate the negative externalities associated with automobile use, including congestion, air-quality degradation, and automobile accidents. Furthermore, car ownership entails costs that accrue directly to owners, which may place undue burdens on low-income families. These tradeoffs should be considered with any automobile-based mobility strategy.

The potential of cars to meet important mobility and opportunity goals for low-income households should not, however, be treated as an alternative to further investment in transit. Automobile access associated with better neighborhood outcomes in our studies partly because public transportation service is so miserable in many of the metropolitan areas in these two studies (especially the WtWV metropolitan areas). Even when they have access to a car, low-income households often need good transit service for their young or disabled members and for occasional use when they lose automobile access (as happened often to the MTO households). In addition, although transit access was not sufficient to lift unemployed workers into employment, according to the research by Blumenberg and Pierce (2014) conducted in tandem with our analyses of neighborhood sorting and summarized in this issue of *Cityscape*, policies that enable households to move to transit-rich neighborhoods can help participants retain employment. Moreover, transit service helps reinforce commercial and residential density and land use diversity, both of which help reduce trip length and thereby reduce the overall cost of travel for drivers. It also eases peak traffic loads. Hence, even for driving households, transit investment makes sense, especially when combined with supportive land use policies.

In all, then, we believe that the policy implications of this research, coupled with Blumenberg and Pierce's (2014) article, solidly support a more integrative approach to transportation for low-income households that helps build systems in which automobile access, transit, and support for pedestrians combine to maximize households' access to both high-quality neighborhoods and employment. Interjecting such a social-equity objective into considerations of how to link housing

[13] See National Economic Development Law Center (2007) and http://www.workingcarsforworkingfamilies.org/.

with land use, transportation, and air-quality plans can occur only with broad federal coordination. The Sustainable Communities Partnership between HUD, the Environmental Protection Agency, and the U.S. Department of Transportation is one example of such coordination. Our findings lend support for similar additional programs that consider social mobility more broadly, emphasizing the role of transportation access as it affects both residential and economic mobility.

Some actions in the short term could improve the development of mobility strategies for voucher holders. HUD could direct housing agencies and assisted-development operators to collect information about whether all their assisted tenants have access to working cars as part of the income verification process. Armed with such information, HUD could develop new programs and partnerships to help able families become economically self-sufficient. Information about car access could also be helpful for identifying neighborhoods where assisted families with cars are living so that new economic development efforts could concentrate there, including affordable options for car maintenance and educational opportunities for courses in automobile mechanics, for example. It is clear that even in high-density, transit-rich cities, voucher users—like many other low-income people—make huge sacrifices to get and maintain car access. Housing and community development policies and programs can be shaped so that the needs of assisted households with and without cars are accounted for individually.

Our results also imply that housing search services should be tailored to the transportation needs of households receiving assistance. Transporting those without access to a car to prospective residential locations, along with providing information about the public transportation options available in different neighborhoods, may help to improve the number and quality of units inspected before a housing search. Shroder (2002) also advanced this policy recommendation, finding that car ownership and the intensity of housing counseling services both increased the likelihood of lease up among MTO program participants. Providing long-term transportation services may be expensive, but combining such assistance with other educational programs may increase the rate at which mobility program participants successfully lease up in desirable neighborhoods (Shroder, 2002).

Finally, our findings call for a more nuanced reframing of the geography of opportunity debates. In our analyses, we find that low-income HUD-assisted households make tradeoffs among different neighborhood characteristics. Areas with high-performing schools, access to open space, and a lower risk of environmental contamination may have inadequate transportation systems, less accessibility to jobs, and an increased risk of exposure to automobile emissions. Furthermore, households at different life-cycle stages and with different levels of access to transportation value each of these amenities differently. Given the spatial heterogeneity of preferences and opportunity structures, our findings call for an expansion of housing assistance services that are tailored to the particular needs of individual households. Thus, the goal of “moving to opportunity” may be more usefully phrased as “moving to opportunities.”

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Authors

Rolf Pendall is Director of the Metropolitan Housing and Communities Policy Center at the Urban Institute.

Christopher Hayes is a senior data manager at the Urban Institute, Metropolitan Housing and Communities Policy Center.

Arthur (Taz) George is a research associate at the Urban Institute, Housing Finance Policy Center.

Casey Dawkins is an associate professor of urban studies and planning and a research associate with the National Center for Smart Growth at the University of Maryland.

Jae Sik Jeon is a Ph.D. assistant at the University of Maryland, National Center for Smart Growth.

Elijah Knaap is a Ph.D. assistant at the University of Maryland, National Center for Smart Growth.

Evelyn Blumenberg is a professor at the University of California, Los Angeles, Luskin School of Public Affairs, Institute of Transportation Studies.

Gregory Pierce is a senior postdoctoral researcher at the University of California, Los Angeles, Luskin School of Public Affairs, Luskin Center for Innovation.

Michael Smart is assistant professor at Rutgers, the State University of New Jersey, Edward J. Bloustein School of Planning and Public Policy.

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Transportation Access, Residential Location, and Economic Opportunity: Evidence From Two Housing Voucher Experiments

Evelyn Blumenberg
Gregory Pierce
University of California, Los Angeles

Michael Smart
Rutgers, the State University of New Jersey

Abstract

Access to automobiles may be particularly important to housing voucher recipients, who are more likely than residents of public housing to live in suburban neighborhoods where transit service is often limited. Access to high-quality public transit is more likely to benefit low-income households who live in dense central-city neighborhoods in close proximity to employment. In this analysis we draw on survey data from two housing voucher experiments—the Moving to Opportunity for Fair Housing and Welfare-to-Work Voucher programs—to examine the relationship between access to automobiles and public transit and the employment and earnings outcomes of program participants.

Our research underscores the importance of automobiles in achieving desirable outcomes for families who receive subsidized housing. Access to automobiles is associated with improved economic outcomes for all program participants and better facilitates job acquisition, job retention, and earnings than public transit. Our findings suggest the need to better link housing and transportation programs and to pursue a set of policies that increase automobile access among all subsidized housing recipients.

Introduction

In the 1990s and early 2000s, the U.S. Department of Housing and Urban Development (HUD) sponsored two major housing voucher experiments to assess whether low-income families benefited from living in lower poverty neighborhoods—either through improved neighborhood conditions or better economic and health outcomes. Launched in 1994, the first of these experiments, the Moving to Opportunity (MTO) for Fair Housing program, was designed to move low-income families from high-poverty to lower poverty neighborhoods. In 1999, Congress initiated the Welfare-to-Work Voucher (WtWV) program, another tenant-based housing voucher program. This second experiment aimed to help families who received or were eligible to receive welfare to transition from public assistance into the labor market. Combined, these two programs produced experimental data (with treatment and control groups) for voucher participants in 10 major U.S. metropolitan areas: Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Los Angeles, California; and New York City, New York (from MTO); and Atlanta, Georgia; Augusta, Georgia; Fresno, California; and Houston, Texas (from WtWV).[1]

To date, transportation has not been a major focus of the research related to housing vouchers. Yet, evidence is growing that shows transportation—particularly access to automobiles—shapes the residential location choices and the economic outcomes of low-income households. Automobiles and high-quality public transit services can enable participants to better search for housing as well as provide improved access to potential employment, services, and other opportunities within a reasonable travel time.

Transportation was the focus of the research reported in *Driving to Opportunity: Understanding the Links among Transportation Access, Residential Outcomes, and Economic Opportunity for Housing Voucher Recipients* (Pendall et al., 2014) a project funded through HUD's Sustainable Communities Research Grant Program.[2] The research on voucher users, cars, and neighborhood sustainability is summarized in an article included as part of this symposium (Pendall et al, 2015). In this article, we review the major findings of our research on the role of transportation in influencing the employment outcomes of housing voucher program participants.[3] We draw on survey data from the two voucher experiments and supplement those data with information on the characteristics of the neighborhoods in which program participants live, including their access to public transit. We then use statistical models to examine the relationship between transportation measures (access to automobiles and public transit availability) and two outcome measures (employment and earnings) controlling for other potential determinants of these outcomes. As one of our control measures, we include experimental group status: whether participants were in the experimental, control, or—in the MTO experiment—the Section 8 group.

Our findings underscore the role of automobiles in achieving desirable outcomes for all subsidized housing recipients. Access to automobiles is associated with improved economic outcomes for all program participants and facilitates job acquisition, job retention, and earnings better than public transit. Being part of the experimental group of these programs and moving to lower poverty neighborhoods did not improve participants' employment outcomes alone or in combination with

[1] Although Los Angeles also hosted a WtWV demonstration, no followup data were collected in that metropolitan area; therefore, we exclude it from our experimental sample.

[2] The principal investigators on the larger project (Pendall et al., 2014) were Rolf Pendall (Urban Institute), Casey Dawkins (University of Maryland), and Evelyn Blumenberg (University of California, Los Angeles). See http://www.urban.org/UploadedPDF/413078-Driving-to-Opportunity.pdf for the final report and the full list of authors.

[3] The full analysis and findings from this research are extensive and appear in multiple articles published in other journals.

transportation. The reason for this null effect may reflect that participants (1) spent relatively little time in lower poverty neighborhoods and (2) had inadequate transit service in these neighborhoods. Most, if not nearly all, MTO households eventually moved back into higher poverty neighborhoods and thus spent a significant amount of time during the course of the experiment in neighborhoods with poverty rates higher than 10 percent, the program's target threshold. For instance, during the 1994-to-2010 period, even households that successfully leased up within the MTO experimental group were exposed to an average degree of poverty of 19 percent, much higher than the 10-percent target. Program households did not necessarily experience less access to transit than the general population. Rather, we suggest that overall transit levels were insufficient to viably support stable economic outcomes among low-income families.

Our analyses point to several implications for future research and data collection efforts, possible improvements in voucher mobility programs, and strategies for coordinating housing and transportation policies in ways that enhance economic opportunity for low-income households. We conclude by proposing the following five strategies—

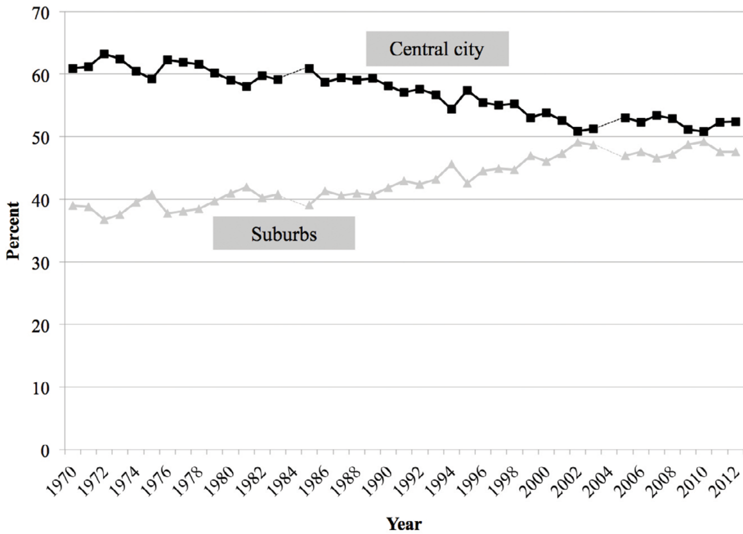
1. Better link housing subsidy and automobile programs.
2. Adopt policies and programs to increase low-income households' access to automobiles.
3. Improve transit in dense urban areas where origins and destinations are reasonably proximate.
4. Strengthen coordination between government transportation and housing programs.
5. Collect better data and conduct additional research on assisted tenants and their access to working automobiles and public transit.

Residential Location, Transportation, and the Poor

In U.S. metropolitan areas, over time, households and employment have dispersed, elevating the importance of automobiles in accessing regional opportunities. Less than two-fifths of the U.S. metropolitan population lives in the central city, defined by the Census Bureau as the principal cities of metropolitan areas (U.S. Census Bureau, 2012). Low-income families, those with incomes that are less than the federally designated poverty line, have also suburbanized (Holliday and Dwyer, 2009; Kneebone and Garr, 2010; U.S. Census Bureau, 2012). As exhibit 1 shows, only a slight majority of the metropolitan poor (52 percent) remain in central-city neighborhoods, motivated by the availability of affordable housing and—for those without automobiles—access to relatively high levels of public transit service (Glaeser, Kahn, and Rappaport, 2008; U.S. Census Bureau, 2012). This pattern will likely continue. As Kneebone and Berube found, between 2000 and 2011, the number of poor families grew twice as fast in the suburbs as in the large cities that anchor them (Kneebone and Berube, 2013). At the same time, employment dispersed. Only 23 percent of employees in the 100 largest metropolitan areas in the United States now work within 3 miles of the central business district. By contrast, 43 percent of workers commute to locations more than 10 miles away from the city center (Kneebone, 2013). Although the dispersal of employment slowed in most metropolitan areas during the recent recession, it did not reverse (Kneebone, 2013).

Exhibit 1

Central City Versus Suburbs, Residential Location of Metropolitan Poor, United States, 1970–2012



Sources: U.S. Census Bureau (various years); Current Population Survey

Proponents of the "spatial mismatch hypothesis" contend that low-income residents have stayed behind in urban areas and are thus now disconnected from suburban employment opportunities. The weight of the evidence suggests that the spatial mismatch contributes to high levels of joblessness, particularly among African-American men (Gobillon, Selod, and Zenou, 2007; Ihlanfeldt and Sjoquist, 1998). Spatial access to opportunities is also a source of concern for low-income families living in the suburbs, where both residents and employment opportunities are dispersed and transit service is limited. Using data for Boston, Shen (2001) found that less-educated jobseekers in the central city have *better* access to jobs than those who live in the suburbs, because job opportunities for less-educated workers remain spatially concentrated in central-city neighborhoods. In Cleveland, Gottlieb and Lentnek (2001) found that residents of a Black suburb had longer commutes than residents of a White suburb. Their results showed that residents in African-American suburban neighborhoods had better access to skill-appropriate employment; however, many had difficulty finding local jobs and, therefore, commuted long distances into the central city. Overall, low-income suburban families tend to live in areas with a below-average number of jobs (Raphael and Stoll, 2010). Finally, suburban residents have less access to public transit. In their analysis of access to public transit in the largest 100 metropolitan areas, Tomer et al. (2011) concluded that, although 94 percent of city residents live in neighborhoods served by transit, only 58 percent of their suburban counterparts do.

A number of scholars, however, assert that rather than facing the classic "spatial mismatch," low-income, inner-city residents suffer from a modal mismatch, a drastic divergence in the relative advantage between those who have access to automobiles and those who do not (Blumenberg and Ong, 2001; Grengs, 2010; Kawabata, 2003; Ong and Miller, 2005; Shen, 1998; Taylor and Ong, 1995; Wyly, 1998). In nearly all metropolitan areas, individuals lacking reliable access to automobiles can reach far fewer opportunities within a reasonable travel time compared with those who travel by car (Benenson et al., 2011; Blumenberg and Ong, 2001; Grengs, 2010; Kawabata, 2009; Kawabata and Shen, 2007, 2006; Ong and Miller, 2005; Shen, 2001, 1998). Even in cities considered to have ample transit service, such as Boston and San Francisco, average transit travel times remain much longer than automobile travel times (Kawabata and Shen, 2007; Shen, 2001). Long transit travel times result from walks to and from transit stops, waits at stops and for transfers, slower travel speeds, and frequent vehicle stops along the way.

Because automobiles provide an access advantage, traveling by car greatly improves outcomes for low-income and minority adults. Traveling by automobile makes it easier to search for and commute regularly—and reliably—to jobs and, in so doing, increases employment rates. Employment conversely can provide households with the necessary resources to purchase automobiles; income is one of the strongest correlates of automobile ownership (Blumenberg and Pierce, 2012). Yet, the importance of automobiles to employment persists even in studies that control for the simultaneity of the car ownership and employment decision (Baum, 2009; Cervero, Sandoval, and Landis, 2002; Gurley and Bruce, 2005; Lucas and Nicholson, 2003; Ong, 2002; Raphael and Rice, 2002; Sandoval, Cervero, and Landis, 2011).

Transportation is one of the largest expense categories for American families—in most cases, second only to housing (Lipman, 2006). Yet, over time, automobile ownership has become nearly ubiquitous, even among the poor. Data from the 2010 American Community Survey of the U.S. Census show that nearly 80 percent of adults with household incomes below the poverty line lived in a household with a vehicle, an increase from slightly more than 50 percent in 1960 (Ruggles et al., 2010). Yet, some low-income individuals face barriers to automobile access. As of 2010, more than 6 million poor adults lived in households without automobiles. Many of these adults still travel by car, either via carpooling with others or by borrowing vehicles. For example, in 2010, 30 percent of low-income adults in households without automobiles traveled to work by private vehicle (Ruggles et al., 2010). A slightly higher percentage (35 percent) commuted by public transit, suggesting that proximity to transit services was essential to their mobility. Writing 20 years apart, LeRoy and Sonstelie (1983) and Glaeser, Kahn, and Rappaport (2008) asserted that the presence of public transit largely explains the concentration of low-income households in the central city. In fact, Glaeser, Kahn, and Rappaport (2008: 2) found that "public transportation is two to three times more important than the income elasticity of demand for land in explaining the central location of the poor."

Despite evidence for the importance of public transit to low-income families, previous studies have, at best, found small, positive effects of transit access on economic outcomes. Some studies showed that public transit access increases the employment rates for residents—particularly those without cars—who live in close proximity to transit stops (Kawabata, 2003; Ong and Houston, 2002; Sanchez, 1999; Yi, 2006). By contrast, in their study of welfare recipients in six major U.S. metropolitan areas, Sanchez, Shen, and Peng (2004) concluded that access to fixed-route transit and employment concentrations showed virtually no association with the employment outcomes of welfare recipients. The few studies that directly compare the relative benefits of cars and public transit found that automobiles better facilitate job acquisition and job retention than does public transit (Cervero, Sandoval, and Landis 2002; Gurley and Bruce, 2005; Sandoval, Cervero, and Landis, 2011).

Transportation and Subsidized Housing Recipients

Existing studies—although few in number—suggest that transportation is essential to the initial use and long-term utility of housing vouchers used outside of public housing projects. Limited access to automobiles and characteristics of the transit system hinder the ability of some voucher households to find suitable units ("lease up"). The lack of an automobile greatly restricts the neighborhoods in which families search for housing (Clampet-Lundquist, 2004; Popkin and Cunningham, 1999). One participant in a Chicago study stated—

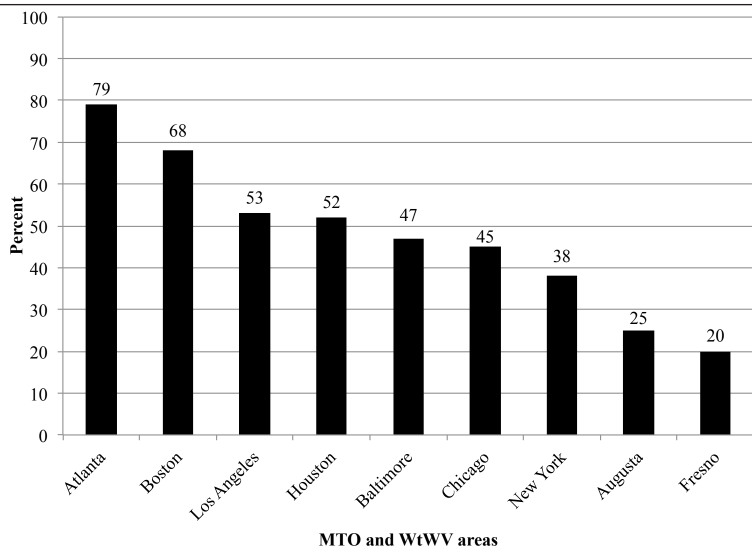
> You only have a small percentage that is finding a decent place, either it's way out in the suburbs someplace, if you don't have a car, you don't have access to transportation, that's not convenient enough for you. (Popkin and Cunningham, 1999: 15)

Searching for housing units can be difficult, made more so by the use of public transit. Some of the transit-related barriers include the cost of transit fares, long travel times, and concern with the safety of transit travel to "unfamiliar locations, particularly in the evening" (Popkin and Cunningham, 1999: 16).

The reliability of transportation can also influence residential stability after the initial move. Like low-income households, housing voucher recipients have suburbanized over time. As of 2008, nearly one-half (49.4 percent) lived in the suburbs (Covington, Freeman and Stoll, 2011). Data assembled in Covington, Freeman and Stoll (2011) showed that 48 percent of housing voucher recipients in the MTO and WtWV metropolitan areas live in the suburbs. Significant disparities exist across metropolitan areas, however. As exhibit 2 shows, in Atlanta, 79 percent of housing

Exhibit 2

Percent of Housing Voucher Recipients Living in the Suburbs, 2008



MTO = Moving to Opportunity. WtWV = Welfare-to-Work Voucher.
Source: Covington et al. (2011)

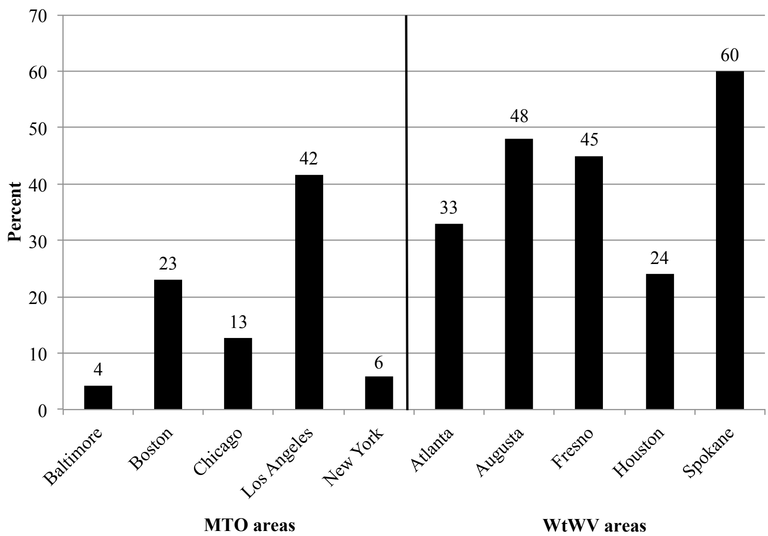
voucher recipients lived in the suburbs compared with Fresno, where only 20 percent lived in the suburbs. In general, housing voucher recipients are more likely than other households to live in low-income suburbs with inferior access to jobs (Covington, Freeman and Stoll, 2011).

Voucher users tend to be more decentralized than project-based housing residents (Turner, 1998) and, therefore, among subsidized housing residents, are more likely to live in neighborhoods with lower levels of transit service. Studies show that MTO participants who moved to lower poverty neighborhoods often found themselves far from bus stops and in neighborhoods where buses ran infrequently; as a consequence, many residents had difficulty reaching jobs by public transit (Briggs, 2005; Turney et al., 2006 ; Turney, Kissane, and Edin, 2012). For example, Turney, Kissane, and Edin (2012) demonstrate that moves to low-poverty neighborhoods increased participants' stress, partly because of their greater distance from public transportation.[4]

When comparing participants from both the WtWV and MTO programs with the general low-income population, we find that the prevalence of car access—at least at the beginning of each of the voucher experiments (baseline)—was low. Automobile access was much higher at baseline for WtWV participants than for MTO participants, however, 40 percent compared with 18 percent. Data from the 1990 census for these 10 metropolitan areas showed that 53 percent of poor adults live in households with automobiles (Ruggles et al., 2010). Exhibit 3 shows these data by voucher program and metropolitan area. At baseline, automobile ownership rates were highest in Spokane and lowest in Baltimore and New York.

Exhibit 3

Automobile Access at Baseline by Area and Voucher Program



MTO = Moving to Opportunity. WtWV = Welfare-to-Work Voucher.

[4] By contrast, in their study of welfare recipients in Cleveland, Bania, Coulton, and Leete (2003) found that, compared with those living in more traditional project-based public housing, welfare leavers who receive housing vouchers are more likely to be employed closer to their homes, to have shorter estimated commutes, and to be better connected to their first jobs by direct bus routes.

Differences across the two programs are most likely attributable to variation in the socioeconomic status of participants in the two programs and the difference in program timing. WtWV program participants had higher incomes than participants in the MTO program and, therefore, many more had the resources to purchase vehicles. Moreover, in terms of timing, the WtWV program was implemented after the MTO program at the same time when automobile ownership rates were increasing among all low-income families. The WtWV program also was adopted in the immediate aftermath of welfare reform. As part of the Personal Responsibility and Work Opportunity Reconciliation Act of 1996, the federal government abolished federal vehicle asset limits that had been set at $1,500. This change prompted many states to relax their vehicle asset requirements. By 1999, 26 states allowed welfare families to own at least one vehicle without losing their eligibility for benefits (Urban Institute, 2006). Although the evidence is mixed, some studies show that lifting the vehicle asset limitation—at least in some benefit programs—results in higher vehicle ownership (Hurst and Ziliak, 2006; McKernan, Ratcliffe, and Nam, 2008; Sullivan, 2006).

The variation in automobile ownership across metropolitan areas may be due to broader differences in the availability of public transit. Exhibit 4 includes data on transit use and coverage for the 10 metropolitan areas. The MTO program was implemented in Baltimore, Boston, Chicago, Los Angeles, and New York City, relatively transit-rich metropolitan areas. In fact, nearly one-half of all

Exhibit 4

Public Transit in MTO and WtWV Metropolitan Areas

Program Location	PUMS (2000)		Brookings Institution Data		National Transit Database (2012)
	Percent of Commuters Using Transit	Percent of All U.S. Transit Commuters	Transit Coverage[a] (higher is better)	Service Frequency[b] (lower is better)	Percent of All Unlinked Trips
MTO					
Baltimore	6	1	68	7.7	1
Boston	14	4	69	8.9	4
Chicago	12	8	79	7.2	6
Los Angeles	7	4	96	6.2	6
New York	45	29	90	4.5	40
WtWV					
Atlanta	4	1	38	10.2	1
Augusta	1	0	30	27.9	0
Fresno	1	0	72	10.7	0
Houston	4	1	44	7.3	1
Spokane	3	0	NA	NA	0
U.S. total (in thousands)		5,835			10,352,177

MTO = Moving to Opportunity. NA = data not available. PUMS = Public Use Microdata Sample. WtWV = Welfare-to-Work Voucher.

[a] Percent of working-age residents near a transit stop.

[b] Median wait time for a vehicle in minutes.

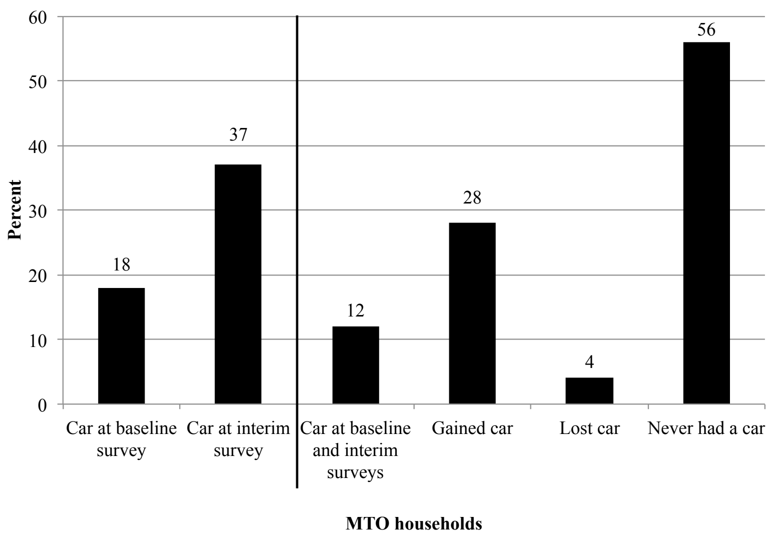
Sources: 2000 PUMS (Ruggles et al., 2010); Tomer et al. (2011); National Transit Database (Federal Transit Administration, 2012) transit commuters in the United States live in these five metropolitan areas, and 29 percent of those live in New York City. The picture is even starker when we include all trips, not just the journey to work; nearly 60 percent of all transit trips occur in the MTO areas. By contrast, only 2.5 percent of all transit commuters and 2.0 percent of all trips are in the WtWV program areas—Atlanta, Augusta, Fresno, Houston, and Spokane.

Longitudinal data from the MTO program enable us to examine transitions in automobile access between the baseline and interim surveys. In other words, we analyze household transitions related to automobile ownership, including (1) having no car at both surveys, (2) gaining a car between the baseline and followup surveys, (3) losing a car between the baseline and followup surveys, and (4) having a car at both surveys. It is unfortunate that in the WtWV followup survey, the automobile question was asked overwhelmingly of respondents who indicated that they were employed but not of respondents who indicated they were unemployed. Because we do not have followup automobile data for all participants, we were unable to capture transitions in automobile access with full confidence.[5]

As indicated in exhibit 5, the MTO data show a rapid increase over time in automobile access. At baseline, 18 percent of MTO households had a car, but this figure increased to 37 percent at the time of the interim survey. Census data for adults in poverty in these 10 metropolitan areas also show increasing automobile ownership rates over time, although the rates are not as dramatic as in the MTO sample. In 1990, 53 percent of poor adults lived in households with cars; this rate increased to 58 percent in 2000 and 65 percent in 2010 (Ruggles et al., 2010).

Exhibit 5

Automobile Transitions, MTO Program



MTO = Moving to Opportunity.

[5] To further explore this relationship between automobile access and employment, we tested our hypotheses using the limited data on automobile access at the followup survey. The direction of change in vehicle access appears strongly associated with the direction of change in employment in this limited sample.

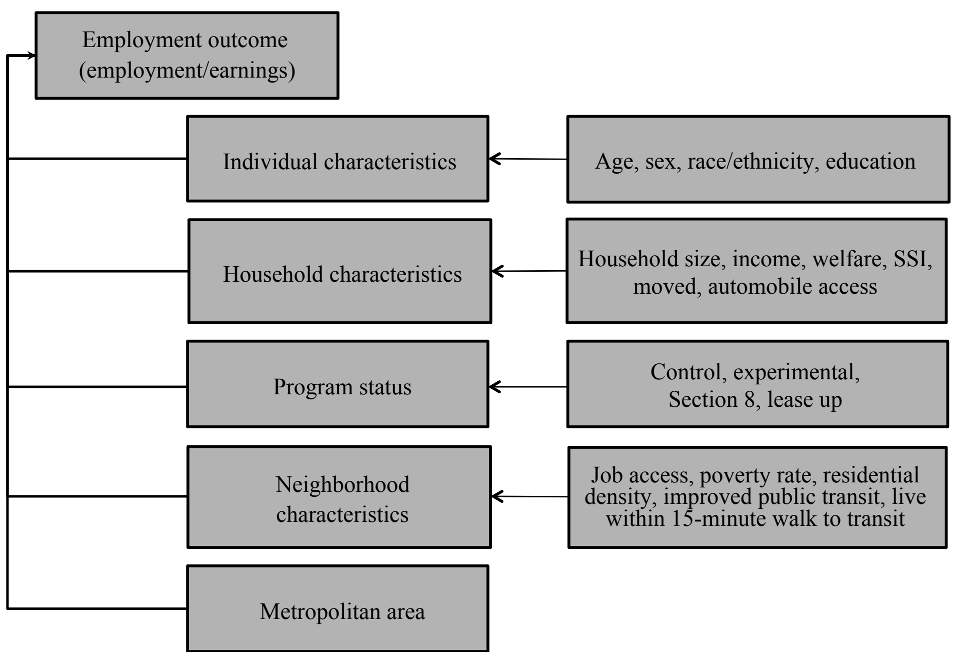
Transportation and Economic Outcomes

In a series of statistical models, we examined the determinants of employment and earnings among program participants. We had two hypotheses. First, we anticipated that access to high-quality transportation—automobiles or public transit—would be positively related to better employment outcomes. Second, as we noted previously, we hypothesized that the relationship between automobile access and employment outcomes would be stronger for participants with vouchers because they would be more likely to live in neighborhoods with less access to public transit. Exhibit 6 presents a basic schematic of expected relationships. Based on the broader literature, we anticipate that the employment outcomes of participants in the voucher experiments will be shaped by five different categories—individual characteristics, household characteristics, program status, neighborhood characteristics, and metropolitan area (geographic location).

Most of the control variables are derived directly from the MTO baseline and interim surveys. For example, in the baseline and interim surveys, households were asked whether they had a functioning car. We use administrative records attached to the interim dataset to determine whether the household had leased up or moved by the interim survey. We supplemented the information on individuals and their households with data on public transit service in the neighborhoods in which program participants lived. A census tract identifier enabled us to match the survey data to census tract-level data on public transit from The Brookings Institution. Between May 2009 and February

Exhibit 6

Determinants of Employment Outcomes



SSI = Supplemental Security Income.

2011, researchers at The Brookings Institution collected data on the routes, schedules, and stops for 371 agencies located in the 100 largest metropolitan areas. They combined these data with employment data to develop a number of different measures of transit access, including the number of jobs available in a 30-minute transit trip from a given census tract.

We briefly summarize our results on employment and earnings in the following sections.

Employment Results

Our research suggests that access to a car makes a big difference in program participants' employment outcomes.[6] In the MTO sample, gaining a car between the baseline and interim surveys is strongly correlated with finding employment and with remaining employed between the two surveys. Participants who have a car at the time of both surveys are similarly more likely to be employed. Having a car raises the probability of finding a job by a factor of two and of being employed at the time of both surveys by a factor of four. In a similar way, in the WtWV sample, access to an automobile has a significant, positive effect on the likelihood of adults making the transition from unemployment to employment and remaining employed at the time of the two surveys. The model indicates that automobile access is the most important determinant in remaining employed across both waves of the survey.

Transit appears to play less of a role, although it can be important. For MTO participants, improved transit access is not a significant factor in finding employment; however, it appears to be the most important factor associated with being employed at both time points. Moving to a neighborhood with better transit between baseline and interim and living within 15 minutes of a bus stop both raise the probability of having consistent employment by a factor of fourteen. Among WtWV participants, improved transit between baseline and followup surveys is not significantly related to employment outcomes.

As other studies have shown, being part of the experimental group has no discernible effect on participants' ability to find or keep work. Successful lease up (moving to a lower poverty neighborhood) also has no discernible effect on employment outcomes. In addition, we tested the interaction between program status and automobile use, but this variable was not significant. This finding suggests that car access is important to all low-income adults, even those who remain in high-density urban neighborhoods where transit service tends to be highest.

Finally, to test the hypothesis that the quality of transit service matters, we explored whether a relationship—or interaction—was present between our public transit measure and metropolitan area. In other words, might there be a positive effect of public transit on employment outcomes in metropolitan areas that provide more extensive transit service? Indeed, we find some variation by metropolitan area. Relative to program participants in Atlanta, moving to richer transit neighborhoods has a negative effect on employment for participants in the other WtWV metropolitan areas. Although tentative, this finding suggests that public transit may be more effective in connecting low-wage workers to employment opportunities in some metropolitan areas than others. These results should be interpreted with caution as the sample sizes for participants who moved to richer

[6] These models and analyses for MTO participants are published in Blumenberg and Pierce (2014).

transit neighborhoods in some of the metropolitan areas, particularly Spokane, are quite small. Moreover, relative to Augusta, Fresno, and Spokane but comparable with Atlanta, Houston has a more developed transit network, yet the interaction term indicates transit plays less of a role there.

For both programs, we find no evidence that the experimental housing treatment and use of the treatment (successful lease up) have any effect on employment outcomes. This finding reflects the complex link between housing choice and economic outcomes and the difficulties in implementing the programs. By contrast, the link between private transportation assets and economic outcomes appears robust. Car access is associated with all positive employment outcomes in the WtWV sample, and it is associated with job retention and gain among MTO participants. Having a car at the baseline survey and gaining employment by the time of the followup survey suggests that the automobile likely preceded the job and, therefore, contributed to getting the job. This sequencing may be reversed, however. We cannot completely rule out the possibility that, for some participants, the job preceded the car purchase. Nor can we rule out the possibility that automobile access is associated with other factors that make employment more likely, such as skill or motivation.

Transit outcomes differ across the two programs, perhaps because of the relative size of the metropolitan areas included in each experiment. Transit is not positively related to employment for WtWV participants, but it is associated with job retention (but not transitions to employment) in the MTO sample. Taking the evidence from the two experiments together, the relationship between car access and employment is strongly positive, the relationship between transit and employment is mixed, and the effect of housing vouchers on employment is not borne out.

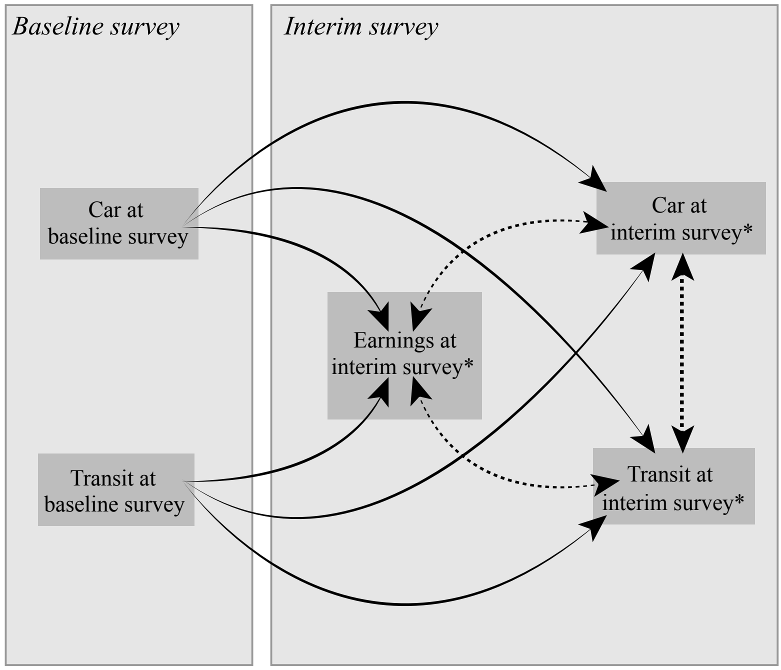
Earnings Results

We also use the longitudinal data from the MTO program to examine the role of transportation in improving earnings outcomes for MTO households. In this research, we analyze the relationship between automobile ownership, residential location in transit-rich neighborhoods, and earnings. Again, similar to our interest in employment models, we are also interested in the effect of program status (being in the experimental group) itself on all three of these outcomes. Because we expect that the relationships among these outcomes are themselves interrelated, we employ structural equation modeling (SEM), which enables us to posit more complex, interrelated pathways of causation than would other modeling approaches.

Exhibit 7 depicts our SEM modeling approach. Our conceptual model rests on the assumption that access to transportation resources—cars and high-quality public transportation—can increase an individual's probability of employment and enhance earnings by expanding the geographic scope of the individual's job search and by improving punctuality and reliability. In the U.S. context, however, the two transportation options we examine—cars and transit—are typically substitute goods for the journey to work. Therefore, we expect that individuals—particularly low-income individuals looking to economize—would make tradeoffs in selecting between the two. We thus expect car ownership and transit richness to be both positively associated with earnings and negatively associated with one another. We further expect car ownership to be more strongly associated with earnings than with transit access, an assumption consistent with previous studies (Cervero, Sandoval, and Landis 2002; Gurley and Bruce, 2005; Sandoval, Cervero, and Landis, 2011).

Exhibit 7

Overview of the Structural Equation Modeling Approach



** Also controlled for randomization group, race/ethnicity, age, sex, and employment at baseline survey. The earnings submodel includes additional controls for years of education and having not moved residences by interim survey.*

Note: Dashed lines indicate modeled covariance of error term.

As depicted on the left side of the diagram in exhibit 7, we use characteristics of the individual at the time of the baseline MTO survey (roughly 1994 to 1998), and we also use a series of time-invariant variables, such as race/ethnicity, gender, and randomization group, to predict our three outcomes of interest at the time of the MTO interim survey. These outcomes are (1) automobile ownership, (2) the transit richness of the respondent's home census tract, and (3) the respondent's self-reported earnings. We also relate the three outcome measures to one another in the overall modeling approach. We estimate a parameter for the error covariance of each submodel. This approach assumes that the unobserved variables that help to explain car ownership, choice of residence in a transit-rich neighborhood, and earnings covary in meaningful ways. For instance, those individuals who prefer owning a car also choose to live in a neighborhood with ample parking and lower levels of transit access.

We find that having owned a car at the time of the baseline survey is a strong predictor of owning a car at the interim survey, perhaps reflecting both the likelihood of an individual's retaining a valuable asset such as an automobile and that individual's preferences for automobile ownership. In a similar way, having a job at the time of the baseline survey is a strong predictor of automobile ownership several years later, reflecting the need for employment to cover the financial costs of car ownership.

Only two variables are statistically significant predictors of living in a transit-rich neighborhood. Being a member of the control group for random assignment has a strong positive association with transit richness at the time of the interim survey. The control group in the MTO experiment did not receive Section 8 vouchers and, thus, most participants remained in traditional public housing, which is often located in transit-rich, inner-city areas, or they left housing assistance altogether for one reason or another. The only other significant predictor of transit richness at the time of the interim survey is transit richness at the time of the baseline survey. This relationship may reflect individuals' transit preferences and the "lumpiness" of making the transition to transit's main competitor—the automobile (through vehicle purchases and licensing). It also may be because of the high financial and social costs of moving to a new neighborhood. Regarding this last point, voucher households can experience difficulty moving out of their current neighborhoods because of limited resources, landlord practices, and institutional obstacles associated with the voucher program (DeLuca, Garboden, and Rosenblatt, 2013).

Access to transportation at baseline appears to make a difference in earnings several years later. Both automobile access and living in a transit-rich neighborhood at the time of the baseline survey are statistically significant predictors of higher earnings. The earnings effect for owning a car is considerably greater, however, than the effect of transit richness. Our results suggest that one would have to live in a neighborhood nearly eight standard deviations above the mean regional transit richness to achieve the same estimated effect on earnings as owning a car. When we test whether transit matters more for households without a car, we find no difference; the role of transit is similarly weak for those individuals with and without cars.

Finally, we find that the error terms of our earnings and transit richness models are both correlated with that of the car ownership submodel. This finding suggests that omitted variables that are associated with higher earnings but are difficult to measure (such as perseverance, intelligence, a highly developed social network, or other factors) are also associated with automobile ownership. The model results similarly suggest clear tradeoffs exist between the choice to own a car and the choice to live in a transit-rich neighborhood. Controlling for a host of other factors, those who are more likely to choose one of these transportation options (for instance, buying a car) are considerably less likely to choose the other (for instance, living in a very transit-accessible neighborhood). This relationship likely reflects both attributes of the person (preference for one mode over the other) and also a host of unobserved factors associated with living in a particular neighborhood. For instance, if a person lives in a transit-poor neighborhood to be close to friends and family, that person may be more likely to purchase a car as well.

Why So Little Bang for the Buck? Voucher Programs and Public Transit

Taken together, the findings from all three analyses show that automobile access improves employment outcomes and earnings for low-income households. Furthermore, we find that access to automobiles is more important than assignment to the MTO or WtWV experimental group. The finding of a strong effect of cars on employment outcomes is consistent with the broader literature on automobiles and low-income populations (Baum, 2009; Cervero, Sandoval, and Landis, 2002;

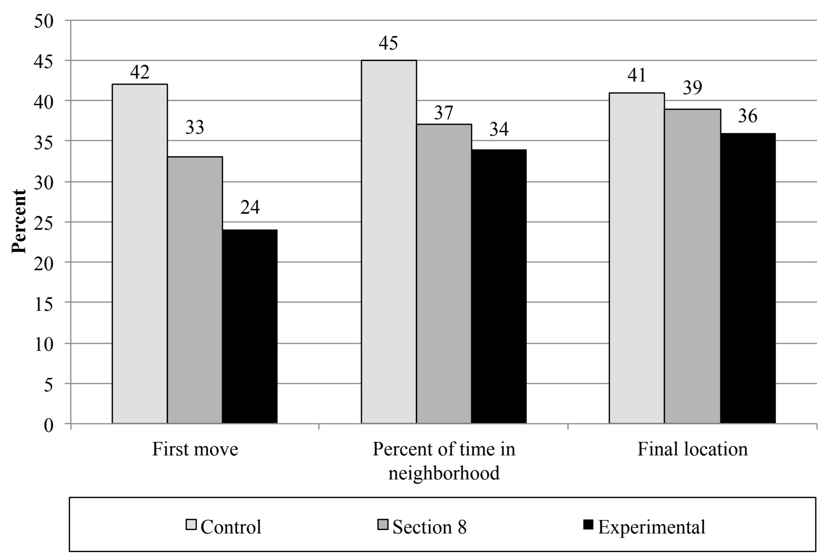
Garasky, Fletcher, and Jensen, 2006; Gurley and Bruce, 2005; Lichtenwalter, Koeske, and Sales, 2006; Lucas and Nicholson, 2003; Ong, 2002; Sandoval et al., 2011). The impacts of public transportation are mixed, likely because of the substantial variability in transit coverage among the metropolitan areas included in the study. Public transit may not effectively connect low-income workers to jobs. It may also be true that public transit—even in the large MTO metropolitan areas—does not provide enough service to adequately connect voucher recipients to employment opportunities.

As a followup on our employment models, we analyze transit access among MTO participants. We use three measures to examine the transit characteristics of the neighborhoods in which MTO program participants live—walk times to transit, service frequency, and the percent of the region's jobs accessible by public transit in a 30-minute commute. To summarize our findings, we focus on the last measure, because—at least in theory—job access by public transit incorporates both the time it takes to walk to a transit stop or station and how quickly transit users can board a bus or train.

Exhibit 8 shows that residents in the control group are much more likely to live and remain in—what we call—transit-rich neighborhoods. This finding holds true for all three measures—at lease up ("first move"), percent of time in transit-rich neighborhood, and at the close of the program ("final location"). Both jobs and transit networks are highly concentrated in central-city neighborhoods, where, as we note previously, public housing tends to be located. In addition, over time—between first move and final location—households in the experimental group are more likely to live in transit-rich neighborhoods. Because our transit data do not change over time and, therefore, do not incorporate changes in levels of transit service, this finding likely reflects the relocation decisions of families in the experimental group.

Exhibit 8

Percent of Region's Jobs Accessible by Transit in 30 Minutes



Sources: HUD; The Brookings Institution

In a separate paper, we examine the determinants of cumulative poverty exposure. In this analysis, however, we show time spent in low-poverty neighborhoods as the MTO program defined them—census tracts with less than a 10-percent poverty rate. Exhibit 9 shows a distinct effect on the amount of total time spent in low-poverty neighborhoods when we distinguish between program subgroups. In short, those who successfully receive the experimental treatment spend far more time in low-poverty neighborhoods compared both with those who receive the experimental treatment (but did not lease up) and those who receive unrestricted vouchers in the Section 8 group. Unrestricted leasing up (in Section 8 households) does appear to have a mild effect on reducing exposure to poverty. The most clear trend, however, is that households in all subgroups, irrespective of program status or lease up, spend much of their time in higher-poverty neighborhoods.

The data underscore the fact that MTO participants—many who wind up living in transit-rich, central-city neighborhoods—still can reach only a minority of jobs within a 30-minute commute. Additional research ought to examine whether there is a threshold effect with respect to the impact of public transit on employment. If a threshold effect exists, the effect of transit on geographically mobile housing voucher recipients will likely remain limited until transit networks are systematically expanded.

Exhibit 9

Percent of Time Spent in Poor Neighborhoods, 1994–2010

Experimental Lease Up	Experimental No Lease Up	Section 8 Lease Up	Section 8 No Lease Up	Control
52	6	16	9	8

Note: 10-percent poverty rate or more, using 1990 poverty rates.

Conclusion

Our analysis confirms the important role of automobiles in the economic outcomes of low-income households. Yet, despite these findings, relatively few federal programs aim to help low-income families gain access to automobiles; some programs actually act as barriers to gaining such access. Post-welfare reform policymakers turned to transportation as a strategy for rapidly moving welfare recipients and other low-income adults into the labor market. In 1998, Congress passed the Job Access and Reverse Commute program, one component of the Transportation Equity Act of the 21st Century (U.S. Congress, 1998). In addition, other federal agencies—U.S. Departments of Health and Human Services, Housing and Urban Development, and Labor—made resources available to provide transportation for welfare recipients and other low-wage workers. These efforts largely centered on public transit and, in particular, on strengthening transit connections from center cities to suburbs. Policy efforts to coordinate housing and transportation similarly have largely focused on public transit, as demonstrated in the funding history of programs such as the Partnership for Sustainable Communities. Transit investments should take place in dense urban neighborhoods where origins and destinations are reasonably proximate. Without increased densities—employment and housing located in close proximity to bus stops and station areas—transit investments will not attract significant ridership and, therefore, will require extensive public subsidy (Guerra and Cervero, 2011).

In the absence of building extensive transit networks, which are fiscally impracticable in all but the densest U.S. metropolitan areas, our study suggests that cars present a more viable means of connecting low-income workers to jobs. Low-income households, therefore, would benefit from policies and programs to increase their access to automobiles. These policies and programs might include efforts to ease the remaining vehicle asset limitations associated with participation in some government social benefit programs. For example, most states have lifted or eased vehicle asset limitation rules for welfare recipients. As of 2012, however, 14 states still maintained a vehicle asset limitation; these states include California, New York, and Texas, states with some of the largest numbers of welfare recipients (Urban Institute, 2006). As we mention previously, evidence suggests that this policy change can increase automobile ownership and employment among the poor (Hurst and Ziliak, 2006; Lucas and Nicholson, 2003; Sullivan, 2006).

Policies such as individual development accounts (matched saving accounts) also may help families save for and purchase vehicles (Stegman and Faris, 2005). Efforts to increase automobile access—rather than ownership—could provide many of the benefits of automobiles without the high costs of ownership. These benefits might include the use of car sharing, ride sharing, and automobile leasing programs. For example, many researchers argue that short-term car rental services such as Zipcar and car2go have the potential to address the travel needs of some low-income adults at a lower cost than ownership (National Research Council, 2005; Shaheen, Cohen, and Chung, 2009). Thus far, however, there is little evidence of the effectiveness of these programs in meeting the transportation needs of the poor, who may require car access for 8 or more hours per day, a duration of time not well suited for carsharing.

Automobiles are expensive to own and operate. Therefore, low-income auto owners would benefit from programs to reduce the operating costs of driving. One example might be pay-per-mile automobile insurance. Low-income drivers tend to travel fewer miles than higher income drivers (Blumenberg and Pierce, 2012); therefore, for low-income families, flat auto-insurance rates can translate into much higher premiums per mile traveled. In addition, evidence shows that many low-income families face auto insurance redlining; residents of poor and minority neighborhoods pay higher premiums than do residents in other neighborhoods (Ong and Stoll, 2007). States should adopt regulations to base auto premiums on motorists' driving records rather than on the neighborhood in which they live. For example, in 1988 California voters passed Proposition 103, a broad sweeping initiative to reform property-casualty insurance. After years of legal challenges, new regulations were finally enacted in 2006 to enforce the requirement that insurance premiums be based on driving record and not ZIP Code, marital status, or other factors (Consumer Watchdog, 2007). Other approaches might include low-cost automobile insurance programs (Brobeck and Hunter, 2012) or the course that Detroit Mayor Mike Duggan endorsed—the formation of a city-owned automobile insurance company (City of Detroit, 2014).

Regarding subsidized housing recipients, the provision of transportation-based services was an integral component of the WtWV program, but was less of a focus in the MTO program. HUD provided guidance to public housing agencies participating in the WtWV program regarding ways in which to tailor services to the transportation needs of households receiving assistance. The HUD website also provides information about how to coordinate housing assistance with the various local transportation programs sponsored by nonprofit organizations, transit agencies, and the business community (http://www.hud.gov/offices/pih/programs/hcv/wtw/resources/bs10/transportation.cfm - 1). HUD's role in this effort, however, is primarily advisory, with local public housing agencies playing the lead role in designing such programs. Housing assistance and transportation ought to be coordinated. To play more of a role, HUD should systematically collect data on whether assisted tenants have access to functioning cars. Housing programs can then be shaped to account for the travel needs of assisted households with and without automobiles. Moreover, additional research—such as an experiment in which automobiles or auto assistance are randomly assigned to unemployed housing voucher recipients—can more clearly determine the effects of cars on employment outcomes by ruling out the possibility that employment and the increased income it provides alone enables automobile ownership. Moreover, such a study could help isolate the particular mechanisms by which automobiles contribute to improved employment outcomes, a topic that has received relatively little attention.

Many, if not most, policymakers loathe policies and programs that promote automobile use, thus contributing to traffic congestion, air pollution, sprawl, and high transportation costs. Many good reasons exist for these concerns and for the associated efforts for policymakers to address them. Yet the responsibility for mitigating the negative externalities of automobiles should not be shifted to low-income families—the population group that currently uses cars the least and, as the evidence shows, greatly needs the economic benefits they enable. For low-income households, the evidence clearly shows that the pursuit of "economic sustainability"—in this case measured by employment rates and earnings—may conflict with other dimensions of sustainability and thus will necessitate that policymakers make some difficult policy tradeoffs.

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Authors

Evelyn Blumenberg is a professor at the University of California, Los Angeles, Luskin School of Public Affairs, Institute of Transportation Studies.

Gregory Pierce is a senior postdoctoral researcher at the University of California, Los Angeles, Luskin School of Public Affairs, Luskin Center for Innovation.

Michael Smart is an assistant professor at Rutgers, the State University of New Jersey, Edward J. Bloustein School of Planning and Public Policy.

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How Can the LIHTC Program Most Effectively Be Used To Provide Affordable Rental Housing Near Transit?

Todd Nedwick
National Housing Trust

Kimberly Burnett
Abt Associates Inc.

Abstract

For millions of Americans, public transportation is more than a mere convenience; it is a necessity for accessing jobs, educational opportunities, healthcare services, and other everyday needs, while living within their financial means. It can be significantly difficult, however, to finance the construction or preservation of affordable housing in location-efficient areas: high demand to live in transit-accessible areas drives up land costs, making it a challenge to acquire desirable sites for affordable housing and putting existing affordable rental housing at risk (Armstrong, 1994; Cervero and Duncan, 2002a, 2002b; Debrezion, Pels, and Rietveld, 2007; Gruen, Gruen & Associates, 1997; Immergluck, 2007; Lin, 2002). As the largest affordable rental housing production and preservation program in the nation, the Low-Income Housing Tax Credit (LIHTC) Program provides an opportunity to ensure that housing affordable to low- and moderate-income families is developed and preserved near public transportation. Yet, nearly 30 years after its enactment, the LIHTC Program remains one of the least studied federal programs. This article addresses a fundamental question: How can the LIHTC Program most effectively be used to promote the preservation and development of affordable rental housing near transit? To answer this question, this study relies on qualitative analysis of interviews of more than 100 housing policy agency staff, developers, and housing and transit policy experts and on a quantitative analysis of more than 400 qualified allocation plans issued during an 8-year period.

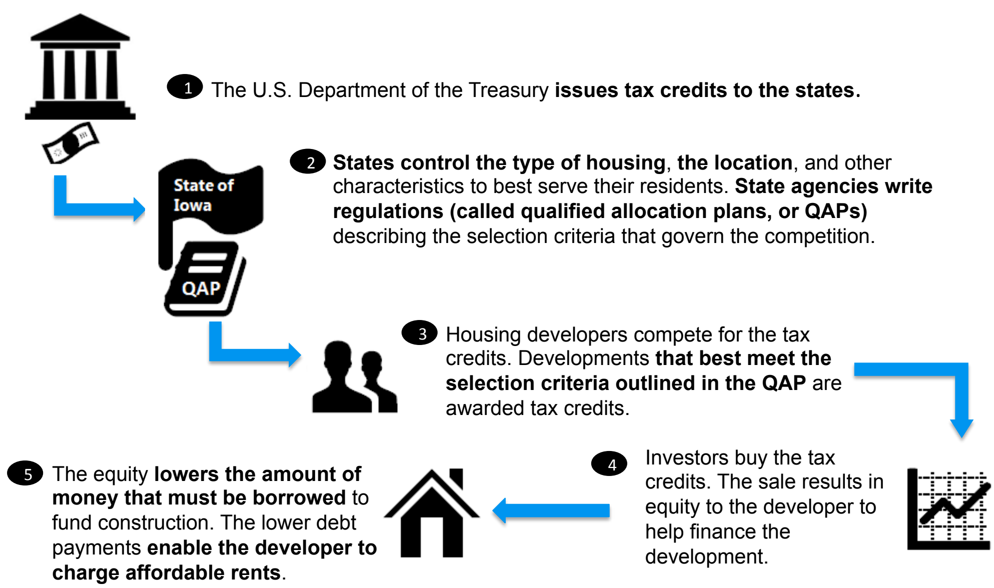
Introduction

Providing affordable rental homes near quality public transit ensures that low-income households are able to fit both housing and transportation expenses into their budget. Studies show that low-income households who live in autodependent neighborhoods can spend as much as 25 percent or more of their income on transportation costs (CTOD, 2009). In contrast, families who live in neighborhoods with quality public transit options, on average, spend only 9 percent of their income on transportation costs (CTOD, 2009). All too often, low-income households are shut out of such neighborhoods because they are unable to afford the high housing costs that come with living in locations that are convenient to transit and other amenities. As a result, many households face a difficult tradeoff, unaffordable housing or budget squeezing transportation costs (JCHS, 2010).[1]

The Low-Income Housing Tax Credit (LIHTC) Program[2] is a unique resource to create and preserve affordable homes near transit (exhibit 1). The LIHTC Program has been the primary source of funding for building new or preserving existing affordable housing since 1986 (JCHS, 2013). State housing agencies have the discretion to determine which developments receive funding and can

Exhibit 1

How the LIHTC Program Works



[1] The report found that low-income households with children that spent less than 30 percent of their income for housing devoted 4.4 times as much to transportation as those with high housing outlays.

[2] For the purposes of this article, references to the LIHTC refer only to the competitive 9-percent tax credit rate.

target resources to address pressing local housing needs, such as providing or maintaining affordable rental housing near transit. Section 42 of the Internal Revenue Code requires each housing credit agency to set forth selection criteria in a qualified allocation plan (QAP). Although the code states that the QAP must give preference to "developments serving the lowest income tenants," "developments obligated to serve qualified tenants for the longest periods," and "developments located in a Qualified Census Tract[3] and the development of which contributes to a concerted community revitalization plan," state housing agencies are granted the authority to otherwise allocate their credits based on their own set of criteria. Housing agencies generally use three mechanisms in their QAP to guide allocation decisions based on state and local housing needs: (1) threshold requirements,[4] (2) set-asides,[5] and (3) preferences.[6]

The report from which this article is drawn addresses a fundamental question: How can the LIHTC Program most effectively be used to promote the preservation and development of affordable rental housing near transit? To answer this question, the report examined the mechanisms through which state housing agencies evaluate LIHTC applicants and make funding decisions. Through a review of more than 400 QAPs issued during the 8-year period and interviews with more than 100 stakeholders, the report explores—

- The extent to which agencies seek to encourage the development and preservation of affordable housing near transit.
- Whether incentives had an observable impact on the location of LIHTC properties.
- Which other factors beyond these incentives—such as local relative land values and land use policies, transit availability and quality, and other QAP requirements or preferences—impact the location of LIHTC properties.

Two significant challenges must be addressed to effectively develop and preserve affordable housing near transit. States must seek a balance between promoting affordable housing near transit and other housing priorities. In addition, the importance of cost in developer decision making reinforces the notion that explicit QAP preferences in and of themselves are necessary, but not sufficient, to encourage the preservation or construction of affordable housing near transit.

Research Methodology and Data Sources

Both qualitative and quantitative methods were used to answer the research questions. The qualitative analysis was based on discussions with a sample of various stakeholders from 15 states

[3] Internal Revenue Code, 26 *U.S.C.* § 42. The term "Qualified Census Tract" means any census tract that is designated by the Secretary of Housing and Urban Development and, for the most recent year for which census data are available on household income in such tract, either in which 50 percent or more of the households have an income that is less than 60 percent of the gross Area Median Income for such year or that has a poverty rate of at least 25 percent.

[4] Threshold requirements set forth the minimum standards a proposal must meet to be considered for an allocation of LIHTCs.

[5] Set-asides allow housing agencies to reserve a portion of their LIHTCs for particular types of proposals.

[6] States' preferences allow housing agencies to weight selection criteria, often through the use of numerical points that allow for developments to be ranked against each other.

with a variety of QAP approaches, transit systems, and market dynamics.[7] Stakeholder discussions were semistructured and intended to identify and explore key themes. The Team developed a set of discussion guides tailored to each stakeholder category with a list of topics to explore. These guides provided open-ended prompts from which the Team began the discussion. The guides were adjusted based on the QAP incentives in the state (for example, the guide for a state with strong transit incentives in its QAP was different from the guide for a state with no transit incentives).

A quantitative analysis was conducted to examine the relationship between the accessibility of LIHTC properties to transit and the transit-oriented incentives incorporated into QAPs. In addition to the requirements and preferences incorporated into QAPs, the location of LIHTC properties is the result of complex interactions between the strength of the local real estate market and economy, the degree of competitiveness for LIHTCs in a state, local demographics, and other factors. Quantitative analysis that controls for as many of these factors as possible enables us to estimate the effects of transit preferences in QAPs and help to inform public policy. Therefore, the quantitative analysis examined the effect of transit incentives on the share of LIHTC properties over time in a metropolitan area that is transit accessible, controlling for several different factors.

The analytical approach included two phases—

1. Analysis of the percentage of LIHTC properties in a state each year that is transit accessible.
2. Regression modeling to explore the relationship between transit-oriented QAP incentives and the share of LIHTC properties in close proximity to transit stations.

More details about the methodology used are in the Quantitative Analysis section. Several data sources were used in this analysis, including stakeholder discussions, a QAP database compiled by the study team at the National Housing Trust (NHT), the Center for Transit-Oriented Development's (CTOD's) National TOD Database, HUD's National LIHTC Database, and other determinants of LIHTC property location, including state gross domestic product (GDP) data from the Bureau of Economic Analysis and census data on annual multifamily housing permits issued in each of the study years to serve as an indicator of the health of the housing market. The National Council of State Housing Agencies, or NCSHA, provided data about the competitiveness of LIHTCs.

Exhibit 2 summarizes how these data sources were used to answer the research questions.

[7] The 15 states selected for the qualitative analysis were Arizona, Colorado, Connecticut, Georgia, Illinois, Maryland, Massachusetts, Michigan, Minnesota, New York, North Carolina, Oregon, Utah, Washington, and Wisconsin.

Exhibit 2

Research Questions and Data Sources

Research Question	Data Source(s)
What incentives do QAPs provide for preserving or producing transit-accessible developments?	• NHT QAP database
How do stakeholders view the role of transit preferences in QAPs in influencing the location of LIHTC properties?	• Housing-policy expert or advocate • Transit-policy expert or advocate • Housing-agency staff • Affordable-housing developer or investor • Rural expert • Investor • Syndicator
Can the change in the number of LIHTC properties near transit be attributed to the QAP preference? Which other factors—such as local relative land value and land use policies, transit availability and quality, other QAP requirements of preferences, or statewide LIHTC competitiveness—might also have affected the change?	• LIHTC database (2002–2010) • CTOD's TOD database (2004–2012) • Census (2000) • ACS data (2005–2009); BEA • Data from NCSHA on tax-credit competitiveness • Stakeholder discussions

ACS = American Community Survey. BEA = U.S. Bureau of Economic Analysis. CTOD = Center for Transit-Oriented Development. LIHTC = low-income housing tax credit. NCSHA = National Council of State Housing Agencies. NHT = National Housing Trust. QAP = qualified allocation plan. TOD = transit-oriented development.

Transit Incentives in QAPs

Most states include incentives for transit proximity in their QAPs. States mostly use preferences expressed as points to encourage the use of LIHTCs to preserve or develop affordable rental housing near transit. This section describes the types of transit incentives incorporated into QAPs. It also discusses trends in the adoption of incentives for transit-accessible tax-credit properties over time and the challenges agencies face when seeking to balance the promotion of affordable housing near transit, while also addressing the housing needs of the entire state.

The study team at the NHT reviewed every state's QAP from 2003 through 2013 to determine how housing agencies use incentives to encourage LIHTC developments near transit. The specific attributes of incentives vary in a number of ways. Our analysis revealed that incentives range based on the following three characteristics—

1. **Explicit versus implicit incentives.** An explicit incentive directly references proximity to transit as qualifying criteria. An implicit incentive includes qualifying criteria for which transit access is embedded in other priorities, such as locating in urban areas or development that is consistent with smart growth principles.

2. **Standalone criteria versus in a category.** Standalone criteria require a development to meet the agency's definition of transit access to qualify for the incentive. For example, the Massachusetts Department of Housing and Community Development identifies transit proximity as a standalone category, requiring a development to be near transit to earn a perfect score.

In states that provide points in a category, LIHTC developments do not need to receive points for transit proximity to receive the total number of points awarded by the QAP. For example, the Indiana Housing and Community Development Authority awards applicants up to 5 points for being in close proximity to a range of public, private, or health-related services under the category of "Desirable Sites." Although public transportation is an eligible public service that can earn points, it is only one of many types of services for which an applicant can earn points. As a result, an applicant can earn the maximum 204 points awarded by the QAP without being near public transportation.

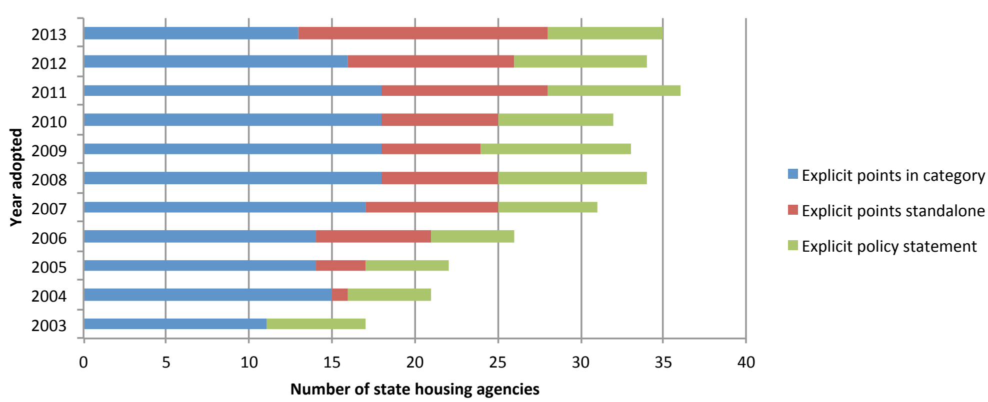
3. **Points versus policy statements.** Awarding points as part of the tax-credit evaluation and selection process is the most common means housing agencies use to encourage transit proximity in LIHTC properties. Some housing agencies, however, express a preference for transit proximity through a policy statement without awarding points. This approach typically is used because the agency does not use a point system to evaluate developments.

Explicit incentives for transit access have become more common in state housing agency QAPs, both in terms of the number of agencies that incorporate explicit incentives and how those incentives are structured. Exhibit 3 illustrates this change. As it demonstrates, the number of state housing agencies that incorporate some type of explicit incentive for transit access doubled from 17 in 2003 to 35 in 2013.

Much of this growth occurred by 2008 but the type of incentives included continues to change through 2013, with the growth uneven across the three incentive types. The primary type of incentive used among state housing agencies to encourage transit access in 2003 was "explicit points in a category." In 2003, no state agency incorporated "explicit standalone points" as the incentive type. By 2008, the number of agencies that incorporated incentives for transit access had increased to 34. The proportion of agencies that had adopted "explicit points in category" declined from 71 percent of all incentives in 2004 to 53 percent in 2008, however, while the proportion of agencies that had adopted explicit standalone points increased from 5 percent in 2004 to 21 percent in 2008.

Exhibit 3

Number of State Housing Agencies With Transit Incentives by Type, 2003 Through 2013



From 2008 through 2013, the total number of agencies that incorporated some type of explicit incentive for transit proximity remained fairly constant, but the proportion of agencies that adopted explicit standalone points increased to 40 percent.[8] The proportion of agencies that incorporated an explicit policy statement in support of transit proximity but did not award any points remained fairly constant from 2003 through 2013.

How housing agencies defined transit for the purpose of qualifying for the incentive vary. Requirements vary most commonly based on the following characteristics—

- Mode of transit; for example, bus versus rail.
- Distance of the development from the transit location.
- Frequency of service, including the hours of service and service headways.

Exhibit 4 illustrates examples of the variety of approaches some state agencies have used to implement the transit requirements in their QAPs.

Exhibit 4

Transit Requirement Examples (1 of 3)

	Transit	Distance	Geography	Other Requirements
Arizona	Bus	0.25 miles	Greater Phoenix	Minimum 15 hours of service on weekdays, 12 hours on weekends at 30-minute intervals between 6:00 a.m. and 6:00 p.m.
			Tucson	Minimum 12 hours of service on weekdays at 30-minute intervals between 6:00 a.m. and 6:00 p.m., minimum 10 hours of service on weekends at 1-hour intervals between 6:00 a.m. and 6:00 p.m.
			Balance of state	Minimum 8 hours of service on weekdays at 1-hour intervals from 9:00 a.m. to 5:00 p.m.
	Rail	0.50 miles		
California	Bus	0.33 miles		Scheduled service every 30 minutes from 7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.
	Rail	0.25 miles		
Colorado	Rail	0.50 miles		
Connecticut	Rail	0.50 miles		Must be part of a TOD, as defined by the Connecticut General Assembly.
Delaware	Bus	0.25 miles	New Castle County	
		0.50 miles	Kent/Sussex Counties	
District of Columbia	Bus	0.25 miles		
	Rail	0.50 miles		

[8] Note that the number of agencies providing explicit standalone points for transit doubled between 2010 and 2013. We unfortunately are unable to look for correlations between these policy changes and housing outcomes in our quantitative analysis because developments that were allocated tax credits in these years are not yet included in the national LIHTC database.

Exhibit 4

Transit Requirement Examples (2 of 3)

	Transit	Distance	Geography	Other Requirements
Georgia	Undefined	300 feet, 0.25 miles, or 0.50 miles		The stop must rest along a transit line that follows a fixed route and daily schedule.
Illinois	Bus, rail	0.25 miles	Chicago	Operates on a schedule beginning no later than 8 a.m. and ending no earlier than 6 p.m., Monday through Friday.
		0.50 miles	Chicago metropolitan area	
		0.75 miles	Other metropolitan area	
		1.00 miles	Nonmetropolitan area	
	Dial-A-Ride			
Indiana	Bus, rail, ferry	0.25 miles		Fixed-transit infrastructure must exist or be planned, approved, and funded at the time of application.
Maine	Undefined	1,500 feet		Year-round service available 5 days per week that provides regular service from 6:30 to 9:30 a.m. and 3:00 to 6:00 p.m. daily.
Maryland	Rail, bus	0.50 miles		Must be part of a TOD as designated by the Maryland Department of Transportation or within 0.5 miles of a planned or existing transit rail stop or station or a transit node that brings at least two bus lines or other forms of transit (excluding cars) together.
Massachusetts	Bus, rail, ferry	0.50 or 0.75 miles		Must be nearby services such as retail or commercial opportunities, grocery or convenience stores, restaurants, and municipal offices.
Michigan	Bus	0.10 miles		
	Walkability			Measured by the property's Walk Score.
Minnesota	Bus, rail	0.50 or 0.25 miles	Metropolitan area	Highest preference for properties within 0.5 miles of light rail transit, bus rapid transit, or commuter rail stations.
	Undefined, Dial-A-Ride	0.50 or 0.25 miles	Greater Minnesota	Fixed-route stop, or located within 5 miles of a job center, community services, and Dial-A-Ride service.
Montana	Undefined	1.50 miles		
Nevada	Undefined, school bus	0.25 miles		
New Jersey	Bus, rail, ferry	0.50 miles		Mixed-use TOD development or Transit Village as designed by the New Jersey Department of Transportation.
New Mexico	Bus, rail, ferry	0.50 miles	Suburban/midsize towns	At least 60 or more transit rides per weekday and some type of weekend ride option.
	Other	5.00 miles	Rural/tribal/small towns	Transit options include vehicle share program, Dial-A-Ride program, employer vanpool, and public-private regional transportation.

Exhibit 4

Transit Requirement Examples (3 of 3)

	Transit	Distance	Geography	Other Requirements
South Dakota	Bus, on demand	1 city block		Projects that provide free transportation on a regular schedule or on-call basis.
Tennessee	Bus, rail	0.50 miles 5.00 miles	Urban Rural	Includes regional transportation services using vans or buses and human resource agency vanpools.
Utah	Rail	0.33 miles		Highest preference for properties contiguous to a FrontRunner or TRAX rail station.
Virginia	Bus	0.25 miles		
Washington	Bus, rail, ferry	10-minute walkshed	King County	Located within a 10-minute walkshed of Fixed-Transit Infrastructure and located in an area zoned for high-capacity, transit-supported density.
Wisconsin	Bus, undefined	0.20 miles		
Wyoming	Undefined	1.50 miles		

TOD = transit-oriented development.

Key Challenge: Maintaining Balance in the QAP

For a property to receive low-income housing tax credits that will lead to a desired policy outcome, housing agencies must place sufficient incentives in the QAP to lead to that desired policy outcome; for example, by developing or preserving housing near transit. Housing agencies, however, can find it difficult to adopt QAP incentives that encourage development near transit while still addressing the housing needs of communities with little or no transit infrastructure. Housing agency staff and developers alike expressed concern about adopting transit incentives out of fear that it might skew the allocation process in favor or properties located in urban areas with heavy transit infrastructure and make it effectively impossible for suburban and rural properties to compete. A developer from Pennsylvania expressed her concern this way, echoing sentiments expressed by stakeholders from a variety of states.

> Too strong of an emphasis on transportation corridors will direct so many of the resources to just the urban hubs and truthfully we know we need affordable housing throughout the state whether it's rural, suburban or urban areas, so I think it's a very fine balancing act that HFA [housing finance agency] has to do.

Stakeholders also discussed the challenge of developing a workable definition of transit access that can be used as part of a statewide preference. It is difficult to develop a "one-size fits all" criterion for the type of transit and level of service a property should meet in most states given the diversity of urban, suburban, and rural communities. A developer who works in Massachusetts described this challenge.

> You have to look at a transit metric that is one thing in the city of Boston where we have mass transit and that's another thing in places like Wareham or New Bedford or

> Springfield where there might be a bus network. So it is difficult to find a good metric that could let people measure how their deals are going to score in those regards. It's easy to say transit access is important, but it's really hard to operationalize it for an application.

Several approaches that housing agencies adopted demonstrate how the QAP can maintain balance in meeting diverse state housing needs while still including robust preferences for properties located near transit or in areas that are otherwise location efficient. Approaches include—

- Creating **geographic pools** that allow for developments from similar types of communities to compete with each other; that is, a development from a suburban location would compete only with other suburban developments rather than with developments from an urban location. The use of geographic pools can result in a more equitable distribution of resources because they allow for properties from similar contexts to compete against each other. In a number of states, the introduction of geographic pools has enabled the housing agency to incorporate transit preferences for the first time or to develop more nuanced criteria tailored to the diversity of communities in the state.

  In its 2010 QAP, the Illinois Housing Development Authority (IHDA) created geographic set-asides for the first time and also adopted more nuanced selection criteria to evaluate a development's transit accessibility. The agency distributed the credit authority among four geographic typologies: the city of Chicago, the Chicago metropolitan area, other metropolitan areas, and nonmetropolitan areas. According to IHDA, the intent of the set-asides was to create a more level playing field by ensuring that the same scoring criteria were not being used to evaluate developments from different geographic contexts. Before the geographic set-asides, developments were considered close to transit if they were located within four blocks of a regular bus route or rapid-transit system. IHDA concluded that this definition of close proximity favored more urban areas. After the set-asides were established, IHDA adopted tailored selection criteria for each type of geography. Close proximity was defined as the following for each type of geography—

  - Chicago: 6 blocks.
  - Chicago metropolitan area: 1.0 mile.
  - Other metropolitan area: 1.5 miles.
  - Nonmetropolitan area: 2.0 miles.

- **Tailoring transit requirements** differently based on the variety of transit infrastructure that can be found throughout a state (for example, require bus service in urban areas to have more frequent service than bus service in suburban or rural areas). In Arizona, transit incentives in the QAP evolved over time as the Department of Housing (DOH) sought to reflect the housing needs and transit accessibility of the diverse range of communities throughout the state. DOH began incorporating incentives for sustainable development in 2008 when it awarded 10 points to properties that met three out of four indicators of sustainable development, including being located within 1 mile of a mass transit route. Consulting with TOD experts from the state Department of Transportation DOT and the Sustainable Communities Collaborative, DOH increased the number of points available in 2010 and also more narrowly defined the types of transit and level of service required to qualify for the incentive.

After receiving pushback from developers and advocates who were concerned that very few developments would meet the strict service-frequency requirements given the lack of rail transit and high-frequency bus service outside of the Phoenix metropolitan area, DOH further adjusted the selection criteria to distinguish between Greater Phoenix, Tucson, and the rest of the state. According to agency staff, adjusting the criteria to distinguish between the various types of communities has enabled them to encourage developers to provide affordable housing where public transportation is, regardless of whether they are in Phoenix or a rural community. By developing different incentive requirements for different types of communities, DOH aims to encourage sustainable development that is appropriate to a variety of local contexts.

- **Incorporating other place-based criteria** to encourage development that is location efficient for reasons other than transit access, such as proximity to job or town centers. This approach promotes access to community amenities and reduces transportation costs without disadvantaging communities without transit service. In Minnesota, QAP incentives for transit access have evolved to reflect the variety of transportation options within the Twin Cities metropolitan region (Minneapolis-St. Paul) and throughout the rest of the state. The state's housing finance agency (HFA), Minnesota Housing, began to encourage development near transit through targeted incentives in the 2011 QAP. The agency initially focused on promoting affordable housing within walking distance of the central corridor light rail system in the Twin Cities metropolitan region. Fearing that the preference for fixed-route public transportation stops would discourage development in rural areas, advocates urged Minnesota Housing to adopt a more nuanced definition of location efficiency that recognized regional differences. In the 2012 QAP, the agency adjusted the location preference to reflect these concerns by awarding points to properties located outside of the Twin Cities metropolitan region if they were located within 5 miles of 2,000 low- and moderate-wage jobs and were located within 1 mile of at least four community facilities or services.

Key Challenge: Addressing the Cost of Developing Affordable Housing Near Transit

Housing developers generally recognize the benefits of locating affordable housing near transit. Higher costs associated with transit-accessible affordable housing can make it difficult for housing developers to identify sufficient sources of capital, however.

It became clear from our interviews with developers that many view providing access to transit as part of their mission to help improve the lives of their residents. A developer from a northwestern state cites the impact of high commuting costs can have on the budget of low-income households.

> In metro areas across the country, the cost of transportation for a low-income family can be very high and it's usually the number two household cost right after housing. So to the extent that we can help people either live without a car, or use their car less, we hope that will allow them to preserve more of their household income for other necessities.

Although providing access to transit is an important consideration to developers, the final decision of where to pursue development opportunities comes down to real estate fundamentals and the financial feasibility of a particular development. Determining financial feasibility consists of (1) assessing the costs of acquiring and developing the housing and the prospect of raising sufficient resources to secure those costs; and (2) evaluating whether operating and debt-service costs can reasonably be provided for based on expected operating income. Higher demand for sites near transit can bring higher costs, however. Access to transit can increase the value of a nearby property. A study released by the American Public Transportation Association and the National Association of Realtors found that during the last recession residential property values performed 41 percent better on average if they were located near public transportation with high-frequency service (CNT, 2013).

Developers identified the cost of providing affordable housing near transit as a significant barrier. Higher acquisition and development costs can make it difficult to finance the preservation and construction of affordable housing near transit, when compared with other locations. Affordable-housing developers are unlikely to have the capital on hand that is needed to acquire expensive sites. Lack of capital puts affordable-housing developers at a disadvantage when competing against market rate developers to acquire transit-accessible sites. As one would expect, these cost challenges can significantly impact a developer's decision to pursue transit-accessible sites.

Our interviews illuminated several strategies to address their barrier and increase the financial feasibility of LIHTC developments near transit. These strategies include—

- **Aligning gap-financing sources to support development near transit.** A number of respondents indicated that prioritizing gap financing for use in developments near transit would increase the competitiveness of such developments in the tax-credit competition and would have more significant impact on their development decisions than the incentives for transit access currently available in the QAP. Gap financing is often needed to ensure the financial feasibility of LIHTC developments. Tax-credit equity and debt products are typically insufficient to cover all of the acquisition, construction, and soft costs of a development. Various sources of gap financing—including public sources of funding from federal, state, and local government housing programs, philanthropic programs, tax increment financing, community banks, and community development financial institutions—are often required to bridge the gap in financing until all permanent financing sources are secured.

  Three key reasons make prioritizing gap financing for transit-proximate developments important within the context of using the tax-credit program to preserve and develop affordable housing.

  1. To be eligible for 9-percent LIHTCs, housing developers must demonstrate control of the site, which often requires significant additional capital.

  2. Land costs cannot be included when computing the amount of credits available to a particular project, indicating that higher costs developments—such as those located near transit—can have significant financing gaps and need additional sources of subsidies to cover the cost of acquisition.

3. It is common for QAPs to include point-scoring incentives for developments that have received a commitment of gap financing.

Respondents identified a number of examples of gap financing sources that are being used to leverage LIHTCs to support the development and preservation of affordable rental housing near transit, including Arizona's Sustainable Communities Fund, Denver's TOD Acquisition Fund, the Atlanta Beltline Affordable Housing Trust, Portland, Oregon's tax-increment financing (which is tied to Urban Renewal Areas), Connecticut's Housing Trust Fund, and Washington State's housing trust fund. Other important sources of gap financing are federal HOME Investment and Community Development Block Grant funds.

- **Reducing development costs through improved land use policies.** Local land use requirements can complicate the economics of an affordable-housing development by increasing the development costs, thereby making it difficult to finance. Respondents identified several types of land use policies that can be particularly challenging—

1. Many respondents identified reductions in minimum *parking requirements* as an important incentive for developing affordable housing near transit, as the cost of providing parking can be expensive, especially if land is limited and structured parking is required. In addition, the benefit of locating near transit means fewer residents will rely on personal vehicles for transportation, thereby minimizing the need for parking.
2. Many respondents also identified *relaxing restrictions on density or providing density bonuses* in exchange for setting aside affordable housing as important incentives for creating affordable housing near transit. Such policies can help foster mixed-income, transit-oriented communities. Mixed-income communities provide poorer households greater access to economic and social opportunities than do communities with concentrated poverty.
3. *Property tax relief* was also identified as an important incentive that localities could use to support affordable housing near transit by reducing development costs. Such relief is already playing a role in preservation transactions in Massachusetts and Portland, Oregon.

- **Balancing cost containment in the LIHTC Program so that higher cost developments are not put at a disadvantage.** Policies such as caps on development costs and incentives for cost efficiencies in the QAP can make it difficult for transit-oriented developments to compete for 9-percent LIHTCs. Although most respondents acknowledged that it is important for agencies to implement strategies to contain costs, they also underscored the importance of doing so in a balanced manner that does not undermine the ability to deliver developments that best serve the needs of low- and moderate-income households. Discussions revealed a number of approaches housing agencies have adopted to achieve such a balance—

1. Washington, Massachusetts, and Virginia consider the type of development and its location when assessing cost reasonableness, with some agencies establishing a variety of multiple per unit cost maximums based on different development conditions.

2. In states including Minnesota and Pennsylvania, housing agencies use point incentives to level the playing field by comparing developments that are similar in type and location.
3. Some agencies, such as those in Virginia and New Jersey, consider building characteristics related to higher density construction that can increase development costs.
4. A number of agency staff also expressed a willingness to waive per unit cost and credit limits for transit-oriented developments in certain circumstances.
5. Another approach housing agencies use to balance cost containment with other considerations is limiting the number of points developments can receive for cost efficiency, so as to not trump other important policy priorities. This approach is being used in Minnesota and Michigan, among other states.
6. Finally, housing agencies such as those in Minnesota and Arizona are employing cost predictive models to assess the cost reasonableness of proposed developments. These models predict expected total development costs based on an analysis of cost data from developments previously financed by the agency.

- **Expanding the use of the basis boost for transit-accessible developments.** The LIHTC basis boost was identified as a potential tool for improving the financial feasibility of developments with higher than average costs. Housing agencies have the discretion to increase a development's eligible basis by up to 30 percent, enabling the developer to raise more equity than would have been possible without the boost and reducing the amount of debt and gap funding needed to finance the development.[9]

  Priorities for awarding the basis boost vary across states, but include encouraging supportive housing, energy efficient and green housing, targeting very low-income households, developing in high-cost areas, rural housing, historic rehabilitation, transit-oriented housing, and preservation (Shelburne, 2011). Relative to other types of priorities, the use of the basis boost to support developments near transit is uncommon. Although a relatively small number of agencies have specifically identified development near transit as a priority (five states in 2010: Indiana, Missouri, Oregon, Texas, and Utah), some states have identified other uses of the boost that can benefit developments near transit. One other use of the boost is to support developments in areas with high land costs or in areas of opportunity.

- Finally, **improving coordination across transit and housing agencies to better leverage and maximize resources.** In a number of states reviewed for this report, coordination across housing and transit agencies has helped overcome some of the barriers to developing affordable housing near transit. In several states, housing agencies are in regular contact with their transit counterparts to better understand where new transit investments are being made so as to

[9] Before 2008, the basis boost could be applied only to developments in Qualified Census Tracts or Difficult Development Areas. As the economic crisis hit, it became difficult for developers to raise the equity needed to assure the financial feasibility of their developments. In response, Congress granted housing agencies the flexibility to establish their own criteria for awarding the boost. Although agencies most commonly used the boost to improve the financial feasibility of developments that were otherwise struggling because of the loss of tax-credit equity, more than one-half have identified other priorities for awarding the boost (GAO, 2012).

improve the chances that affordable-housing goals are incorporated into station area plans. This type of coordination has helped to leverage and maximize resources and increase the financial feasibility of affordable-housing developments.

Collaboration among housing and transit agencies can improve the use of the LIHTC to preserve and create affordable housing near transit. In Arizona, officials from the state DOH sought out expertise from the state DOT when they were developing a new scoring category for transit access in the QAP. In a similar way, collaboration among the Washington State Housing Finance Commission and the Puget Sound Regional Council led to the incorporation of targeted transit incentive criteria in the QAP. Collaboration with transit agencies is also important because it can identify opportunities for affordable-housing development in areas where new transit investments are planned—an opportunity that officials in both Connecticut and Maryland recognized during the interview portion of data gathering for this report. Integrating affordable housing into transit-oriented development is more likely to be successful if planning begins early in the development process. Identifying opportunities for affordable-housing development early can reduce costs, because land speculation often occurs as soon as plans for new transit investments are announced.

Quantitative Analysis of Transit Incentives in QAPs From 2003 Through 2010

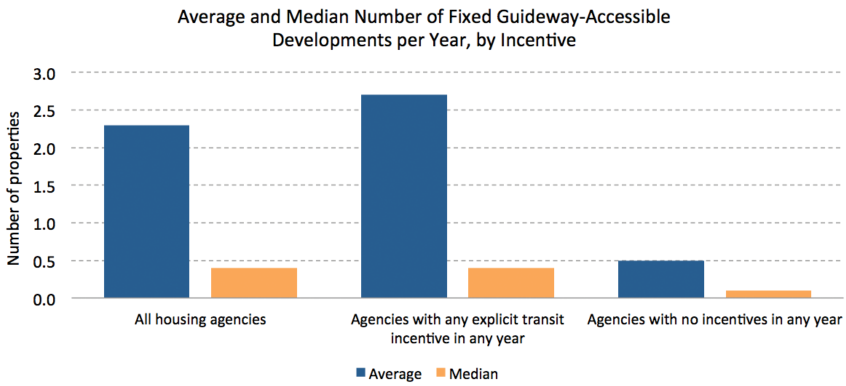
The preceding section of this article drew on discussions with a range of stakeholders to identify the right conditions for using the LIHTC Program to successfully develop affordable housing near transit. The case study analysis demonstrates explicit QAP preferences are necessary but not sufficient to encourage the preservation or construction of affordable housing near transit. To further test the impact of transit incentives on tax-credit allocation outcomes, a quantitative analysis was undertaken to estimate the effects of the incentives.

The results of the quantitative analysis suggest that explicitly including incentives for location near transit within a category (the most commonly used incentive during the study period) slightly increases the probability of LIHTC developments being located near transit. Quantitative analysis of the effect of other types of incentives—such as implicit preferences and implicit basis boosts—was inconclusive, however, partly because of the relatively short period that was examined. The analysis period was limited because LIHTC property data were available only through 2010. The number of agencies that adopted explicit standalone points for transit access, however, increased between 2010 and 2013. We found a small negative correlation between explicit standalone points and the location of LIHTC properties, but believe that the small number of observations available raises questions about the robustness of the results.

Cross-tabulation of data exposes an apparent relationship between LIHTC awards to transit-accessible properties and incentives. As shown in exhibit 5, across all housing agencies, the average number of tax-credit awards to transit-accessible properties annually was 2.2. Among agencies with any explicit incentive in any year, the average was slightly higher at 2.7. Among the

Exhibit 5

Relationship Between Transit-Accessible Properties and Incentives



five agencies with no incentives, the average was 0.5. The median number of LIHTCs awarded to transit-accessible properties annually was also somewhat higher for agencies with incentives than for those without, at one approximately every 3 years compared with one every 10 years.

Multivariate regression models were used to further explore the relationship between transit-accessible tax-credit properties and incentives used between 2003 and 2010. We also used these models to test whether provisions in the tax-credit housing agency's QAP were statistically related to a development's location relative to transit. For all analyses we tested both simple and fixed-effects model types for transit proximity defined as being within a 1/2 mile, a 1/3 mile, or a 1/4 mile of transit.

Methodology for Multivariate Analysis

Multivariate regression models are designed to account for the multitude of factors that affect the location of LIHTC properties. In addition to the requirements and preferences incorporated into QAPs, the location of LIHTC properties is the result of complex interactions between the strength of the local real estate market and economy, the degree of competitiveness for LIHTCs in a state, local demographics, and other factors. Regression models estimate the effects of transit preferences in QAPs, controlling for as many of these factors as possible.

Data Used for Analysis

As stated earlier in this article, this analysis relies on four main sources of data. The first of these sources is HUD's LIHTC database, which includes information on the location of properties placed in service in each year through 2010. The second is the CTOD's TOD database, which gives the location of fixed-guideway transit stations in 54 regions covering 90 metropolitan areas.[10]

[10] We did not have transit data for any metropolitan areas in Alabama, Alaska, Idaho, Iowa, Kentucky, Montana, Nebraska, North Dakota, Oklahoma, Puerto Rico, South Dakota, and Wyoming, so these states and territory are not included in our sample. This exclusion should not affect the analysis, because these places do not have fixed-guideway transit stations, so any QAP incentives would have no effect on the proximity of tax-credit properties to transit.

The study team combined these two data sources to calculate the relative proximity of each LIHTC property to its nearest transit station to determine whether or not properties are transit accessible. The third source of data, the QAP database, was created specifically for this study. It summarizes the type of transit incentives included in QAPs in all states in each year from 2003 through 2013. Other determinants of the location of LIHTC properties are also included in the analysis.

The study period for the quantitative analysis was 2003 through 2010. This analysis period was selected for two main reasons—

1. States began incorporating transit incentives in more frequency beginning in 2003.

2. Comprehensive data were available only for LIHTC developments placed in service through 2010.

Of the 7,509 properties in the LIHTC database from 2003 through 2010, 5,332 were competitively awarded and subject to incentives in the QAP to locate near transit. Among these, 3,193 properties were new construction and 1,764 involved the rehabilitation of existing properties. The remaining 375 properties could not be identified as either new construction or rehabilitation.

We excluded projects that were not located within one of the 54 regions for which we have transit location data. We did not exclude properties outside of a metropolitan statistical area because QAP transit incentives could have the effect of encouraging tax-credit properties to be built in metropolitan areas (that have access to transit) instead of nonmetropolitan areas. After culling, we had 3,702 projects in the dataset that were used for regression analysis.

Only fixed-guideway transit data were available in the TOD database used for this study. This data limitation means that for the purpose of the study, projects near bus stops but not transit stations are not considered to be near transit, although these projects may have qualified for transit incentives under some QAPs.[11]

Multivariate Regression Models

The primary independent variables we tested were the existence and types of incentives contained in a housing agency's QAP. In one set of regressions, these incentives were the only independent variables included. Two additional variables were included in another set of regressions to represent jurisdictions' time-variant features that could potentially influence the probability of a development being near transit. Many factors influence developers' decisions about where to site

[11] The study team sought other data sources to approximate the transit accessibility beyond just access to fixed-guideway rail stations. The team examined the Transit Score® dataset created by https://www.walkscore.com. This dataset had its own limitations, however. Although transit score incorporates both bus and rail transit access, the dataset available to use unfortunately includes only 100 cities (not metropolitan areas). About 75 percent of the properties in our LIHTC sample were not in sufficient proximity to a location with a transit score to be matched to a score, which limited the number of observations available for analysis. In addition, the transit score data reflect current transit accessibility, but we analyzed properties awarded tax credits in the past, from 2003 through 2010, and nonfixed-guideway transit service may have changed substantially over time. Because of the small number of observations and the likelihood that current transit accessibility does not reflect conditions at the time tax credits were awarded, we were unable to use these data in our analysis.

developments for which they seek LIHTCs, so we also controlled for two potentially intervening factors that change over time: state economic conditions and state housing market conditions. We specifically included—

- Annual percent changes in state GDP as a proxy for general economic conditions.
- Annual percent changes in state housing permits as a proxy for housing market conditions.

Two sets of regression models were tested. In the first, the probability of credits being allocated to a transit-accessible development is estimated as a simple function of incentives in the QAP. This analysis is strictly correlational and addresses the question of whether jurisdictions with certain provisions in their QAPs have more (or fewer) LIHTCs allocated to transit-accessible developments.

A limitation of this analysis is that correlation does not necessarily imply causation. Some jurisdictions may have more (or fewer) credits allocated for developments near transit for reasons completely unrelated to provisions in the QAP, such as the relative availability of developable land near transit, zoning, or high premiums for land located near transit. Jurisdictions with a lot of developable land near transit may offer no incentives and still have many developments located in proximity to transit, while jurisdictions with unfavorable geographies may offer aggressive incentives and still get a weak response.

The second set of models addresses this limitation to a degree by holding the jurisdiction fixed. This "fixed-effects approach essentially removes the influence of each jurisdiction's invariant (or fixed) features. These features include many geographical characteristics and perhaps political culture. For example, developers may traditionally have more political influence in some jurisdictions than in others. Because it implicitly controls for all the invariant features of the jurisdiction, the results of the fixed-effect approach may be considered closer to causal effects.

Three dependent variables were tested, indicating the probability that a LIHTC development was within 1 1/2 mile, 1/3 mile, or 1/4 mile of transit, measured "as a crow flies" (that is, not necessarily along pedestrian routes). Independent variables in the model indicated types of incentives contained in the QAP. The simple models were estimated using Probit, and the resulting coefficients were transformed to reflect percentage-point effects on the probability of a development being near transit. The results from the fixed-effect models also reflect percentage-point effects on the probability of a development being near transit.

We assume that the model takes the form—

$$p = Pr(Y\mathrm{t} = 0) = C + (1 - C)F(x'\ \beta), \tag{1}$$

where Y is the response—either 0 or 1 (development is inside or outside of the specified distance from transit); β is a vector of parameter estimates; F is a cumulative distribution function of the standard normal distribution; x is a vector of explanatory variables (in the simple model, these are preferences—explicit, implicit, and tiebreaker points); p is the probability that a development is within 1/2 mile, 1/3 mile, or 1/4 mile of transit as the crow flies; and C is the natural (threshold) response rate.

In the fixed-effects model, a parameter indicating the HFA is added.

Other versions of this model also include two other parameters—

1. **State GDP.** Data from the Bureau of Economic Analysis were used to compute the annual change in per capita state GDP. This computation was used as proxy for general economic conditions in the state.

2. **Multifamily housing permits.** We used state-level census data on the annual number of multifamily housing permits issued in each of the study years to serve as an indicator of the housing market health, hypothesizing that more private multifamily housing construction may increase the demand for LIHTCs and therefore increase developers' responsiveness to incentives for locating units near transit.

We were unable to identify a measure of annual average household transportation costs[12] to use in testing the hypothesis that higher costs will increase the demand for transit-accessible units and lead to an uptake in developers taking advantage of the incentive.

Models were estimated on the following three samples—

1. All competitively awarded developments.

2. Competitively awarded developments and new construction developments.

3. Competitively awarded developments and existing or rehabilitation developments.

Bond-financed tax-credit developments were not included in the analysis, because they are not subject to a competitive process.

Effects of QAP Incentive Types

Controlling for GDP and housing permits, our analysis found that explicitly including an incentive for location near transit within a category (the most commonly used incentive during the study period) slightly increases the probability of LIHTC developments being located near transit. Incentives with consistent, statistically significant relationships in the fixed-effects models are "explicit points included in a category" and "explicit preference included in a category" for a new tax-credit construction. "Explicit points" is associated with an increased probability of a LIHTC development being located near a fixed-guideway transit stop, whereas "explicit preference" is associated with a reduced probability. It is important that this incentive was used in only six QAPs, so the number of observations is small. These effects were relatively small in both directions.

The results for these two incentive types are very similar regardless of whether controls for economic conditions are included in the model, as shown in exhibit 6. This similarity suggests that the potentially intervening factors we included did not exert substantial influence on the outcome beyond the effects rooted in the QAP incentives themselves and the invariant features or HFA jurisdictions.

[12] Data on transportation costs are available from the decennial census but not on an annual basis.

Exhibit 6

Fixed-Effects Models With No Controls Versus Two Controls

	Fixed-Effects Model			Fixed-Effects Model (controls for economic conditions)		
	1/2 Mile	1/3 Mile	1/4 Mile	1/2 Mile	1/3 Mile	1/4 Mile
Explicit points included in a category (incentive used in 16 jurisdictions)						
All	– 0.01	0.05	0.03	– 0.01	0.05	0.03
New construction	0.04	0.08	0.07	0.04	0.09	0.07
Rehabilitation	– 0.05	0.08	0.01	– 0.06	0.06	– 0.01
Explicit preference included in a category (incentive used in 6 jurisdictions)						
All	– 0.04	– 0.04	– 0.04	– 0.04	– 0.04	– 0.04
New construction	– 0.09	– 0.09	– 0.09	– 0.09	– 0.09	– 0.10
Rehabilitation	0.01	0.00	0.00	0.00	– 0.01	– 0.01

Notes: Statistically significant results are highlighted with varying shades of black and gray. Black results are highly significant (p < .05), dark gray results are of modest significance (p < .10), and light gray results are only suggestive (p < .20). We tested for and did not find evidence of collinearity among the independent variables.

Other incentives did not have a statistically significant relationship with the transit proximity of tax-credit properties. One reason for the lack of statistical significance for most incentives may be not enough observations. Only a few incentives were used by more than a handful of tax-credit allocating agencies, and some of these probably came into play only rarely. The period covered by the study is relatively short, and relatively few states used incentives at the beginning of the period, further reducing the opportunity to observe any impacts of transit incentives on the location of tax-credit properties placed in service. Other data limitations probably play some role as well. For example, our sample excludes properties in the tax-credit database that were not geocoded, because the properties' location could not be determined relative to transit. This culling reduced the number of observations.

The incentives used may also simply be too weak. Although two implicit incentives—preferences and points—were used by a relatively large number of allocating agencies, these incentives are indirect and therefore may not be very strong. Implicit points, for example, indicate that incentives for transit access are embedded in other priorities that receive points, such as locating in urban areas or demonstrating sustainable development. Connecticut's implicit points are a case in point. Points were awarded in QAPs in 6 of the 7 study years for urban location, which would refer to an urban area, major metropolitan area, downtown, city center, or inner-ring suburb, regardless of whether the specific location selected is near fixed-rail transit.

In addition to the limited number of observations and the short study period discussed previously, a key limitation of the analysis was the lack of comprehensive transit data available nationwide. The review of QAP transit incentives revealed that most states include frequent bus service as an eligible mode of transit. Transit locational data were available only for fixed-guideway rail stations, however, because no nationwide dataset of frequent bus service is available. Therefore, we suspect that some properties are near frequent bus service that benefited from the transit incentives but could not be included in our observable findings.

Conclusion

A growing number of states are including incentives for locating LIHTC developments near transit in their QAPs, with the number of such states more than doubling from 17 in 2003 to 35 by 2013. Furthermore, more states—40 percent as of 2013—are using the strongest type of incentives—explicit, standalone points. The other types of transit incentives—explicit policy statements and explicit points in a category—are relatively weak. Most states award LIHTCs based on point scores. Points for proximity to transit that are submerged in a larger category can be weak, because it is possible for a proposed development not located near transit to obtain all the points in the category or to outscore a property close to transit in the number of points obtained.

Even so, the quantitative analysis that attempted to relate transit incentives to the actual location of developments that were awarded LIHTCs found that points within a category increased slightly the probability that LIHTC developments would be located near fixed-guideway transit. The analysis of the effectiveness of the stronger, standalone points that states increasingly adopted after 2010 was inconclusive because of the small sample size.

Interviews with housing agency staff, developers, and housing and transit policy experts identified two challenges to developing or preserving affordable housing near transit: (1) conflicting state priorities—in particular, the desire to locate LIHTC developments in places not likely to have the type of transit access identified in strong incentives—and (2) the high cost of developing transit-accessible sites. The interviews identified strategies that some states have used to mitigate those barriers.

Balancing LIHTC Allocations and Tailoring to the Diverse Needs of Different Geographic Areas

Perhaps the most promising approach states have used to incorporate strong incentives for location near transit into a QAP that reflects other geographic priorities is separating the allocations of LIHTCs into geographic pools. That approach makes it possible to have very strong incentives for location near transit in the urban pool without preventing all developments in rural areas from scoring enough points for a LIHTC allocation.

Another approach taken by some states—tailoring transit requirements to the nature of the location, accepting greater distances from transit and longer headways to qualify for the transit points—would seem to dilute the meaning of the transit incentive, especially if it is not used in combination with separate geographic pools. Points awarded for proximity for transit then become points nearly any development can obtain.

Instead, states that are interested in other priorities should consider using separate geographic pools and then examine the policy priorities that are most relevant to each pool in the allocation of LIHTC, both in deciding what percentage of the state's allocation of 9-percent tax-credit authority goes into each pool and in implementing that priority through the QAP. State housing agencies should identify those areas that do have a pressing need for affordable housing—for example, resort communities or areas of fast growth associated with oil and gas extraction industries—and then tailor the QAP incentives to the most promising way to preserve already existing affordable housing or build new affordable housing for low-income people who work in those areas, while reducing the burden of transportation costs.

As another example, many states are concerned about the fair housing implications of LIHTC locations and attempt to create incentives in their QAPs for locating housing, especially family housing, in areas with good schools and other dimensions of "opportunity" that may or may not be closely related in practice to transit access. Depending on the configuration of metropolitan areas in the state, the state agency may want to consider creating separate competitions for suburban developments and developments in the urban core. For developments in the urban core, states may want to incentivize preservation of the thousands of affordable apartments already located near transit that may otherwise be lost to the affordable housing stock. For the pool within which suburban properties compete, the QAP could have incentives that reflect a variety of place-based criteria, including access to existing and planned transit.

In crafting incentives that are appropriate to different geographic pools, housing officials should work closely with transportation officials on plans for the transportation infrastructure and on actual use patterns of public transit for journeys to work and other purposes. This study has shown that the definitions of distance from housing, times covered by transit service, and headways that are used in current transit incentives vary greatly from state to state. (Current incentives seem to be silent on fares and fare structures.) Incentives should be based on rigorous studies of the features of transit most likely to be used by nearby residents seeking to save time and money.

Improving the Financial Feasibility of Transit-Accessible LIHTC Developments

State housing agencies face competing priorities in the area of cost as well. Many states have per-unit or per-development caps on the amount of LIHTCs that can be allocated, and this cap reflects the understandable interest of state officials in using their allocations of 9-percent credits to support as many affordable homes as possible. States also often assess the reasonableness of the development costs of proposed LIHTC developments, creating threshold requirements that may apply to both 4- and 9-percent credits, because of their responsibility for exercising prudence in decisions about the use of public resources.

On the other hand, many states also recognize the need to develop and preserve affordable housing in neighborhoods where low- and moderate-income families have access to critical services. Those places, by definition, are places where the development costs are high—including sites near transit, where desirability of the location is reflected in the high cost of available sites.

Depending on the barriers to developing in transit-accessible locations, the state agency can adopt one or more of the promising practices identified in this article: consider the type of development and its location in applying both credit limits and development cost limits; use gap funding that the agency or its partner state and local agencies control in pursuit of locating affordable-housing developments in high-cost areas; use the "basis boost" in support of the same priorities; and change land use policies, such as parking requirements and density restrictions, that do not make sense in transit-oriented locations. The use of gap funding for LIHTC developments with access to transit can have the added benefit of creating housing with a fully mixed income character, because "soft money" often comes with requirements for a portion of the development to be affordable for households with poverty-level incomes.

Future Research

Nearly 30 years after its enactment, LIHTC remains one of the least studied federal programs. This study of the use of QAPs to create incentives for locating affordable housing close to transit and of the challenges to, and promising practices for, achieving that end is one of the few to use indepth interviews with state agency officials, developers, and housing and transit experts to study the LIHTC Program. The study's findings suggest a strategy for further research. That research strategy is based on two approaches: one is intensive and based on piloting promising approaches, and the other is extensive and based on further analysis of national trends and patterns across states.

First, policy developers and researchers could build on this article's findings to work with one or more states on a model QAP allocation system that balances locating affordable housing near transit in urban areas with other policy priorities, including both tailoring LIHTC locations to the different needs of different types of geography and maintaining focus on the cost-effective use of public resources. Researchers would then conduct intensive case studies of the implementation and effectiveness of those systems. Among the issues to be examined in more depth than was possible in this study is how gap financing is—or could be—aligned with other state priorities, including locating affordable housing near transit.

Second, as LIHTC data for years beyond 2010 become available, researchers could repeat the quantitative analysis initiated by this article, with the particular objective of measuring the effectiveness of the stronger incentives for location near transit that more states have implemented in recent years. As national LIHTC data make strides toward fulfilling the statutory requirement for a national database on LIHTC that includes the demographic and income characteristics of occupants of tax-credit developments, research on the use of LIHTC nationally could examine the interplay between location near transit and the income levels and household composition of affordable housing produced by LIHTC.

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Authors

Todd Nedwick is the Housing and Energy Efficiency Policy Director at the National Housing Trust.

Kimberly Burnett is a senior associate at Abt Associates Inc.

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Advancing Social Equity as an Integral Dimension of Sustainability in Local Communities

James Svara
The University of North Carolina at Chapel Hill

Tanya Watt
Arizona State University

Katherine Takai
U.S. Environmental Protection Agency

Abstract

Sustainability has been viewed as a commitment to protection of the environment, responsible economic growth, and promotion of equity—the well-known three "Es." The third "E," however, is not as well understood or promoted as the other two. This article considers what equity *means as a dimension of sustainability and examines what local governments are doing to advance social equity. Reviewing the results of a national survey in 2010 made it evident that most cities and counties are doing little related to equity. A followup survey was conducted involving two groups of governments identified in that survey—one group was active in social equity and a second was active in sustainability overall but was doing little related to equity. The results reveal the widespread differences between the goals and agendas pursued by the two groups of governments. From the survey respondents, nine governments with broad-ranging activities to promote equity were identified to be the subjects of case studies. Engaging citizens, cooperation between cities and counties, partnerships with nonprofit organizations, and recognition of the value of diversity were qualities shared by the governments in the case studies. Building on and expanding the theme of the livable cities initiative sponsored by the U.S. Department of Housing and Urban Development, Environmental Protection Agency, and U.S. Department of Transportation, the research indicates that sustainability entails efforts to improve the livability of communities in the present and to build the social, environmental, and economic viability of communities for the long term.*

Introduction

Since the 1980s, sustainability—defined as measures to protect and enhance the environment, the economy, and equity for current residents and future generations—has become an issue of increasing importance both domestically and internationally. In the past decade, local governments in the United States have demonstrated increasing leadership in this area. Some exemplary local government officials have worked in partnership with businesses, nonprofit organizations, community organizations, and residents to collaboratively develop programs to create more vibrant, resilient communities. With these collaborative initiatives as the locus of most of the sustainability activity in the United States, it is important to increase our understanding about how local governments articulate the connection between equity and other dimensions of sustainability. A comprehensive approach to achieving sustainability should address the "three Es"—environment, economy, and equity—but in practice, the equity dimension often receives less attention and may not even be incorporated in a government's sustainability program.

In 2010, the International City/County Management Association (ICMA) conducted its Local Government Sustainability Policies and Programs Survey and found that most local governments were still in the early stages of addressing sustainability. Most placed emphasis on long-standing areas of commitment, such as recycling and the environment, and also on new areas, such as energy conservation, but only a minority of governments had developed comprehensive sustainability programs (Svara, Read, and Moulder, 2011). Few local governments were adopting measures to promote social equity. Without a strong commitment to social equity, local governments have moved only part of the way to achieving true sustainability. The experience of American urban areas shows that inequality and social exclusion are not sustainable practices, because they undermine the viability of communities. Thus, communities may have programs that protect the natural environment, reduce energy use, and address other aspects of sustainability, but without programs to promote social equity, they are not strengthening their social foundation for long-term viability.

Our research examines the definition of social equity, the level of commitment of local governments in addressing equity issues, and the extent to which social equity activities are included within an integrated approach to sustainability. Social equity means redressing injustices and remediating damages that were previously incurred, fully incorporating all segments of the community in the political decisionmaking process, and establishing measures to prevent future inequities from occurring (Johnson and Svara, 2011). Such efforts include expanding opportunity and promoting equal access to public services, providing equal service quality, ensuring procedural fairness, and striving for equal opportunity in such areas as education, health, and employment. The social equity dimension of sustainability refers to how burdens and benefits of different policy actions are distributed in a community. The more evenly they are distributed, the more equitable the community is, and this even distribution is reflected in economic, ecologic, and social outcomes.

This article describes the current activities, leading practices, and achievements of communities that seek to achieve true sustainability. It is a summary of the full report *Local Governments, Social Equity, and Sustainable Communities* (ICMA, 2014).[1] Such communities were created through a

[1] The full report and accompanying case studies are available for free download at http://icma.org/en/results/sustainable_communities/projects/advancing_social_equity_goals_to_achieve_sustainability.

comprehensive, integrated approach to sustainability supported by inclusive engagement, equal access to services, and livable neighborhoods. Our analysis examines all local governments that responded to the ICMA 2010 survey, focusing in particular on the characteristics of the minority of governments—fewer than 1 in 10—that are very active in social equity. Using additional information from a followup survey conducted in 2012, the analysis explores the adoption of a wider range of equity activities. From these surveys, nine local governments were identified for indepth examination as case studies.

Many communities (both surveyed and selected for case study) have an extensive range of sustainability activities that address social equity concerns, such as affordable housing programs, wellness initiatives, preschool programs, and actions to promote job creation. We find it surprising, however, that few of these governments are organizing and resourcing their sustainability initiatives in a coordinated manner or through a comprehensive approach that addresses social equity issues as an integrated part of their sustainability strategies. Even governments that have extensive activities that promote social equity may not see them as part of sustainability.

The conclusion of this study describes alternative explanations for the interconnection of equity and sustainability and suggests approaches for expanding equity and integrating it with other components of a community's sustainability program. Some governments make an open, comprehensive commitment to sustainability that fully incorporates social inclusion and opportunity for all members of the community, and they support that commitment with planning and assessment. Other governments may want to avoid the possibly contentious ideas of sustainability or equity or simply do not see how equity relates to sustainability. These governments may want to stress the key qualities and values that sustainability promotes: livability for all residents and long-term viability for the community as a whole. These governments could identify the activities needed to achieve livability and viability and measure the progress in realizing them. Their approach would be consistent with general definitions of sustainability, but it focuses on the special conditions of local governments as opposed to stressing broader issues, such as climate change.

The key point for promoting social equity activities is that exclusion and inequality are not sustainable practices. Put simply, we're all in this together; that is, we are mutually dependent economically, socially, and environmentally. If we want livable and viable communities, we must pursue a comprehensive approach to sustainability that includes social equity.

Methodology

This study examines the results of a national survey of the full range of local governments' sustainability activities conducted by ICMA in 2010 with 2,176 responding governments. It also draws on a 2012 followup survey of 300 selected governments that focuses exclusively on social equity activities. The initial survey provided some insights about the extent of social equity activity as part of the overall sustainability program in local governments. Analysis of the 2010 survey examines variation in the use of 10 activities related to social equity and identifies the kinds of governments that have adopted most of these activities (high-equity governments), and these governments were surveyed again in 2012 to get more information about their equity activities. The 2010 survey indicated that governments that have little or no involvement in equity programs are also not likely to be active in sustainability in general; however, identified among the 2010 survey respondents was a group of local governments that are active in sustainability in general but do little related to equity (low-equity governments). These governments were surveyed as well in 2012 and serve as a comparison group. We examine the similarities and differences between these high- and low-equity governments based on the 2010 survey.

From the respondents to the 2012 survey, nine local governments were selected to be case studies. The case studies provide additional information about the range of activities and the involvement of governmental and community organizations to support them. Furthermore, the interviews and reviews of documents in each case-study site were examined for explanations of the rationale for the sustainability program and the extent to which social equity is incorporated in the overall approach. The results show that some governments have fully integrated many equity activities into their sustainability programs, whereas others have active sustainability programs and extensive social equity activities but make little connection between them. This article examines the implications of these different approaches.

2010 ICMA Survey Results

In the summer of 2010, a national survey was sent to 8,569 local governments with populations more than 2,500 examining what they were doing to promote sustainability (Svara, 2011; Svara, Watt, and Jang, 2013). The survey had a 25-percent response rate with 2,176 local governments responding. The survey contained questions about 109 sustainability activities in 12 major categories: (1) recycling, (2) water conservation, (3) transportation improvements, (4) energy use in transportation and lighting, (5) social inclusion, (6) building energy use, (7) local production and green purchasing, (8) land conservation and development rights, (9) greenhouse gas reduction and air quality, (10) building and land use regulations, (11) workplace alternatives to reduce commuting, and (12) alternative energy generation. The social inclusion category directly relates to social equity, and a few other specific activities in other categories are also relevant to equity (see discussion that follows). The overall finding from this survey was that most local governments generally participate in long-standing activities such as recycling, expanding biking-walking trails, sidewalks that support farmers' markets, and activities that provide immediate budgetary benefits, such as reducing energy costs. Less than one-half, but more than one-third, plan for tree preservation and planting, purchase energy-efficient vehicles, have zoning codes to encourage more mixed-use development, act to conserve the quantity of water from aquifers, use water pricing to encourage conservation, adopt zoning codes to encourage mixed-use development, and provide financial support or incentives for affordable housing—the only practice used by one-third or more of government that directly addresses social equity concerns. Less than one-third are taking on well-established practices to advance sustainability such as land conservation, weatherization, higher density development, and measuring greenhouse gas emissions. Finally, few governments are taking advantage of more innovative approaches, such as use of solar power, reclamation of grey water, and alternative work schedules for government employees (Svara, 2011).

Support for the triple bottom line, focusing on environmental, economic, and equity concerns, was measured with questions about the extent to which various policy issues are priorities in the community. Of the respondents—

- 94 percent said the economy was a very high or high priority.
- 62 percent considered the environment a priority (70 percent of respondents called energy conservation a priority but only 19 percent assigned high-priority status to climate change).
- 38 percent considered social justice to be a priority, although support for affordable housing was more widespread (48 percent) as a policy priority.

The lower acceptance for some of these priorities reflects political controversy associated with them—in particular, climate change and social justice. (A wider range of priorities was examined in the 2012 survey.) Still, for most survey respondents, the triple bottom line was not addressed in an even manner, and a clear hierarchy in priorities emerged. The economy is by far the highest priority for local governments.

Some local governments are pursuing overall sustainability-related goals to an exceptional degree, but, on average, local governments are using only 18 percent of the surveyed sustainability activities. The pattern of adoption for most innovations reflects a normal distribution, with most governments in the middle with moderate rates of adoption and smaller numbers at the leading and trailing edges of adoption in a bell-shaped curve (Nelson and Svara, 2011). For sustainability activities, however, the distribution of ratings (the percentage of total sustainability practices adopted) is skewed toward the low end of the scale, as shown in exhibit 1. Most governments rank below the average adoption rating of 18 percent. The 2010 survey results indicate potential for a substantial increase in sustainability activity if most governments were to “catch up” and move toward the middle of the distribution.

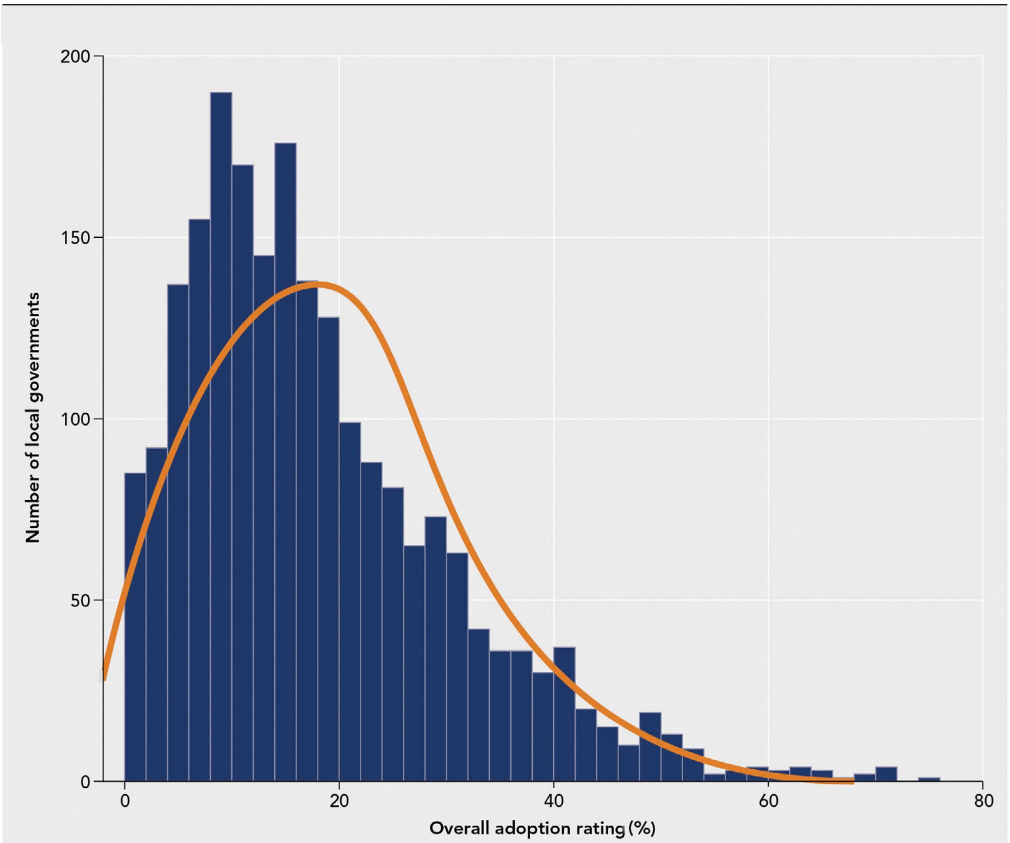
A number of factors are related to the level of total sustainability adoptions. Local governments that use the council-manager form of government and are located in Western states have higher ratings, and the adoption rate increases with higher population (Svara, Watt, and Jang, 2013). Significant but weaker relationships are found with a younger population, higher education level, lower income, and higher housing value, and sustainability ratings increase as the White population percentage increases. Demographic and socioeconomic status characteristics make a difference, but not a substantial one when examining the overall level of sustainability activity undertaken by local governments.

Additional analysis has been conducted on an expanded social equity index drawn from the 2010 survey using the seven items in the social inclusion category plus three additional activities related to transportation and subsidies for residential energy conservation included in other categories. The activities and the percentage of governments adopting each are listed in exhibit 2.

The average number of these activities adopted by the responding government in 2010 is 2 out of 10, although variation exists based on the characteristics of the local government. When the distribution of local governments is arranged by the number of social equity activities they have adopted, the pattern is similar to the one that appears in exhibit 1, but it is even more skewed toward the low end. As indicated in exhibit 3, more than one-third of these local governments are not providing any of the programs that address social equity concerns of unequal access or opportunity.

Exhibit 1

Distribution of Sustainability Ratings



Source: Svara (2011: 46)

Exhibit 2

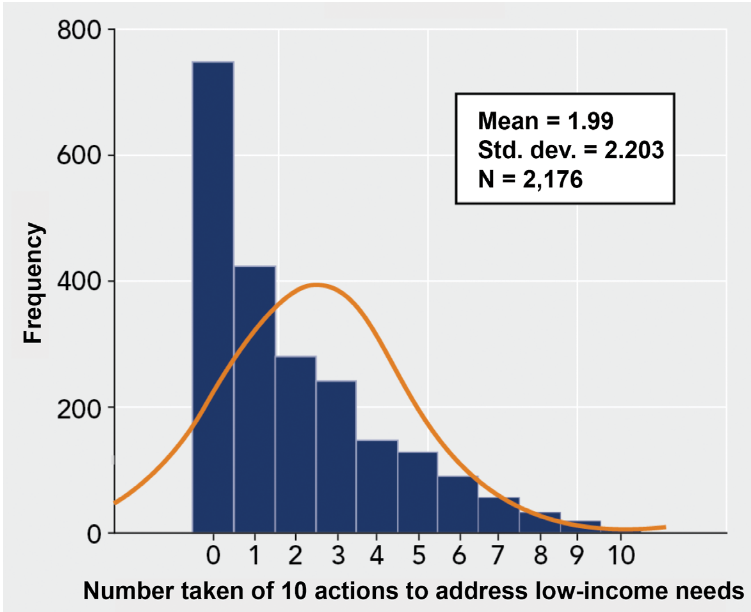
Activities That Promote Social Equity

Activity	Percent Adopting
Provide financial support or incentives for affordable housing[a]	33
Provide access to information technology for people without connection[a]	27
Provide housing options for elderly people[a]	27
Provide after-school programs for children[a]	26
Expand bus routes	22
Provide transportation programs specifically targeted to assist low-income residents	21
Provide supportive housing to people with disabilities[a]	15
Provide funding for preschool education[a]	12
Provide housing within the community to homeless people[a]	10
Provide energy-reduction programs specifically targeted to assist low-income residents	8
Mean number of 10 activities	2

[a] *Items in the original social inclusion category.*

Exhibit 3

Level of Social Equity Action



Std. dev. = standard deviation.

The factors related to the social equity index score for all responding governments in general are similar to those for sustainability ratings. Council-manager form of government, Western states, higher population, and more educated population are positively related to social equity adoptions and negatively related to population age and income level. Race and ethnicity are not related to social equity level for all governments. The results indicate that certain governments are "predisposed" to include social equity in their sustainability programs. In communities that do not have these characteristics, proponents of social equity need to present the issue of equity in such a way as to increase the likelihood of building support.[2] As discussed later in this article, alternative ways exist to describe how equity relates to sustainability and one approach to illustrating this relationship may be received more favorably than another depending on the disposition of the community.

Strong correlation of data is evident across all the sustainability activities, so governments that do more on social equity are likely to be more active in sustainability in general. As noted, the factors related to higher ratings on both the overall sustainability and the social equity scales are similar. Additional analysis of the 2010 survey results was conducted to compare governments that had high ratings on sustainability but low scores of social equity. The governments assigned to the high-equity group of governments were engaged in at least 6 of the 10 activities in exhibit 2 and

[2] Finding appropriate ways to frame the issue is important in all communities. For example, the advantage of promoting equity in a larger council-manager city in the West is that that area of the country has more examples of other comparable cities that have already incorporated social equity in their sustainability programs than in governments with different characteristics. Still, finding the right way to promote the theme will be important to success.

totaled 200 governments, or 9.2 percent, of the responding governments. On the other hand, among governments with high scores on the overall sustainability ratings (in the upper 30th percentile of ratings), 227 governments had 2 equity actions or less. They were assigned to the low-equity group even though they are active in other areas of sustainability. Most of the higher sustainability/lower equity governments are cities (94 percent) with populations of under 50,000 (76 percent). To match the high-equity governments, a comparison group of 100 governments was selected.[3] The two groups are similar in the actions they have adopted outside of the equity areas. The high-equity group has adopted an average of 37 activities, while the low-equity group has adopted 34 activities.

It is important to know how the two groups compare in their characteristics. Do dramatically different types of governments take different paths when it comes to adopting measures to promote social equity? The analysis of differences used the same characteristics noted earlier. Two sets of factors lead to different expectations about which governments would be high and which would be low on equity. It might be expected from other research on policy choices that governments with higher minority populations and lower levels of socioeconomic status would be more likely to adopt equity measures. On the other hand, people with higher incomes and communities with more educated people and more young adults would be more likely to be innovative and take on new responsibilities. The results are presented in exhibit 4. As expected, the high-equity governments have higher minority populations and lower levels of education and income. The differences in housing value and percentage of young residents are not significant.

The differences in demographic and socioeconomic measures are modest. Although they have less potential social need than the high-equity governments, the low-equity governments still have 23 percent Black and Hispanic populations and 12 percent in poverty. Thus the low-equity governments have needs that are not being addressed to the extent that they are in the other cities. These governments are also smaller—with an average population of 106,510 compared with 201,307 in

Exhibit 4

Comparison of Local Governments With High Social Equity Activity

Comparison Groups of Governments		Black	Hispanic	Foreign Born	Bachelor Degree	Homeowner	Poverty	Age 25 to 44 Years	Median Housing Value
Low equity, high other areas of sustainability	Mean	8.87%	13.95%	11.11%	35.10%	65.65%	11.75%	26.61%	$287,253.61
	n	91	91	91	90	90	91	83	84
High equity, high other areas of sustainability	Mean	12.01%	17.81%	13.68%	29.31%	60.31%	17.02%	26.95%	$272,117.16
	n	178	178	178	178	177	178	139	140
Total	Mean	10.95%	16.50%	12.81%	31.26%	62.11%	15.24%	26.82%	$277,793.33
	n	269	269	269	268	267	269	222	224
ANOVA significance		0.080	0.083	0.060	0.003	0.001	0.006	0.552	0.607

ANOVA = authors' Analysis of Variance.

[3] The governments selected were *all* 55 governments in localities of more than 50,000 in population and 45 governments chosen randomly in localities of less than 50,000 in population. For the comparison group, it was important not to compare primarily small low-equity governments with larger high-equity governments.

high-equity governments, as shown in exhibit 5. The difference, however, is caused in part because the low-equity cities include fewer counties that tend to have higher populations. When comparing the median populations for the two types of governments, however, the differences are small. In other words, one-half of the low-equity cities are under 46,483, and one-half of the high-equity cities are under 47,796 in population. The low-equity counties have higher mean and median populations.

Thus the data from the 2010 survey do not support the simplistic conclusion that high-equity governments are large and have high levels of social and economic need whereas low-equity governments (that are active in other areas of sustainability) are small, affluent, and homogenous. The high-equity communities have found ways to solidify support for social equity that is missing in the marginally, yet significantly different low-equity communities. Additional information was needed to measure the full scope of social equity activities in these two types of governments and the factors that support the stronger commitment to equity.

Exhibit 5

Population Comparison

Comparison Groups of Governments		Population	
		Mean	Median
Low equity, high other areas of sustainability	City (87%; n = 87)	67,460	46,483
	County (13%; n = 13)	367,849	264,063
	Total	106,510	53,429
High equity, high other areas of sustainability	City (78%; n = 156)	165,266	47,796
	County (22%; n = 44)	329,090	227,384
	Total	201,307	61,766

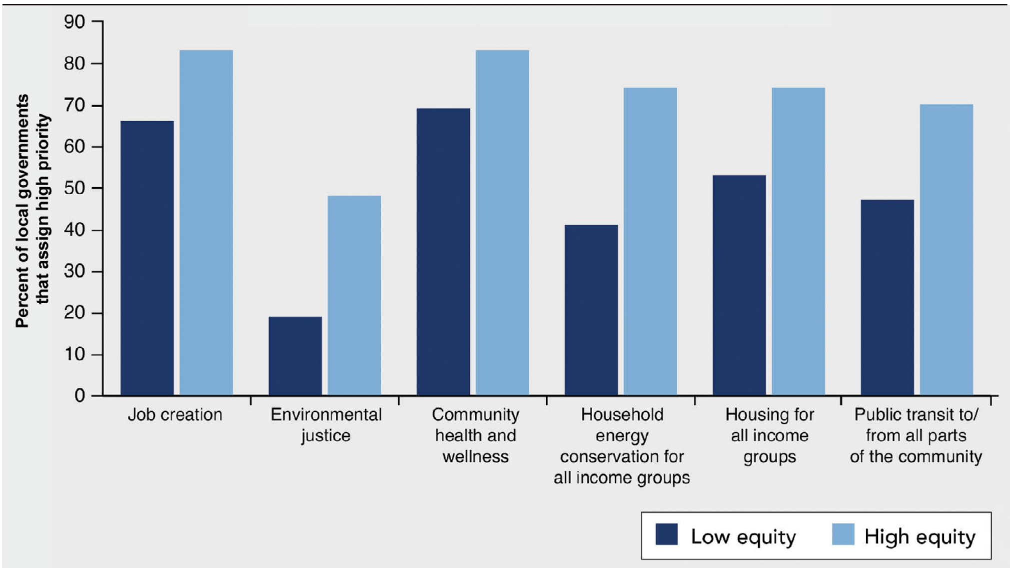
2012 Social Equity Survey Results

In 2012, a followup survey was sent to the 200 local governments that were found to be highly active in social equity in the first survey, as well as to a control group of 100 local governments that were identified as highly active in other sustainability activities but that reported low adoption of activities related to social equity. The purpose of the survey was to delve more deeply into the range of social equity-related activities that the two groups of local governments had adopted and examine how the two groups compare in policy priorities and approaches to organizing their sustainability programs. The response rate was 34 percent for both groups (68 respondents from the local high-equity governments and 34 respondents from the control group). Overall, in each section of the survey, the high-equity respondents showed higher percentages reporting a wider range of equity-related activities than did the low-equity respondents. In many instances, the differences were pronounced.

The two groups of governments had different policy priorities. As indicated in exhibit 6, the percentages of each group that assign a high level of priority to the issues presented, showed similarities and striking differences. As in the first survey, the high-equity governments are much more likely to place a high priority on environmental justice than are the low-equity governments. Still, even in the high-equity governments, fewer than one-half consider this issue to be a high-priority. Household energy conservation statistics reveal a big gap in the support for all income groups and

Exhibit 6

Priority Assessment



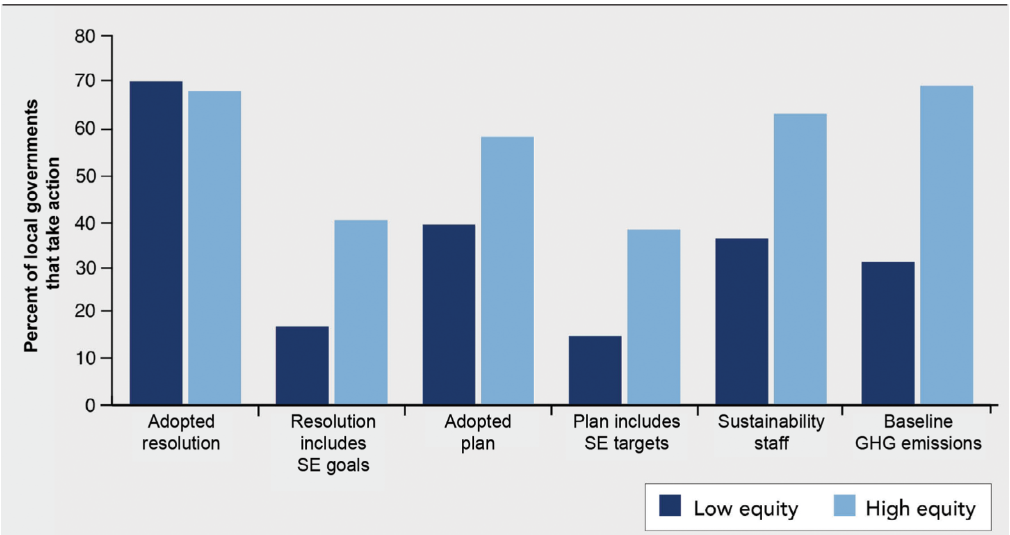
to public transit to and from all parts of the community. For these issues, however, a substantial minority of low-equity governments consider the issues to be important. The likelihood that these issues will be assigned a high priority shows little difference for the issues of job creation and community health and wellness. Thus, a possibility exists that support for equity activities can be mobilized around issues that command broader support—job creation and community health, as well as housing and public transit for all residents.

In high- and low-equity governments, approaches to organizing sustainability programs are virtually identical with regard to having a resolution to convey support for sustainability, as seen in exhibit 7. Approximately two-thirds of the governments in both groups have such a resolution, although the high-equity governments are much more likely to include social equity goals in the resolution. On the other measures of how the program is organized, however, substantial differences exist even if equity is not directly involved. High-equity governments are more likely to (1) have developed a plan that clearly articulates social equity goals, (2) commit adequate resources to implementing the plan, and (3) assign staff to administer it. They are also more than twice as likely to have determined base-line greenhouse gas emissions. Thus, those governments active in equity are more likely to commit more resources to sustainability and pursue a broader strategy that includes greenhouse gas emissions reduction. On the other hand, only two in five high-equity governments have explicit social equity goals and targets. Although these governments have extensive activities related to social equity, most have not articulated social equity goals within their sustainability plans.

Actions to reduce housing costs and expand housing options are an important element in social equity. Providing residential energy audits, weatherization to reduce energy use, and upgrades of residential heating and air conditioning systems reduce greenhouse gases and save money for occupants. All three practices are more prevalent in high-equity communities, with weatherization assistance offered in more than three-fifths of these governments, as shown in exhibit 8. To encourage construction of affordable housing, 60 percent of high-equity governments provide incentives

Exhibit 7

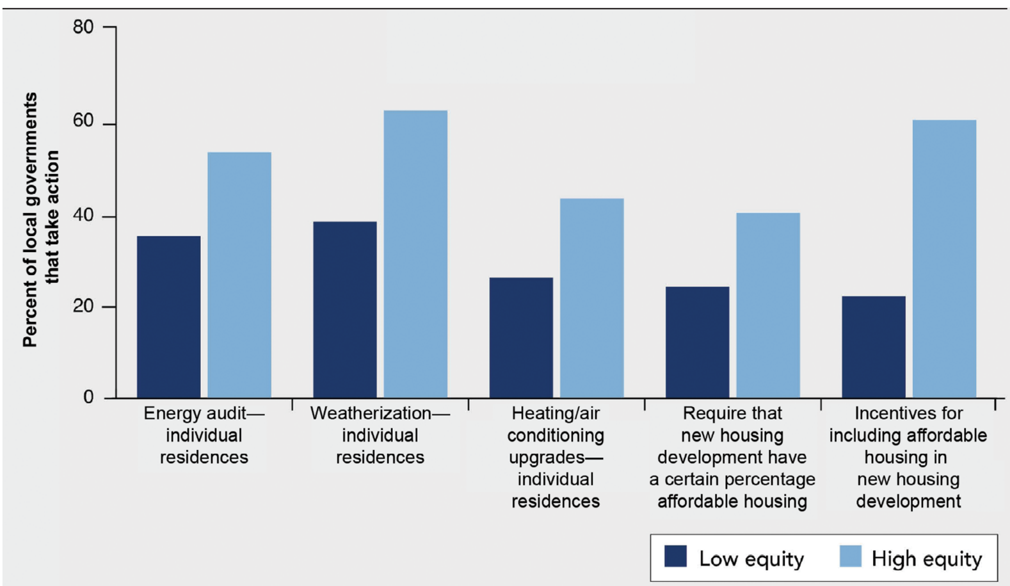
Organizing Sustainability Programs



GHG = greenhouse gas. SE = social equity.

Exhibit 8

Support for Housing



compared with 22 percent of low-equity governments. Requiring that new housing complexes have affordable units is nearly twice as common in high-equity governments—but still only 40 percent of those governments have this kind of inclusionary zoning requirement.

Differences are not as pronounced in programs that focus on residential energy use. More than 3 in 10 of the low-equity governments conduct energy audits and support weatherization in individual residences. A wide range of services and facilities can be specialized to assist low-income residents. As shown in exhibit 9, all the services are more commonly provided in high-equity local governments, more than one-half of which provide facilities to receive social services, transportation to service locations, libraries, security programs (including community watch and community policing), efforts to reduce blight, and space for community gardens. More than 40 percent of

Exhibit 9

Local Government Actions Targeted to Low-Income Populations

Action	Equity Level	Percent Taking Action
Provide community wellness programs	Low	15
	High	41
Provide facilities to receive social services	Low	18
	High	56
Provide transportation from neighborhood to receive social services	Low	29
	High	57
Provide facilities to receive medical services	Low	9
	High	47
Locate library in neighborhood that is open during normal work hours	Low	32
	High	62
Locate library in neighborhood that is open in the evenings after normal work hours	Low	29
	High	58
Make efforts to promote security, such as community watch	Low	34
	High	60
Provide programs to reduce blight and graffiti	Low	26
	High	62
Make linkages between neighborhood residents and law enforcement, such as community policing	Low	47
	High	65
Provide space and support the development of community gardens	Low	32
	High	59
Provide space for farmers markets	Low	24
	High	47
Provide active brownfields, vacant property, or other program for revitalizing abandoned or underused residential, commercial, or industrial lands and buildings	Low	15
	High	31
Take other actions to rectify toxic air, water, or land pollution	Low	3
	High	21
Provide a land conservation program	Low	3
	High	29

governments offer community wellness programs, farmers' markets, and facilities to receive medical services. The most commonly provided service in low-equity communities is community policing, which is found in 47 percent of these governments.

Actions to expand job opportunities are also offered more commonly in high-equity communities, as shown in exhibit 10. Nearly all high-equity communities take actions to promote job creation, and this action is evident in 62 percent of the low-equity communities as well. Still, the high-equity communities are nearly twice as likely to develop "green jobs" and are much more likely to offer training and development programs to prepare for these jobs. Requirements for contractors to pay a living wage are used in fewer than one-half of the high-equity jurisdictions (38 percent), and these jurisdictions rarely require that health insurance be provided (5 percent).

A number of dimensions affect the extent to which individuals and groups are connected to the life of the community and are capable of being fully involved in political, social, and economic activities. Technology is increasingly becoming the channel for communication, but some residents are excluded from full participation by a digital divide caused by their lack of knowledge or resources to access the Internet. Most high-equity communities and more than one-half of the low-equity communities are offering services and facilities to provide training to expand technology skills and access to information technology, as shown in exhibit 11. Financial subsidies, however, are less common in both groups of governments. Community centers that offer educational and recreational programs and after-school programs are provided in both groups of communities surveyed, but they are more common in high-equity communities. The extent to which preschool is provided has a wide divergence (78 percent of high-equity compared with 29 percent of low-equity governments). One-half

Exhibit 10

Local Government Actions To Create Jobs

Action	Equity Level	Yes (%)	No (%)	Don't Know (%)
Actions to promote job creation	Low	62	38	0
	High	88	11	2
• If yes, have actions included development of "green jobs"?	Low	33	52	14
	High	64	27	9
Training and workforce development	Low	42	58	0
	High	72	23	5
• If yes, have actions included preparation for filling "green jobs"?	Low	36	50	14
	High	61	30	9
Requirement that contractors with local government provide a living wage for employees	Low	9	82	9
	High	38	53	10
Requirement that contractors with local government provide health insurance for employees	Low	3	87	10
	High	5	81	14

Exhibit 11

Local Government Actions To Promote Social Inclusion

Action	Equity Level	Percent Taking Action
Provide access to information technology for people without connection to the Internet	Low High	59 82
Provide training for community members interested in improving their technology skills	Low High	53 76
Provide assistance in accessing subsidies that may be available for low-income members of the community to obtain Internet access in their homes	Low High	26 40
Provide community center for educational and recreational purposes	Low High	71 93
Provide funding for preschool education	Low High	29 78
Provide after-school programs for children	Low High	59 87
Provide education on organic farming	Low High	32 50
Report on community quality of life indicators, such as education, cultural diversity, and social well-being	Low High	44 71

of the high-equity and one-third of the low-equity communities offer opportunities to learn about organic farming.[4] Finally, most of the high-equity communities report to the public on quality-of-life indicators in the community compared with less than one-half of the low-equity communities.

The 2012 followup survey results indicate that two overlapping groups of local governments approach social equity with different degrees of commitment despite that fact that both groups have active sustainability programs in areas other than social equity. The two groups were classified on the basis of their responses to the 2010 national survey, and their programs could have changed in the interval before the followup survey. The two groups are not complete opposites in their approaches. As the discussion of survey results indicates, some of the communities identified as high equity are not providing certain programs and services specifically related to social equity, whereas some communities in the low-equity group are doing so. More needs to be done to increase activities even in communities receptive to promoting social equity; these communities can expand and deepen their efforts.

Many communities in the low-equity group offer a number of programs that are related to equity, and they are active in efforts to improve the environment and economy. Thus, they have a foundation on which to build a comprehensive approach to sustainability. In addition, as noted at the beginning of the discussion of the 2012 survey, sizable minorities of these communities give high priority to job creation and health and wellness. These policy areas could provide the policy foundation for expanded equity activity. A comparison of the two groups' median housing values and

[4] As reported in exhibit 9, 59 percent of the high-equity governments provided space for community gardens compared with 32 percent of the low-equity governments. Urban farming has been an important element in the revitalization plans of jurisdictions that have experienced population declines, such as Detroit and Cleveland.

percentages of population in poverty presented in exhibit 4 suggests that the low-equity governments presumably have higher resources and lower social needs. Although the high-equity group has more large cities and more counties, both of which have access to a wider range of resources, the median populations for both groups are similar. As the case studies indicate, local governments with extensive activities in social equity have a strong commitment to addressing the needs and expanding the opportunities of vulnerable populations, and they are adept at involving residents and community organizations in their programs.

Case Studies

Case studies were conducted in nine communities identified from the 2012 social equity followup survey for the purpose of gaining insights about how to strengthen the equity dimension of sustainability.[5] The communities studied were considered to be highly active in social equity. In selecting communities for case study, three major criteria were used: (1) a high level of social equity activities, (2) evidence that some practices of leading communities were being used, and (3) a diverse array of small to moderately large cities and counties would be included.[6] Out of 60 items in the followup survey that governments might include in their sustainability programs, the nine case-study communities reported that they provided from 37 to 54 of the items. Websites of possible case-study sites were reviewed to determine whether elements identified in the review of leading sustainability governments were present. The sites selected, however, reflected different approaches to organizing the sustainability program, planning, and incorporating social equity. One objective of the case studies was to assess whether these differences have any impact on the coherence and operation of the sustainability program and the commitment to social equity. Efforts were made to select a variety of sites from across regions of the country and population size. The nine case-study locations are listed in exhibit 12, which reveals the variations that exist between

Exhibit 12

Comparison of Case-Study Communities

Community	Population	Poverty (%)	White (%)
Cities			
Dubuque, Iowa	57,637	11.8	90.2
Fort Collins, Colorado	143,986	17.2	89.0
Hayward, California	144,186	12.8	34.2
Lewiston, Maine	36,592	20.5	86.6
Combined city/county program			
Ann Arbor/Washtenaw County, Michigan	113,934/347,962	21.5	73.0
Arlington, Virginia[a]	207,627	7.1	77.3
Durham/Durham County, North Carolina	228,330/267,587	18.6	42.5
Counties			
Clark County, Washington	425,363	11.7	88.1
Manatee County, Florida	322,833	13.6	86.8

[a] *Arlington is a county government that provides the full range of city services. The county contains no separate municipalities.*

[5] No case studies on social equity were conducted after the 2010 survey.

[6] Practices of leading communities that incorporated equity into sustainability programs were identified from the 2010 ICMA Sustainability Survey, studies, and recognition by other sustainability-related programs.

the local governments studied. Included are cities, counties, and a combination of the two from states in the Northeast, Midwest, South, Mountain, and West Coast regions. The areas range in population from 36,592 to 425,363 and differ in their poverty rates and the racial diversity of their populations.

The case studies examine the action that has been taken by the local government(s) and timeline in which they were developed. In addition, the researchers sought to determine the purpose of the activities, the dynamics of the program(s), how the separate parts fit together, who contributes to the activities, what have they accomplished, and how the overall purpose of the program and the social equity component are defined and justified.

Key Observations From Case Studies

From conducting case-study research in nine communities across the United States, several recurring findings serve as replicable best practices for other local governments seeking to strengthen the social dimension of their activities related to sustainability. Summary findings are presented here, and detailed examples are provided in the full report.

1. Inclusive citizen engagement has played a critical role in improving the quality of public projects, improving relationships between the public and city government, and increasing the overall quality of life for community residents.

    - Citizen engagement initiatives in Dubuque, Iowa, have enabled community leaders to identify local priorities and address critical challenges. The Sustainable Dubuque Collaboration was created in 2011 to carry on the goals of the original Sustainable Dubuque Task Force. It coordinates community engagement between participating organizational and individual members to achieve goals, collect data, and monitor progress.

    - Since the catalytic resistance of residents of Lewiston, Maine, to that city's 2004 Heritage Initiative and neighborhood transformation plan, the importance of engaging citizens in planning decisions that will affect them has been emphasized and put to practical use. A number of recent plans for development and revitalization incorporate significant community input, including the Riverfront Island Master Plan and revised Comprehensive Plan.

    - In 2012, Arlington, Virginia, introduced PLACE (Participation, Leadership and Civic Engagement), with the goal of expanding the scope and quality of citizen engagement. The goals are to expand participation in important county decisionmaking processes, and improve the quality of the involvement of citizens in county government, while setting realistic expectations for broader participation in decisionmaking.

2. Formal and informal networks of service providers and stakeholders are needed to advance social equity goals because of their complexity and cross-sectoral nature.

    - In Ann Arbor/Washtenaw County, Michigan, more than 18 partners (including the largest players in economic development—universities, large and small companies, municipalities, the state-level economic development agency, and other organizations) work together to strategically plan around economic and workforce development.

- Through the Smarter, Sustainable Dubuque Partnership in Dubuque, Iowa, equity initiatives are spread out among local government, private organizations and nonprofit organizations, which is exceptionally important as local government financial resources are increasingly constrained.
- The Hayward Promise Neighborhood in Hayward, California, integrates the efforts of more than 21 community partners toward improving outcomes for a significantly marginalized neighborhood. Led by CSU East Bay, a number of local governments, education nonprofit organizations, and business partners are pursuing a healthier and safer neighborhood with improved literacy rates and access to technology.

3. Clearly articulating the importance of social equity in local government mobilizes support and resources.
    - Through its Coordinated Funding Approach, local government leaders in Ann Arbor/Washtenaw County have identified maintaining and expanding the "social safety net" as a major priority and have assigned responsibility for each priority area to different governmental and nonprofit organizations.
    - Fort Collins, Colorado, conducted a social equity "gap analysis" to identify areas in which important needs were not being met. This analysis has demonstrated a significant affordable housing shortage and yielded an ongoing Housing Affordability Policy Study.
    - Durham/Durham County, North Carolina, faced the shortage of affordable housing openly and adopted a "penny for housing" tax increase in 2012 to address the shortage.
4. Actions and standards at the state level impact local programs.
    - The requirements established by the state of California are helpful in providing clear, standardized requirements, but it was repeatedly noted that flexibility in how those requirements are met would be more helpful that an imposition of ends and means.
    - In Clark County, Washington, a number of individuals noted that laws established at the state level help in furthering sustainability programs at a consistent pace. Many expressed their hope that more assertive state laws might be passed in the near future.
    - Arlington County has benefited from enabling legislation in state government that authorized an affordable housing mandate, whereas the absence of state authorization in North Carolina limits the options Durham has to include affordable housing in new projects.
5. A holistic approach to comprehensively serving the needs of the most marginalized groups in a community is critical to achieving social equity.
    - A comprehensive social services system has been established for the immigrant population in Lewiston. This system ensures that members of this group have adequate nutrition, health care services, safe housing, jobs, and access to education, in addition to engaging individuals through opportunities to participate in youth groups and community planning.

- The primary goal of the Office of Economic and Community Development in Ann Arbor is to provide access to high-quality jobs for those who need it. This goal is facilitated through workforce development, affordable housing, and access to transportation for all.
- In Durham, services to support social equity come from housing improvement and development, neighborhood services, energy conservation, manpower development, community gardening, healthy living, police, social and health services, and transportation.

6. Sustainability activities are dispersed throughout a number of departments in most local governments. Sustainability offices rarely encapsulate all sustainability activities undertaken by the local government as a whole.
    - Fort Collins is purposefully organized to holistically address sustainability, with a Chief Sustainability Officer who oversees the Sustainability Services Area. This organization is composed of Social Sustainability, Environmental Services, and Economic Health. The Environmental Services director noted a number of additional sustainability related activities being undertaken by many departments in the city, emphasizing that the Sustainability Services Area is not the only locus of sustainability activity in the city.
    - In Clark County, Washington a single coordinator is responsible for all sustainability reporting and for advocating for sustainability within local government, but sustainability is incorporated into all planning processes and departmental strategies.
    - Dubuque's sustainability plan, *Sustainable Dubuque*, established sustainability as a broad visionary approach: the "lens through which city operations are developed and analyzed… likewise there are numerous community initiatives . . . along with businesses that are finding ways to save money and improve their environment and community by implementing the principles that define Sustainable Dubuque" (City of Dubuque, 2014).[7]
7. A number of organizing themes can achieve the objectives of sustainability and social equity. For cases in which it is a tradition to support other goals or in which sustainability, climate change, or equity are politically sensitive topics, other organizing strategies can be successful in achieving desired outcomes.
    - In Clark County, public health equity was the organizing strategy by which environmental, economic, and equity objectives were successfully articulated.
    - In Arlington, smart growth is the long-standing commitment that reinforces attention to housing, neighborhood conditions, transportation, energy conservation, and economic development.
    - In Lewiston, integrating a large group of new immigrants and refugees into the community through establishing programs and partnerships was an overriding theme.

[7] http://www.sustainabledubuque.org/en/about_us/about_sustainable_dubuque/.

8. Local governments can encourage the acceptance of certain initiatives (for example, affordable housing or housing that is universally accessible, green building, or increasing accessibility to healthy food) by well-designed incentives that avoid unintended barriers to desired projects.

    - Through a program called SARD (Sustainable Affordable Residential Development) in 2009, Clark County worked with a group of consultants to process a plan for green development to identify and remove unintended roadblocks to the project. Zoning and planning requirements were reviewed and adjusted to allow for sustainable development projects to be approved in a more streamlined manner.

    - Arlington offers the alternative of requiring 10 percent of units in housing projects be affordable or paying the equivalent of the value of 15 percent of the units into the Affordable Housing Investment Fund.

9. Local governments can advance particular objectives by demonstration and information.

    - Many communities are providing garden space in unused lots, incorporating gardens in parks and governmental facilities, and offering instruction on gardening and cooking with fresh ingredients.

    - Arlington has insulation assistance patterned after master gardeners. The Energy Masters program provides hands-on training in energy efficiency and weatherization techniques to make energy- and water-saving improvements in low-income apartments. The program also includes a special apprenticeship opportunity for high school and college students.

    - Durham has a demonstration project with convenience stores to offer fresh foods including information about how to properly store food.

10. Targeted outreach and assistance are required to involve low-income households in energy conservation projects thereby extending the benefits of reduced utility bills to persons in need.

    - With funding from the Energy Efficiency and Conservation Block Grant (EECBG) and Climate Showcase Communities program of EPA, the Neighborhood Energy Retrofit Program (NERP) and Home Energy Savings Program (HESP) have focused on installing a few highly effective upgrades in existing residences in Durham, with a target of reducing energy use by 20 percent in participating homes. Improvements have been made in more than 700 homes of low- and moderate-income residents.

11. Support from elected leadership for sustainability and social equity initiatives is crucial for the long-term commitment necessary to achieve positive results. In the absence of such leadership, resources may be reallocated, thereby diminishing the positive impact sustainability programs might otherwise achieve.

    - In Clark County, the most recent election resulted in a change in leadership and subsequent change in priorities. Public health and sustainability were de-emphasized by the new leadership, who are ideologically in favor of a much smaller scope of government primarily emphasizing business interests.

- Arlington County Commission is a champion of the smart growth philosophy and expanding support for affordable housing, energy conservation, active living, and education.
- In Fort Collins, the importance of a supportive city council with high expectations was repeatedly noted. The council encourages innovation but expects measurable results in support of their objectives.

12. Leadership on social equity-related initiatives can come from staff members at all areas of local government; and social service-oriented staff is required for success in social equity-related initiatives. Initiatives can be pursued laterally and vertically.

    - A focus on social inclusion is evident in all levels of local government in Manatee County, Florida. The county administrator has a broad vision for social sustainability as it impacts economic viability, and this vision guides staff to take a holistic approach to future growth that focuses on ensuring equal opportunities for all residents. Leadership in equity and inclusion is also promoted within other departments; for example, the Parks and Natural Resources Department offers many low-cost, accessible programs to ensure that all segments of the community can participate.
    - The Durham Urban Innovation Center within the Neighborhood Improvement Services Department is exploring broad strategies for neighborhood revitalization and sustainability that include the involvement of other departments and residents. The center has produced concept papers on affordable housing and the linkages between housing and transit, agriculture, arts, brownfields, and health with funding from a U.S. Department of Housing and Urban Development (HUD) Fair Housing Partnership Grant.

13. Restoring the physical assets of the past in the downtown, neighborhood redevelopment, and preserving history and cultural traditions provide the foundation for revitalization and new developments in distressed neighborhoods.

    - Community and social vibrancy in Dubuque proceeds in step with economic (re)development that builds from the region's past. Dubuque has a number of plans for redevelopment of the downtown, the Port of Dubuque, the lower income Washington Neighborhood, and the Historic Millwork District, Dubuque's former center of commerce. The district is a model template of complete streets and innovative street scape design to recreate a historic and culturally interesting sense of place.
    - The revival of Durham starting in the 1980s was based on a mix of adaptive reuse of existing structures along with new construction. Economic development activities stressed finding new occupants for renovated structures in the downtown area. Revitalizing and reusing existing structures, especially school building with historic and cultural significance, has also been an element in neighborhood revitalization efforts.

14. Performance metrics in social equity leave a considerable amount to be desired. Community and public health seem to be the areas of social equity in which indicators are most fully developed.

    - In Manatee County, the Manatee County Health Department uses data and mapping tools to address the one of its priority issues of food deserts. Availability of these data has enabled public officials to establish and promote farmers' markets and stands where most critically needed. Several other public officials mentioned a desire for better measurements of performance in initiatives related to social equity, such as for the *How We Will Grow* (Manatee County Government, 2013) development plan.

    - Partners in public health in the City of Lewiston (including the county-level public health agency, Healthy Androscoggin, two private hospitals, and other community health agencies) used data from the State of Maine's 2011 OneMaine Health Assessment to conduct a local assessment to design and implement cost-effective ways to improve the health of the population. One of the largest public health issues, lead poisoning, disproportionately affects housing stock in downtown areas where many low-income residents live. Data on lead poisoning is tracked through hospital partners, the Maine Childhood Lead Poisoning Prevention Program, and the Maine Office of Geographic Information Systems.

    - In Washtenaw County, data is collected on a multitude of indicators for social equity-related initiatives, including data related to jobs, for grant requirements, including HUD programs and the County Budget, and information collected through resident satisfaction surveys. Key stakeholders are engaged in efforts to identify the most effective indicators to improve impact and resource allocation. In 2013, the Washtenaw Board of Commissioners adopted a resolution to identify appropriate metrics—both for short-term measurable outcomes and long-term impacts—tied to budget priorities in the following areas: (1) ensuring a community safety net through health and human services inclusive of public safety, (2) increasing economic opportunity and workforce development, (3) ensuring mobility and civic infrastructure for county residents, (4) reducing environmental impact, and (5) realizing internal labor force sustainability and effectiveness.

Overall Findings

Based on analysis of all data collected for this investigation, including survey results and case studies, several general findings emerge. The following observations help to shape recommendations designed to increase the capacity of local governments to increase social equity in their communities and increase public awareness of social equity in sustainability.

- Surprisingly few governments are organizing and resourcing their sustainability initiatives in a centralized manner or through a comprehensive plan. Fewer still are addressing social equity issues as an integrated part of their sustainability strategies. The distribution of actions adopted related to sustainability overall, and to equity in particular, are more heavily concentrated at the low end than is typical for the diffusion of many innovations. Moving the distribution of all local governments toward the "middle" is needed in sustainability overall and in social equity in particular. Many good examples from early adopters and leaders in sustainability fortunately provide guidance to those governments that are waiting to get more involved. Thus, governments that are leaders in sustainability need to be more involved in social equity.

- Communities should develop either a comprehensive plan (with measures) or a comprehensive assessment tool to provide a scorecard of what is being accomplished toward addressing sustainability that integrates the social equity component. This approach helps to ensure that interrelated activities support each other and that the coverage has no gaps.

- Better measures and comprehensive monitoring of accomplishments in all aspects of sustainability are needed. The STAR Community Index is an example of a comprehensive tool for addressing this, but it can be overwhelming in its detail. Each community can develop its own principles related to sustainability goals with indicators of performance. Dubuque offers a strong example of a comprehensive framework for evaluation with measures to show how it is doing.[8] Other communities have extensive measures but have not drawn them together in one place with clear reference to the aspect of sustainability that they are measuring.

Conclusion

A central question in the case studies was to determine how the local government defines and explains social equity as part of their sustainability program. When interviewing local government officials, it was very common to be asked the question—what do you mean by "sustainability" and what do you mean by "equity"? If local officials do not know what social equity means or how it is related to sustainability, they are less likely to adopt programs that promote social equity. The case studies indicate a need for a sustainability framework that supports the incorporation of social equity and coordination of the three dimensions of sustainability. This concluding section reexamines alternative ways that social equity is related to the other critical aspects of sustainability to develop a clearer rationale.

The Triple-Bottom-Line Approach

The long-standing approach has emphasized giving attention to three dimensions of sustainability—this is the "three-legged stool" model.[9] This concept implies that if the social equity leg is missing, the stool will fall over. Stated positively, "the concept is that everyone in a community—not only those on the 'A List'—needs the opportunity to participate and thrive for that community to sustain itself indefinitely" (Chapman, 2014). A graphic to illustrate the interconnections is showing sustainability as a Venn diagram with three overlapping circles—one for each dimension (exhibit 13). This is certainly the prevailing conceptual model and is used by Dubuque to illustrate the components of its program.

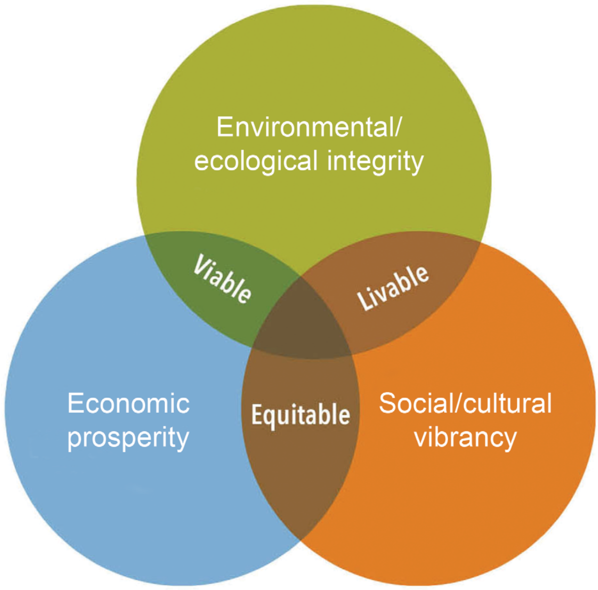
Fort Collins has created an integrated administrative framework for its efforts in the areas of economic, environmental, and social sustainability. Ann Arbor approved a sustainability framework

[8] http://www.sustainabledubuque.org/documents/filelibrary/documents/Final_Report_with_Appendices_29E33A454A218.pdf.

[9] A similar approach is to measure results in the three dimensions—the "triple-bottom-line" method—although the lack of attention to metrics means that bottom lines are not being measured in most communities.

Exhibit 13

Dubuque's Venn Diagram of the Elements of Sustainability



in 2013 with elements that go beyond the three dimensional approach. The elements in its framework are climate and energy, community (which includes economic vitality), land use and access, and resource management. For some communities, this approach with explicit emphasis on the three "Es" will be the preferred rationale for its sustainability program.

The other case-study communities do not present their wide-ranging activities related to sustainability in an integrated framework. It appears that a different approach is needed to explain what sustainability means and what it will include. To be clear, this is a different way of articulating a commitment to sustainability—not a change in the content of what sustainability means.

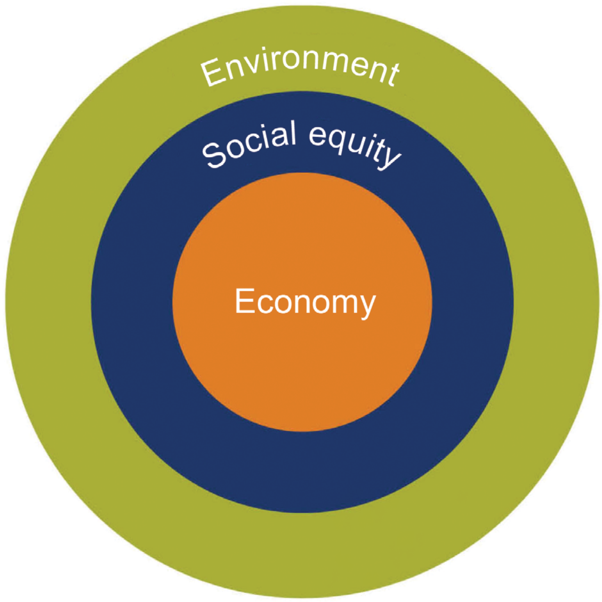
Nested Model

Another approach is to think of the dimensions as concentric circles. In exhibit 14, the economy is viewed as "nested" in the social dimension, and all human activities are affected by and in turn impact the condition of the environment. Melissa McCullough, Senior Sustainability Advisor in the Sustainable and Healthy Communities Research Program for EPA in Research Triangle Park, expressed the relationships this way in an assessment she did while on detail working with the Durham Sustainability Office—

> Another consideration is that the three "legs" of sustainability are not so much equal, as nested. The economy of any given place cannot exist without a stable society around it. Durham has seen that in the past as crime, or the perception of a crime problem, adversely affected our economy. A society is defined by more than its economy; things like relationships, culture, norms, place, language, and much more. This set of societal inputs

Exhibit 14

Nested Diagram of Sustainability Elements



is recognized in Durham's plans, in the desire to maintain a sense of place and history. In a similar way, a society exists within, and depends on, its environment. A sense of place arises first from its natural context. (McCullough, 2011)

In this view, the social dimension is not optional or only partially linked to the other dimensions. It is the essential setting for economic activity, exactly like the economic and social dimensions that are nested in the environment. For economies to thrive, all must participate. Environmental enhancement supports social and economic activity and depends on the contributions of all segments of the population.

Defining Livability and Viability in the Sustainability Context

The challenge in expanding actions to promote sustainability is to create a broad rationale that can be easily understood and related to other community goals. All of the case-study jurisdictions have active agendas that include a wide range of the activities associated with the three dimensions of sustainability, but they differ in the extent to which they explain and organize these activities under the banner of sustainability. Three of the case-study communities had a clear, integrated approach to sustainability, but the common underlying purpose across all of these communities is that they are promoting livability and viability. When identifying the components of sustainability at the community level, it may be helpful to identify these qualities as the underlying objectives of a comprehensive approach to sustainability.[10] Livability by itself has a present orientation that must be balanced with the long-term perspective of viability. For example, Portland identifies qualities it wants to foster now and during the next 25 years. Both qualities—livability and viability—necessarily have economic, social, and environmental aspects. It is possible that this definition of sustainability may resonate in a wider array of communities: sustainability is a commitment to improving the livability of our community for all its residents and to strengthening the viability of our community for all who will live here in the future.

Livability is central to the definition of sustainability developed by HUD, DOT, and EPA working together under the Partnership for Sustainable Communities. It should be available for everyone in a locality. Thus livability presumes equity as well as economic opportunity and a supportive environment. Viability means being capable of normal growth and development. A city or county, like an organism, does not achieve normal growth and development when some of its parts are not healthy, not functioning fully, or deprived of essentials so that another part of the organism can succeed. Since World War II, various forms of disconnected social and economic processes have emerged in American urban areas. They are examples of incomplete development. Racial segregation based on laws and social restrictions was replaced by residential segregation and the increasing physical separation of races between suburbs and central cities. Economic development benefited most of the population, but left others behind and shifted some of the costs of production, such as pollution, to low-income areas. These practices are not sustainable because they deny livable conditions to many and they undermine viability. Urban areas with empty centers did not thrive although residents of outlying areas could try to ignore the areas that were falling behind. Now many young professionals as well as retirees have returned to the community centers, and social interdependence is unmistakable. Exactly like recognizing how economic strategies can destroy the environment by pollution or exhausting scarce resources and can weaken long-term economic viability, it is clear that practices that exploit or ignore disadvantaged members of our communities and harm their quality of life are not viable.

Applying Livability and Viability Rationale to Communities With Limited Current Activities

The discussion of how sustainability is conceptualized and the rationale for including social equity has been based on the actions of the case-study governments and other leaders in sustainability. Examine the reasons for including social equity in communities with lower levels of social distress like those in the low-equity comparison group. The first reason is that these governments have significant disadvantaged populations compared with the high-equity governments. For example, the average percent of persons in poverty in the two groups of governments was 17 percent in communities with a strong commitment to social equity and 12 percent in the comparison group. Groups in these localities clearly would benefit from equity measures and would contribute to the

[10] Dubuque uses these terms in its graphic (exhibit 13) to summarize the approach to sustainability. The program affirms that "Dubuque is a viable, livable, and equitable community." This approach is worthwhile. It is also possible to argue that equity along with other dimensions of sustainability is essential to both livability and viability. That approach is the one taken in this report.

overall sustainability plans of these governments. Furthermore, analysis of census data over time indicates the ever greater dispersion of minority groups and the poor. Without attention to equity, current residents may be forced out of the community.

Ignoring equity represents a failure to meet needs of nonresidents that are already working in these communities but cannot afford to live where they work. Failure to expand housing options for moderate-income job holders contributes to other sustainability problems, most obviously long-distance commuting with increased energy consumption and cost to the commuters but also the loss of time for family or personal wellness activities. Although a community may be prosperous in the present, its economic viability is threatened when it is not an attractive place to live for the teachers, police officers, service workers, and consumers that the community wants to attract. Equity spillover effects in other communities that result from ignoring or excluding the disadvantaged, such as excessive concentrations of low-income or homeless people in some localities because of the refusal of other jurisdictions to accommodate these people within their boundaries. Sustainability must be a shared effort pursued beyond narrow boundaries. Livability and viability need to be examined on a regional basis, as well as within each separate jurisdiction.

Livability and Viability Rationale in Federal Sustainability Priorities

The federal government has made significant progress in defining and advancing sustainability through the Partnership for Sustainable Communities. The activities it has promoted explore linkages between components of sustainability. Its livability principles encourage communities to approach sustainability as a multifaceted strategy. Clearly recognition of environmental justice and equitable development is evident in the work of the Partnership.[11] The opportunity exists to establish a comprehensive and integrated definition of sustainability, however, by further developing its social dimension. Equity is mentioned explicitly in regard to affordable housing and commitment to equity is implied in supporting all existing neighborhoods; however their definition of "sustainable communities" provides no explicit mention of other features related to equity, environment, or economy, potentially limiting the scope of activities associated with achieving greater social sustainability. In addition, the elements identified in the 2013 EPA report entitled *Creating Equitable, Healthy, and Sustainable Communities* (EPA, 2013), add certain features missing from the livability principles: meaningful community engagement, public health and a clean and safe environment, access to opportunities and daily necessities, and preservation of the features that make a community distinctive.[12] The overall approach in this report, however, does not discuss sustainability as an overarching concept. Are "equitable, healthy, and sustainable communities" unified or separate goals?

Sustainability is a complex concept with multiple dimensions. Each community must examine its own circumstances and future prospects to determine which aspects of sustainability will be targeted for action. It is clear that some aspects of sustainability may not be relevant in a particular community, but the assessment of need and the review of possible initiatives should take consider the full scope of sustainability. As local governments look to the Partnership for Sustainable Communities for guidance, it is important that they find a comprehensive definition that encourages

[11] For example, Partnership for Sustainable Communities (2010).

[12] The report does not refer explicitly to the principles of livability.

a broad examination of how they can create a prosperous, healthy, and inclusive community now and in the future. In the Partnership, attention should be given to expanding the livability principles and to more clearly articulating a definition of sustainability that includes these elements: sustainability is a commitment to improving the livability of the community for all its residents and to strengthening the social, economic, and environmental viability of the community for all who will live there in the future.

In conclusion, several different ways to explain and justify a commitment to sustainability exist that include a social equity component. The livability and viability of communities depends on a strong economy, inclusive society, and sound environment. Equity is essential for a livable present and a viable future. Each community needs to find the rationale and goals that best match its values and engage the community in pursuing steps to advance livability and viability for all.

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Authors

James Svara is a visiting professor in the School of Government at the University of North Carolina at Chapel Hill. He was a professor in the School of Public Affairs at Arizona State University when this research was conducted.

Tanya Watt is a Ph.D. student in the School of Public Affairs at Arizona State University.

Katherine Takai is a fellow at the U.S. Environmental Protection Agency, Office of Sustainable Communities. The fellowship is funded by the Oak Ridge Institute for Science and Education. She was previously a project manager at the International City/County Management Association, Center for Sustainable Communities.

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Adoption of High-Performance Housing Technologies Among U.S. Homebuilding Firms, 2000 Through 2010

Andrew P. McCoy
C. Theodore Koebel
Virginia Tech

Andrew R. Sanderford
University of Arizona

Christopher T. Franck
Matthew J. Keefe
Virginia Tech

Abstract

This article describes foundational processes of a larger project examining U.S. home builders' choices to adopt innovative housing technologies that improve the environmental performance of new single-family homes. Home builders sit at a critical juncture in the housing creation decision chain and can influence how new housing units change related to energy consumption, and the units they produce can also reflect shifting technology, demography, and policy landscapes. With some exceptions, U.S. home builders have been characterized as being slow to adopt or resistant to the adoption of product and process innovations, largely because of path-dependent and risk-averse behavior. This article focuses on home builder choices by analyzing a summary of innovation adoption literature and that literature's relationship to homebuilding. Researchers then describe analytical approaches for studying home builders' choices and markets at a Core Based Statistical Area level, the data and statistical methodologies used in the study, and the policy implications for promoting energy efficiency in housing. Future work will draw on the foundation presented in this article to specify versions of this generic model and report results using improved quantitative analyses.

Introduction

In the National Climate Assessment, researchers report that the warming of the U.S. climate during the past 50 years is significantly related to human (Melillo, Terese, and Yohe, 2014). They argue that a strong need exists for businesses and individuals to adopt innovative products, processes, and thinking that changes how products are produced and energy is consumed. Failure to move toward these innovations, scientists believe, will result in continued growth in the severity and types of risks to the United States.

The U.S. Department of Energy (DOE) reports that the housing stock has been increasing energy efficiency since 1980. Houses built most recently are 14 percent more energy efficient (EE) than homes built 30 years ago and 40 percent more EE than homes built 60 years ago (DOE, 2014). With respect to energy consumption, in 2014, all residential buildings consumed 21.15 quadrillion BTUs (British Thermal Units) of energy, down 1.1 percent from 2010.

From 2005 to 2010, the academic literature focused on climate change doubled in size along with heavy expansion in the range of topics, geographies, and disciplines analyzed (Burkett and Suarez, 2014). One study area has had an expansion of analysis is in regard to innovation applied to issues of environmental change and performance. Innovation can be a powerful lens to process empirical information about changes within markets and can be used as a framework for gaining increased understanding of potential solutions to environmental problems. After more than 100 years of innovation research, scholars can show that adoption and diffusion of innovation are critical forces that build competitive advantage, disrupt existing markets, and create new markets (Christensen, Anthony, and Roth, 2004). Despite innovation being applied to a wide swath of disciplines, until recently, scholars of innovation have not focused a great deal on construction. Few diffusion-of-innovation modeling techniques have been applied in the commercial construction literature (Kale and Arditi, 2009, 2006, 2005; Rose and Manley, 2014, 2012) and scholars have not regularly experimented with advancing variations of innovation diffusion models within residential building construction or new and existing housing. At the same time, U.S. home builders have been characterized as being resistant or slow to adopt innovation.

In light of these industrial concerns, a substantial opportunity for new analysis exists. This work (and article) sits at the convergence of these topics and serves as a foundational step of a larger project examining U.S. home builders' choices to adopt innovative housing technologies that improve the environmental performance of new single-family homes. The article begins by summarizing literature on adoption and diffusion of innovation and defining its relationship to homebuilding. The work then describes a conceptual statistical model and application for analyzing innovation adoption among home builders. Another goal of the work is to distill current and previous research, variables, and methods for future work. Future projects could augment the statistical model to examine extant factors that explain U.S. home builders' choice of EE and high-performance technology over traditional and less EE substitutes.

In the following sections of this article, the authors address these research questions: (1) What external parameters are likely to be associated with builders' decisions to adopt high-performance housing technology alternatives across time and into recent years and (2) do external parameters surrounding this change support a general shift toward environmental performance as a central component of diffusion in the homebuilding industry? In answering, we describe an array of data that will inform diffusion modeling and enable others to refine industry models and draw empirical conclusions about builders' innovation adoption choices. Our description of the data and the generic conceptual model further proposes (1) methods for measuring adoption patterns of high-performance technologies, (2) a comparison of the sample with independent measures of the builder population, (3) regression analysis tools, and (4) the potential significance of the preliminary model for diffusion of technology in general. The article links the diffusion of innovation among home builders to broader concepts of sustainability and highlights several implications for federal policymakers.

Literature Summary

Researchers have argued that the characteristics of the construction industry, particularly the residential construction industry, are important in determining the role of innovation in the industry (Koebel and McCoy, 2006; McCoy et al., 2010a; McCoy, Koebel, and Sanderford, 2011; McCoy, Thabet, and Badinelli, 2008). The construction industry is characterized by low levels of research and development (R&D) expenditures, volume-based modular product offerings that have to be adjusted to site characteristics, asynchronous liability problems, highly cyclical markets, disaggregation (many small firms) and reliance on subcontractors, diverse building codes, and financing and insurance impediments that can (and do) inhibit the adoption of innovation. The construction industry is often seen as laggard because of the numerous impediments to innovation, adopting innovations only after the rewards of the products or techniques are clearly established and the risks minimized (Dibner and Lemer, 1992; Laborde and Sanvido, 1994; Tatum, 1987). Focusing on impediments to innovation could result in underestimates of actual innovation, and evidence suggests that innovation does occur in this industry (Koebel et al., 2004; Laborde and Sanvido, 1994; Toole, 1998).

Unlike most consumer products "facilities are large, very complex, long lasting, and they are created and built by a temporary alliance of disparate organizations within an explicit social and political context" (Slaughter, 2000: 3). Further, the construction industry is unusual because the firm (the builder) acts as an assembler that is reliant on multiple subcontractors for subassembly along the supply chain between the upstream manufacturers and suppliers and the downstream consumer-occupant. Slaughter (1993a) argues that reliance on the tried and true (path dependency) could hinder successful adoption because builders are the agents of technical expertise that operate between the two and shoulder the liability of installing new products. For example, the timing of the commitment to adopt an innovation, the communication within a project team about the requirements of using an innovative product, the degree to which an innovation requires the use of special resources, or outside expertise, and the levels of supervisory competency are drivers and obstacles of innovation in construction (Slaughter, 1993b).

For some time, housing researchers and policymakers have struggled with the lack of technological innovation in the housing industry in the United States and abroad (Gann and Salter, 2000; Koebel, 1999; Woudhuysen and Abley, 2004). Previous interventions to promote innovation adoption and studies of adoption have focused on impediments to innovation and strategies borrowed from other industries. The divergence of green building technologies from previous adoption and diffusion patterns provides a new opportunity to examine innovation in this industry. In place of path dependency and resistance to innovation, numerous industry studies point to a widening awareness and likely use of innovative practices and techniques that support environmental goals (Bodie, Kane, and Marcus, 2008; Turner and Council, 2006).

Whereas homebuilding innovation has traditionally experienced slower rates of adoption, some green building technologies exhibit accelerated adoption patterns (Koebel et al., 2004). Little empirical work exists that measures and analyzes such phenomena, which is the subject of this work. Commercial construction scholars have started to apply classic empirical models of the diffusion of innovation to analyze the adoption of various technologies and construction strategies (Kale and Arditi, 2009; Rose and Manley, 2014. This research confirms previous hypotheses that the diffusion of innovation can be mathematically modeled in construction (Larsen, 2005; Hartmann, 2006) and suggests attributes of the adopter, context, and the innovation each influence the adoption decision. A model that includes these three types of factors has not yet been applied to housing, however. Given this opportunity, we focus on the home builder as the central actor and will set the stage for a series of different empirical analyses of builders' adoption of EE green building technology innovations. Previous research has tended to focus on the attributes of the firms that catalyze the adoption of innovation. When capturing attributes of the building firms, we will also move beyond that traditional focus and will analyze a broader array of factors including public policy, climate, and market area characteristics that could help explain builders' high-performance technology adoption patterns. Quite simply, our larger project seeks to offer new insight into the factors, other than time and the attributes of the firm, which explain builders' choices to adopt high-performance housing technologies.

EE construction is gaining acceptance as a sign of excellence in the trade, limiting the options in the market for firms who cannot bring these skills to a building project (McCoy, Pearce, and Ahn, 2012). Others have realized the importance of defining tools of performance at a broad level for their industry. Such metrics have become central to customers' abilities to comfortably make purchasing decisions and trust in these decisions (Adomatis, 2010). An inclusive and comprehensive definition is first needed for high efficiency in housing technology. Literature suggests no one standard definition; however, all definitions emphasize energy-efficiency, sustainability, and environmentally friendly products (Adomatis, 2012, 2010). In general, technologies that can be described as having high performance are (1) safer and healthier, (2) more energy and resource efficient, (3) more durable, and (4) more comfortable. Highly efficient technologies also exist as alternatives to traditional or existing state-of-the-art technologies. By exploring the diffusion of innovation with respect to energy efficiency, we also have the opportunity to develop innovation's linkage with sustainability.

The Adoption Decision

In seminal work, Rogers (1995) distilled evidence across a number of disciplines and suggested that attributes of the product, the adopter, and communication about the innovation each contribute to the decision to adopt an innovation. These product and adopter attributes form the backbone of diffusion modeling, a technique that focuses on why and when different actors choose to adopt various innovations. In the construction industry, and particularly the residential sector, the builder is the key adopter of innovations, much like the farmer in the agricultural industry (Koebel, 2007). Within the construction industry, the builder is the critical link between a host of factors (for example, capital, manufacturing, entrepreneurship, geography, and public policy) and the innovation—yielding significant opportunities for research.

Attributes of the Adopter

A 2004 survey of builders revealed that national and regional home builders, multifamily builders, modular builders, and custom home builders were more likely to adopt innovations than other firms (Koebel et al., 2004). These firms were likely to (1) have a technology advocate in the firm, (2) stress creativity, (3) use a technology transfer program (for example, PATH), and (4) use unionized labor at least some of the time. Innovative firms also recognized the importance of demand for innovative products (from homebuyers) and the ability of a manufacturer to stand behind the quality of their product (Koebel et al., 2004). To be more specific, home builder research has found that—

- Larger builders tend to be early adopters of innovations only when new materials provide potential cost savings, improvements in production processes, reductions in call-backs, and reduced exposure to liability (Koebel et al., 2004).
- Smaller builders tend to adopt new materials when consumer awareness of the product is high, the price of the new material is superior to its replacement, and the home-production process must be substantially altered (Koebel et al., 2004).
- Not all innovation should be assumed "good" for the firm, but some new technology may contain benefit(s) (Koebel and McCoy, 2006; Koebel et al., 2004).

These findings built on earlier evidence suggesting that the primary barriers to the diffusion of innovation in the construction industry were highly cyclical markets, a preponderance of small firms (vertical and horizontal fragmentation), institutional factors such as building and zoning codes, and unionization (Blackley and Shepard III, 1996).

Because the builder is the central focus of this article, it is important to note that they represent, to a large degree, the interests of a homebuyer. Therefore, measurement of the attributes of the potential buyer is also important—though the literature is opaque on precise attributes that play significant roles. An examination of the characteristics of homebuyers who influenced the purchase of a green-certified home showed increased income as a significant factor (Goodwin, 2011). A related study found that the political persuasion of most voters in an area is associated with green-certified industrial building prices (Harrison and Seiler, 2011). In the end, it appears that no evidence suggests individuals with green technology leanings occupy green buildings with more frequency than those individuals without the same disposition (Wilkinson, Van Der Kallen, and Kuan, 2014). Together, these findings suggest that researchers may find more utility in measuring the attributes of the buyers in aggregate—analyzing the extent to which factors such as income, levels of educational attainment, owner-occupancy rates, and the age of the housing stock are associated with the adoption decision of builders.

Attributes of the Product, Supply Chain, and Communication Networks

According to a National Association of Home Builders (NAHB) poll (Hudson, 2011), nearly 80 percent of respondents mentioned actions and products within the 'green' portfolio. Building industry professionals provide ample testimony that green building is an upward trend (McCoy, Pearce, and Ahn, 2012). Instead, energy-efficiency and related building practices are quickly becoming the state of the art in the building industry, and the ability to deliver these services to clients is increasingly important to maintain a successful business. Research on innovation in the construction industry has also focused on the attributes of products in green building (McCoy, Pearce, and Ahn, 2012) and the commercialization of innovative building technologies (Habets, Voordijk, and van der Sijde, 2011, 2006).

Builders' choices to adopt innovative and EE technologies could be linked to variation in the price of the technology and the characteristics of the builders' market and supply chain (Koebel, 2007; Koebel and McCoy, 2006; McCoy et al., 2010b; Rogers, 1995). Local markets can affect the ability to conduct business using variability in material and labor costs or the total cost of construction. Uncertainty along the supply chain also plays a major role in determining the success of a product's adoption and diffusion. The presence of individual stakeholders of the supply chain at a local level can also influence decisions using either veto or endorsement. Within the homebuilding supply chain, home builders are often considered the most influential in determining commercialization success (McCoy et al., 2010a). We also posit that adoption choices are also associated with the presence of, and variation in, public policy and climate (Kontokosta, 2011; Simons, Choi, and Simons, 2009).

Finally, we hypothesize network effects may be based on the density and proximity of builders on a regional basis, reflecting the communication and contagion characteristics of diffusion and have created an explanatory variable (Raub and Weesie, 1990) using a "gravity index."

Attributes of the Market

Diffusion research and policy suggests that a number of attributes of the market where the adoption decision occurs are significant predictors. A study of the decision to adopt ecolabels such as the U.S. Green Building Council's Leadership in Energy and Environmental Design, or LEED, or the Environmental Protection Agency's ENERGY STAR, researchers found that a significant percentage of the decision could be predicted using market factors describing income, unemployment rate, climate, energy prices, and public policy (Kok, McGraw, and Quigley, 2011). Devine and Bond showed clearly that different types of public policy encouraged the adoption of ecolabels in multihousing markets (Devine and Bond, 2013). These market attributes are logical predictors that are regularly used in the sustainable real estate literature as predictors in hedonic pricing models. Scholars analyzing commercial and residential property with increased environmental performance have used the presence of public policy, climate, income, employment, energy prices, and relative location (or urban form attributes) as predictors of green home and building price premiums (Eichholtz, Kok, and Quigley, 2011; Pivo and Fisher, 2011; Wiley, Benefield, and Johnson, 2010). We posit that adoption choices are associated with the presence of and variation in public policy and climate given the geographic variation and availability of policy (Kontokosta, 2011; Simons, Choi, and Simons, 2009). In a similar way, many of these same factors are used in models examining the extent to which environmental innovations and features mitigate mortgage default (Kaza, Quercia, and Tian, 2014; Pivo, 2013; Rauterkus, Thrall, and Hangen, 2010). These findings are bolstered by evidence from studies in commercial construction innovation on the role of the government policy in promoting the adoption of innovations (Morledge, 2011; Wandahl et al., 2011; Wong, Wong, and Nadeem, 2011). Further, urban design and compactness have been linked to a range of public health and property related issues (Ewing and Hamidi, 2013; Ewing et al., 2014).

Energy Prices

Referenced in another green product diffusion study, information about energy prices appears to have significant influence on the ecolabel adoption decision (Kok, McGraw, and Quigley, 2011). It is also a fundamental assumption by most real estate researchers relative to green building prices (Costa and Kahn, 2009; Jaffee, Stanton, and Wallace, 2012; Warren-Myers, 2012). Scholars have shown a positive association between ecolabel adoption and green building prices. A cautionary study of Dutch households relatedly demonstrates that residential energy literacy varies substantially and many households are unaware of their energy consumption (Brounen, Kok, and Quigley, 2011). Tangibly reflecting energy prices and their role in housing decisions, previous research suggests that in certain markets, high-efficiency windows (HEWs), such as double-pane windows, solar panels, and energy-efficiency certifications are associated with premium home prices (Aroul and Hansz, 2011; Bloom, Nobe, and Nobe, 2011; Dastrup et al., 2012).

Time

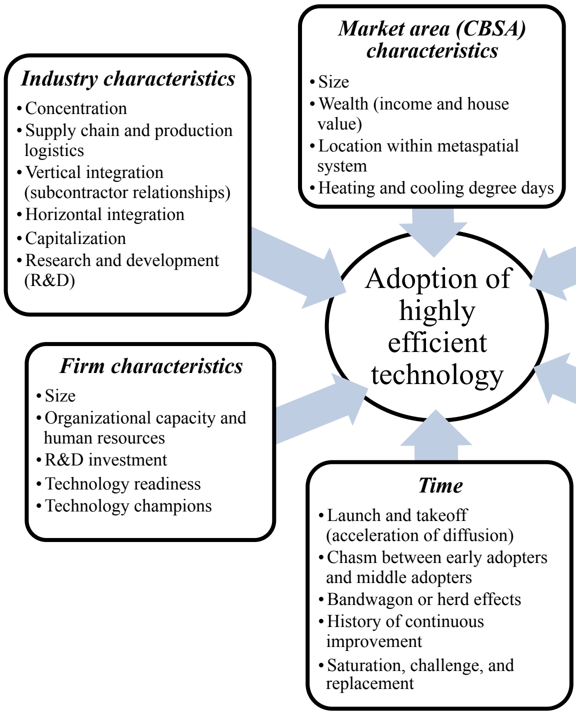
Traditional Bass models stress the role of time as a critical factor in the spread of an innovation into a market (Bass, 2004). Analyzing the effect of time provides researchers with the ability to observe the extent to which bandwagon effects, exogenous shocks such as recessions, and also unobserved variables that may also contribute to the adoption decision. Given the Technology recession of 2001 through 2002 and the Great Recession of 2007 through 2009 it will be of paramount importance to include time in any adoption model covering these periods. Further, because the implied task of the adoption model is to identify additional variables that help explain the adoption decision beyond time, control variables for time should be considered de rigueur for all analyses. Large, unexplained time effects confirm that diffusion is occurring along a mathematically modeled trajectory, but they fail to explain the underlying factors influencing this trajectory.

Conceptual Model

Basing our decision on the literature summarized in the previous sections, we propose the conceptual model in exhibit 1 as a graphic representation of the adoption decision. In the center is a builder with a dichotomous choice to adopt or not adopt a high-performance housing technology. Helping to explain that choice are those attributes and factors identified by literature and team logic. These factors include attributes of the adopter (builder firm), market, product, climate, public policy, industry, and labor supply chain, time, and communication networks.

Exhibit 1

The Conceptual Model and Variables



CBSA = Core Based Statistical Area.

Data and Proposed Analytical Techniques

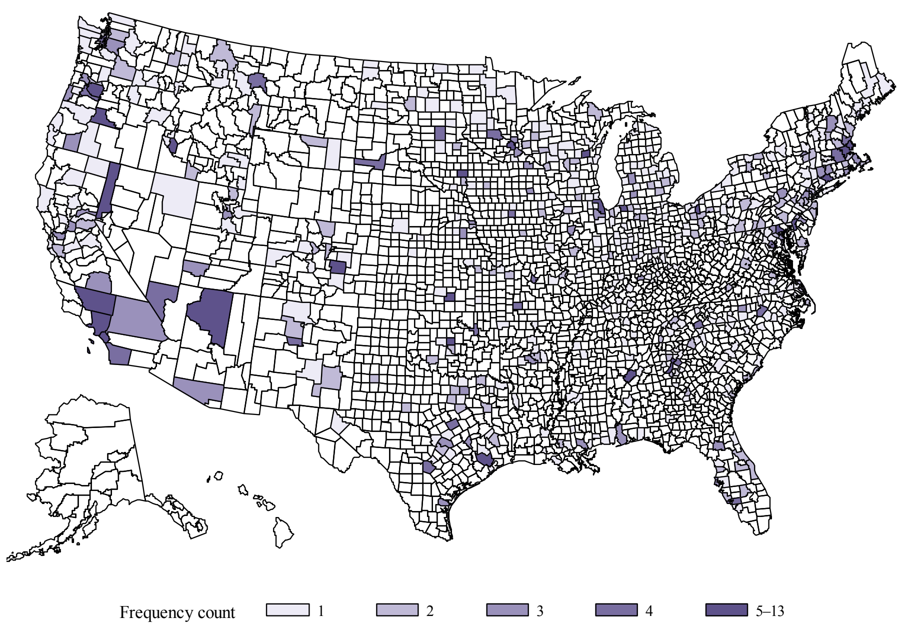
In the context of the literature summarized and conceptual model described previously, the research team assembled a large dataset describing U.S. homebuilding product use from 1996 to 2010. The measures of product use in the dataset come from the Builder Practices Survey (BPS), an annual survey conducted by the NAHB Innovation Research Labs. The BPS is designed to capture builders' product use patterns of new residential construction projects annually across nearly 1,100 product types and more than 40 clusters of products. The coming sections discuss the development of the dataset for analyzing builders' use of innovative high-performance construction products from 2000 to 2010 incorporating local, state, and regional level data for market characteristics proposed in exhibit 1. The BPS includes product use within the housing types of Single-Family Detached, Single-Family Attached, and Multi-Family as the unit of analysis of the builder firm, typically an individual survey respondent (see exhibit 1), because the survey process does not specifically control for multiple respondents from the same firm in the instructions. The BPS data do not contain any information about the characteristics of the firm beyond the city and county of the respondent's address and summary measures of the number, size, building type, and price of the housing units built during the previous year. The data are nonlongitudinal because respondents cannot be linked over time. After being merged with exogenous market characteristic variables sourced by the research team, the dataset is the largest of its kind and unique in its integration of industry, market, and public policy measures.

Most statistical methods assume that the data at hand are representative of the larger population from which inferences are to be made. Representativeness ideally is achieved by drawing respondents (that is, survey participants) randomly from the list of all possible participants in the population such that any set of builders is equally likely to appear in the sample. For data such as these, the responses instead constitute a convenience sample where builders were contacted without use of a probability-based sampling scheme, and they responded on a voluntary basis. Nevertheless, the assembled data constitute the most up-to-date and comprehensive database of this sort, to our knowledge, in residential construction (see exhibit 2).

Because representativeness could be called into question in a strict sense, the research team further compared the amount of respondents in the BPS with public data on the presence of home builders. The team assembled County Business Pattern (CBP) data from 2003 to 2010 by year and compared those data with BPS respondent data, based on single-family and multifamily builders by state (a combination of establishments in North American Industry Classification System (NAICS) codes 236115+236116). Further, the team analyzed total establishments and the number of establishments with fewer than ten employees, based on first quarter payroll. It is not surprising that many builder respondents contain fewer than 10 employees. It is important to note that NAICS codes for the builder categories were changed in 2003 and no data codes for 236115+236116 were available for 2000, 2001 and 2002.

Exhibit 2

Respondent Geographic Coverage—Number of High-Efficiency Window Users, 2010



Based on the team's analysis, the *R*-squared (RSQ) value between 2003 through 2010 CBP and 2003 through 2010 BPS was approximately 0.71; the less-than-10 employee CBP had a slightly higher RSQ value. These RSQ values are interpreted as the proportion of variation in one measure (for example, 2003 through 2010 CBP) associated with the other (for example, 2003 through 2010 BPS). Although not ensuring true representatives at the population level, these values indicate a strong linear association between BPS and CBP overall, meaning that points that are high in BPS tend to be high in CPS and similar for low values.

Although nonrepresentativeness could be seen as an issue to some degree in these data, we proceed with statistical analysis in an attempt to glean insights about builder behavior on the basis of the available data. The granularity of the BPS data allows for deep analysis of individual products, such as windows, which are within the high-performance building envelope and are central to achieving energy efficiency for the home. Although performance of windows varies, saturation of EE, high-performance technology options offers an excellent example of diffusion over time (2000 through 2010) in the marketplace.

Clusters of Dependent Variables

The original goal of the research was to discover patterns of use in EE technologies among builder firms, which was later expanded to high-performance products as explained previously. The research team initially needed to organize BPS variables into clusters of products that affect performance in a home, focusing on energy-efficiency as part of performance. Also in 2007, the Better Housing Coalition (BHC) of Richmond worked with local, regional, and national resources to select a core group of products and technologies that impact performance in new construction (http://www.virginialisc.org/pdf/rpts/Sustainabilitymap.pdf). BHC sorted high-performance technologies in new construction homes into the following clusters: engineered wood systems (including open web joists), EE lighting, air sealing, EE water fixtures, heating and cooling within conditioned space, sealed duct system, advanced framing, house wrap, proper heating and cooling unit sizing, cement board siding, cellulose or spray foam insulation, and HEWs.

As an example of one cluster of technology critical to performance, the HEWs cluster includes insulated glass (IG) in three product types, all of which can be used by builders as choices not mutually exclusive between homes: double-pane, Argon; double-pane, Argon low-E; and triple-pane windows. Single-pane (non-IG) windows have become virtually obsolete and double-pane, no-Argon (no filling) windows had become the lower efficiency and lower cost alternative, although the cost and performance of windows of all types vary considerably between manufacturers based on designs and materials used, including trim. An annual time series plot of use for variable names Double-Pane no Argon (DP-no Argon); Double-Pane with Argon (DP-Argon); Double-Pane Argon-Filled Low-E (DP-Argon Low-E); and Triple-Pane from 2000 to 2010 shows that DP-no Argon was used by 40 percent of builders in 2000 (see exhibit 2). DP-Argon was already used by 50 percent of builders by 2000 and quickly became the dominant[1] window type reaching a near saturation level of 80 percent by 2010.

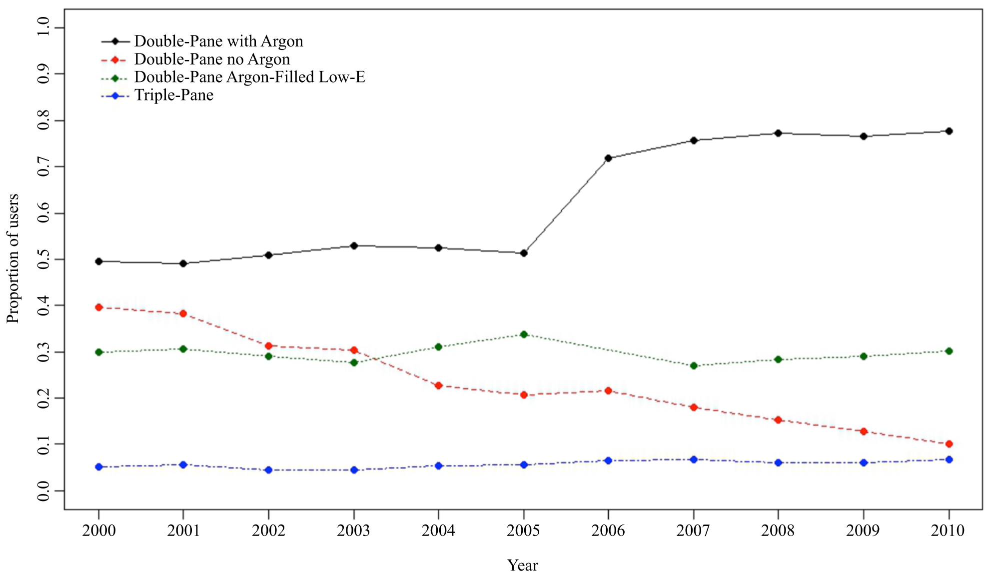
[1] We model whether builders use the products as a binary variable (1 = use, 0 = no use) but not the extent of use across all the units a company builds because of uncertainties about the consistency of responses around percent use. Nor do we weight use by the number of homes the respondent builds in a year (which is used as a proxy for firm size as an independent variable). Because the latter is positively associated with use, the binary use variable could understate market share for DP-Argon.

Since 2010 the high-efficiency cluster (Double-Pane with Argon, Double-Pane Argon-Filled Low-E, and Triple-Pane) has rapidly displaced the lower efficiency alternative (DP-no Argon), when the latter dropped from 40 to 10 percent of the market share. Our focus in this article is the general model for the choice between the high-efficiency cluster and Double Pane No Argon; in the aggregate we are modeling the rapid replacement of the low-efficiency alternative by HEWs option (see exhibit 3).

Double-pane (no filling) windows were introduced in 1962 and were commonly available by the late 1970s. Low-emissivity (Low-E) coatings were introduced in the late 1980s and were widely available by the mid-90s; the introduction date for Argon-filled is not clear, but Argon filled low-E windows were widely available in the early 2000s (Fisette, 1998).

Exhibit 3

Use of High-Efficiency Windows, 2000–2010



Potential Statistical Modeling Techniques

The logistic regression model described in the following section for analyzing use of HEW reflects our dichotomous choice framework. Given the structure of the BPS dataset and its nonlongitudinal nature, we consider the adoption decision to be a dichotomous choice to adopt or not adopt the high-performance technology over its traditional economic substitutes. The use of a logistic regression framework to capture builders' year-to-year adoption decisions aligns with and reflects adoption and diffusion theory, research on impediments to innovation in construction, and research on adoption of building construction innovations.

Among the potential contributions of this research will be the ability to analyze data on product use in residential construction for a large national sample of individual firm-respondents geocoded by location and integrated with aggregated measures for industry and market characteristics, climate, public policy, and time. Critical to the generation of these observations is the merging of the BPS data with the assortment of additional independent variables that operationalize the types of factors identified in the literature review. To merge these data, a crosswalk directory was developed linking every county (or county equivalent) to Core Based Statistical Area (CBSA) definitions for 1999, 2003 and 2009, enabling data aggregated to a variety of geographic scales to be added to the microdata (firm respondent level) file.

Independent Variables

For analysis, the research team includes product attributes noted previously in the literature review. Among attributes, cost advantage refers mainly to price and is measured using RS Means 2010 national cost data, which are adjusted by year and available at the three-digit ZIP Code level. Using common software for geocoding, these data were merged with county- and state-level data of the BPS. Although broad performance measures are also available using RS Means data, they are not available for separate technologies and thus cannot be included in a model of technology choice. As a consequence, detailed product characteristics remain exogenous to the model tested to date. Cost factors that affect the local cost of doing business (based on RS Means 2010 national cost data) per year is available, however, and was included in the model. Further, the team surveyed a builder panel to rate attributes of all technologies deemed appropriate for modeling toward environmental goals. Survey results will be used to develop measures of performance for products in the BPS data.

Attributes of the adopter are measured by firm characteristics and market area characteristics. Relative to the firm, the literature reports that size; organizational capacity and human resources; R&D investment; and presence of technology champions are associated with adoption decisions. Mixed results have reported the impact of firm size in the residential construction industry with evidence indicating that small companies led by a technology champion and large companies with technology capacity can each promote innovation. The conceptual model includes measures for company size (using number of houses built annually as a proxy), and organizational capacity based on diversity of operations spanning residential building types that include multifamily housing. In addition, we include measures of the firm's average housing unit size and average sales price. R&D investment in the housing industry is notoriously low and not included. Data on technology champions within each respondent firm were not available.

Industry characteristics noted in the residential construction literature include concentration, supply chain, subcontractor networks, and efficiency. The construction literature discusses the importance of measuring construction efficiency, which includes the productivity values for technologies and the cost of insurance. Productivity values are the expected amount of time to install a product at a national level (available from RS Means by year and location by three-digit ZIP Code). Change in the productivity value could affect the use of product technologies, because it is an indicator of the labor required at a local level. Within productivity, we also consider the subcontractor fragmentation of the industry and separated work division values that independently affect product use. We include a measure for worker compensation insurance fees, also separated by the work division associated with installation of the building product, which could affect the use of technologies, because some divisions of work are considered more risky. In general, the residential construction industry lacks concentration with small firms producing the bulk of housing in some areas, but higher levels of industry concentration in markets dominated by large production firms. As a result, the research team includes the following variables to account for these effects. For the model, we include a proxy measure of firm size and are developing a measure of industry concentration within market areas. To measure supply chain effects, we use proxy measures on the number of firms at the CBSA level for industry data for construction materials suppliers from the CBP series. In a similar way, we test subcontractor network effects using a proxy measure for the number of product related subcontractors at the CBSA level, also from the CBP series. For the HEWs model, we use the number of framing subcontractors in the CBSA. Alternative specifications, of the supply chain and subcontractor network measures, include the number of larger firms in the CBSA (based on those with 50 or more employees).

Market area characteristics include CBSA level measures for population size, income, and wealth (median income and median house value) and location within a network of market areas as an indicator of the potential for contagion effects. For the latter we developed a gravity index based on the product of the CBSA's population size and the population sizes of all other CBSAs divided by the square of the distance between the CBSAs (Raub and Weesie, 1990). This index measures the potential for contagion effects (for example, learning about new technologies) positively associated with size and inversely associated with distance squared (an accelerating distance decay effect). Contagion effects associated with market area sizes and distances have never been tested, but are expected based on the opportunities for learning from builders in other nearby markets.

Public policy impacts on innovation and on green building have been documented in previous research, but the focus has been on buildings and certifications and not on specific product use by residential builders. We incorporate measures for federal stimulus funds (state-level American Recovery and Reinvestment Act Funds Per Capita), green building certifications, utility rebates, state grants, and a variety of other state and local incentives for increasing energy efficiency. We also include the state's sales tax as a potential negative impact because of higher costs. In addition, urban development compactness is measured via Ewing's composite index (Ewing and Hamidi, 2013).

Time effects are well documented in diffusion research, but typically in aggregated models of diffusion (for example, Bass models). We include year as either a continuous measure or a discrete dummy variable measure to capture exogenous shocks and bandwagon effects reflected in changes of the impact of time on use, innovation chasm reflected in no impact of time beyond the stage of early adopters, and maturation or peak saturation effects reflected in negative impacts of time. As noted previously, our objective is to build a model that reduces the unexplained variation that might otherwise be absorbed in the time measure.

Regression Modeling

To analyze how external parameters support a general shift toward environmental performance as a central component of diffusion in the homebuilding industry, we will fit logistic regression models to the builders' choice questions. The dependent variable will be specified so that 0 describes use of the traditional technology option(s) (for example, double-pane windows without argon gas filling) and 1 describes the use of at least one of the high-performance economic substitutes (for example, DP-Argon, DP-Argon Low-E, and Triple-Pane). The generic logistic regression used for this analysis is—

$$ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k, \quad (1)$$

where p indicates probability of technology usage, β_0 denotes the y intercept, and x_i and β_i represent ith predictor variable and regression coefficient respectively for =1,…,k. Logistic regression is a popular technique to predict binary outcomes (such as use and nonuse) as a function of multiple variables, because the resulting usage percentages are correctly constrained between 0 and 100 percent. For more details, see Agresti (2002).

Variable selection is a statistical approach that attempts to identify a parsimonious model, which is a model that is as simple as possible (that is, fewest predictor variables) while maintaining good predictive ability for the response variable. Parsimony is a fundamental concept for the statistical modeling of outcomes in a wide variety of fields. To obtain preliminary insight into a potentially parsimonious model, we will use stepwise variable selection in the logistic regression framework. Stepwise selection operates by iteratively adding variables that increase model performance and removing variables that become obsolete in the presence of new additions. The process begins by considering the single most predictive variable available (as measured by significance levels) and then iterating between adding and removing variables until no additional variables are added or removed in a given step. We used a criteria of alpha = 0.05 as the criteria for adding and removing variables in this study. The chosen model will be the subject of future work based on the variables and methods described previously.

In addition, we intend to use the Least Absolute Shrinkage and Selection Operator (LASSO) as a penalized regression and variable selection technique. LASSO is a form of continuous variable selection that operates by imposing a constraint on the sum of the magnitude of regression coefficients (Tibshirani, 1996). The LASSO is able to partially include regression coefficients corresponding to variables that have limited predictive ability over the outcome in question, while the stepwise approach either fully includes or excludes each variable. The constraint on the coefficients is frequently chosen based on a k-cross validation approach that chooses the threshold one standard error above the value that minimizes cross-validation mean square error. The LASSO paths are computed using the coordinate descent algorithm (Friedman, Hastie, and Tibshirani, 2010).

By applying statistical modeling approaches to our national database of builder decisions we will able to quantify the adoption rates of the high-performance technology alternatives as a function of time, policy, firm, market, and industry characteristics simultaneously. Characterizing usage rates in this way enables assessment of the impact of disparate predictors on the adoption rates of green technology. Cross-validation was used to assess predictive accuracy of the statistical models. Cross-validation, briefly defined, is a process by which a subset of the available data are withheld from model fitting and retained as a test set. If a model is able to predict the out-of-sample test set well, this provides evidence that the model has good predictive accuracy. Poor performance on the test set indicates potential model over-fitting or other problems with the generalizability of model.

Furthermore, statistical comparisons among the many candidate predictors are possible within the framework of a single model, which can be used to specifically compare usage rates at individual time points for any combination of predictor inputs.

Discussion

This article describes foundational processes of a larger project examining U.S. home builders' choices to adopt innovative housing technologies that improve the environmental performance of new single-family homes. This population is important to study because builders sit at a critical juncture in the housing creation decision chain and can influence how new housing units address change related to energy consumption while also reflecting shifting technology, demography, and policy landscapes. Home builders have been known, in many cases, for resisting adoption of new technology, creating a need for methods that target a divergence from previous firm adoption patterns by—(1) promoting recent trends in environmental goals and (2) providing a view into market agility and competitive advantage for technologies in U.S. housing.

Until now, scholars have engaged in the process of identifying the role of innovation on economic growth and argued that firms are engines of growth through innovation. Studies of innovation have been limited to industries with adequate data, which until now has not been the case for the residential construction industry. Although U.S. housing has historically been marked by its lack of change, innovative building technologies have recently diverged from previous adoption and diffusion patterns. In place of previous path dependency, the construction industry is demonstrating a widening awareness and likely use of innovative practices and technologies. Little empirical evidence measures and analyzes the choice of building products, which is a shortcoming addressed in this project. After reviewing the adoption, diffusion, technology, construction, real estate, and statistics literature, we identified an array of factors that are likely to be associated with builders' adoption decisions around high-performance technologies. In addition, basing our analysis on initial plots of the data, we estimate that the construction industry is moving increasingly toward the adoption of high-performance technologies within new homes.

Moving forward, analysis and measurement of green building diffusion can be defined and modeled using the foundation presented in this article. Analysis is now possible for dichotomous use through product characteristics, firm characteristics, industry characteristics, market area characteristics, climate, public policy, and time. The logistic regression model described in this work enables measurement of the use of green building technologies based on adoption and diffusion theory, research on impediments to innovation in construction, valuation research (hedonic models for price of residential and commercial buildings), and research on adoption of building construction innovations. Among our major contributions in this research will be the ability to analyze data on product use in residential construction for a large national sample of individual firm-respondents geocoded by location and integrated with aggregated measures for industry and market characteristics, climate, public policy, and time. Based on the work presented in this article, innovation in residential firms may be quantified as a method of creating market agility, competitive advantage, disrupting markets, or creating entirely new markets.

Another aim of this work is linking the diffusion of innovation among home builders to broader concepts of sustainability and highlight implications for federal policymakers. Beyond providing initial diffusion of innovation empirical techniques for residential construction, this article provides a roadmap for ensuing work to test and refine an empirical model. As a result, future work can complement innovation's connection to the broader topic of sustainability and interpret housing's significant economic and ecological dimensions.

The innovation-decision process surrounding the use of technologies in housing (and why) clearly influences energy consumption, a rippling effect toward future resource consumption. It is also clear that energy efficiency in housing can influence financial sustainability for multiple stakeholders along the supply chain—residents, developers, owners, and operators, to name a few.

Government plays a strong role in supporting green building causes—incentives, cost relief, regulations, and promotion. From a policy perspective, energy efficiency in housing could benefit residents through reduced overall housing costs and monthly savings that provide a cushion against unforeseen economic shocks. Green building using a third-party, verified process could also serve housing stakeholders as a risk mitigation tool into the future (healthy homes, durability, and long-term value).

Although the trend is toward green design and construction standards, Yudelson (2008) argues "the differentiating point clearly is now on results." Policy should reinforce the need for data that generate results of energy-efficiency standards in housing and measure possible savings to residents.

Low-income housing tax credit programs in Virginia are already using energy-efficiency housing requirements for developments and resulting data may guide policy for its programs and elsewhere. Data would guide developers and property owners in benefits from implementing a green building protocol in the broader housing stock. At a minimum, the collection of accurate data on energy use could catalyze our understanding of energy, its use, and our modeling of its effect on home builder decisions in the larger built environment.

Further, American Housing Survey and American Community Survey data could provide opportunities to define current levels of local need in housing using longitudinal data. Modeling real depreciation (age of unit, actual versus expected upkeep, improvement expenditures, and location) and worst case housing needs at state and local levels could provide an empirical basis.

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Authors

Andrew P. McCoy is an associate professor and the Director of the Virginia Center for Housing Research at the Virginia Polytechnic Institute and State University.

C. Theodore Koebel is a professor and senior associate at the Virginia Polytechnic Institute and State University.

Andrew R. Sanderford is an assistant professor at the University of Arizona.

Christopher T. Franck is an assistant research professor and Assistant Director of the Laboratory for Interdisciplinary Statistical Analysis at the Virginia Polytechnic Institute and State University.

Matthew J. Keefe is a doctoral student at the Virginia Polytechnic Institute and State University.

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Coming Full Circle: The Innovation of HUD's Sustainable Communities Initiative

Harriet Tregoning
U.S. Department of Housing and Urban Development

On the occasion of the 50th Anniversary of the U.S. Department of Housing and Urban Development (HUD), the new directions posed by the authors in this issue of *Cityscape* bear special significance as we honor our past and define our future as the "Department of Opportunity." HUD has a legacy of supporting local innovation, comprehensive planning, and regional collaboration—the hallmarks of the work of our Sustainable Communities Initiative (SCI).

Using this opportunity to reflect on the evolution of HUD's sustainable communities work, I will present my comments in three parts. First, I discuss the historical and contemporary context for the SCI, using case studies of current grantees to illustrate how communities are grappling with today's challenges. Next, I review the salient findings presented by this volume's authors about the relationship between equity and sustainability. Finally, I consider the implications of this work on future policy and propose ways that HUD and its partners can join forces to support sustainable and resilient communities.

Supporting Innovation in the Face of Change

HUD was created at a time of crisis for America's cities. Social, economic, and environmental volatility engendered new approaches. The Housing Act of 1954[1] introduced Section 701 Comprehensive Planning Assistance grants, which facilitated the development of comprehensive plans for urban and rural areas. Grants were awarded to multipurpose regional planning agencies, cities, counties, and states to build local technical capacity and coordinate regional planning efforts around housing, transportation, land use, and the management of natural resources.

The Urban Development Action Grant program (UDAG) was created in 1977 as a cornerstone of the Carter Administration's national urban policy. The program encouraged the private sector to take part in the revitalization of distressed cities by investing in physical development projects that would create jobs and ignite local economic activity. During the course of 12 years, UDAG directed $4.6 billion to roughly 3,000 large-scale development and redevelopment projects in more than

[1] Public Law 83–560.

1,200 cities, most of which were experiencing severe economic hardships and were having trouble attracting private investment. It was an early test of public-private partnerships deployed in the service of urban economic development.

UDAG and Section 701 set important precedents for encouraging local flexibility to craft revitalization strategies, create partnerships between the public and private sectors and among governments at the regional scale, and to make transformative improvements in struggling cities and towns. By the end of the 1980s, however, neither of these programs existed. What have we learned from HUD's recent revival of support for long-range, comprehensive planning through SCI? Why was this initiative *the right program at the right time*, and, moreover, how do we sustain this momentum into the future?

The roots of SCI can be identified in those earlier, landmark programs, but the context for the work now is different. We are living in a time of tremendous change—demographics, population shifts, climate-related changes, and economic restructuring, to name only a few challenges communities face—without an obvious handbook of solutions.

On the economic front, many communities have experienced a slow or uneven recovery from the Great Recession with the prospect that economic restructuring of some industries may mean that more jobs are disappearing from the economy. At the same time, new opportunities in the knowledge economy and the role that shared assets can play (the sharing economy) are a focus for some regions seeking to increase their economic competitiveness. Workforce development strategies must find ways to match economic trends and sector-specific needs to training workers with those specific skills to meet the needs of growing sectors. In addition, communities increasingly are recognizing that investing in vibrant, high-quality places may be one of the most effective ways to retain their local talent, attract top-notch workers, and grow jobs and businesses.

When HUD launched SCI 5 years ago, many communities were seeking ways to reenergize and refocus their economies. During a 2-year period, fiscal years 2010 and 2011, HUD invested $240 million in competitive Regional Planning Grants and Community Challenge Planning Grants to 143 regions and communities to enable them to take a deliberate approach to adapting their economies for a changing future.

- The Opportunity Collaborative, representing metropolitan Baltimore, for example, used a Sustainable Communities Regional Planning Grant to map out existing barriers to employment and promising career pathways. By identifying emerging opportunities, the Collaborative was able to provide clarity to jobseekers while also cultivating a skilled workforce for the region's major employment sectors. This study also identified transportation and housing barriers that prevent Baltimore-region residents from accessing employment opportunities. Workers there struggle to find affordable housing near the growing job centers that are concentrated far from the urban core, and low-income households dependent on public transportation are unable to make the commute because the region's transit systems do not connect to these decentralized employment locations. The Opportunity Collaborative's *The Last Mile* project, funded with its HUD grant, sought to bridge that gap by teaming the Central Maryland Transportation Alliance with the BWI (Baltimore-Washington International Airport) Business Partnerships to create stronger transit connections to the region's airport district. This innovative partnership will connect people to a major employment center, increase access to jobs for everyone in the region, and ensure that regional employers can attract new talent and retain existing workers.

- Flint, Michigan, which lost more than one-half of its population during the past four decades in large part because of automobile plant shutdowns, used a HUD Sustainable Communities Challenge Grant to develop its first master plan in 50 years. This award-winning plan[2] designates job growth areas, calls for repurposing vacant land, and has helped direct strategic investments. Those investments already have helped the city engage 42 projects, creating or retaining nearly 2,000 jobs, including more than 1,000 permanent positions, and catalyzing more than $1.2 billion in capital investments in Flint.

SCI has also enabled communities to take a deliberate look at changing demographics so they can make strategic choices about future investments.

- East Arkansas' Regional Planning Grant, for instance, has helped this largely rural region develop a user-friendly data platform, changing the regional discussion about out-migration and a shrinking population. With a close examination of population trends, reNEW East Arkansas (led by the East Arkansas Planning & Development District) determined that, although several of its counties were indeed losing population, they are actually gaining population in the 25- to 44-year-old age group, the prime employment years. With this insight, the region is working to expand its entrepreneurship programs targeting this demographic, particularly in the area of value-added agriculture and its regional food economy. The region also has revealed that tourism (including cultural and historic tourism) brings more than $0.5 billion into the area annually, reminding county governments of the value of supporting and expanding this economic sector.

One of the most significant changes in the past several years is the visible evidence of climate change. From 2005 to 2013, Congress allocated $43 billion in Community Development Block Grant Disaster Recovery funds to states and localities. The most recent catastrophic disaster, Hurricane Sandy, caused more than $50 billion in damages. Hurricane Katrina, in 2005, caused more than $108 billion in damages. Although disasters are expensive for all levels of government, for households, and for businesses, they have the most devastating effects on low- and moderate-income households without the personal resources to bounce back from a disaster—and those disasters are happening with increasing frequency and intensity. Be it extreme weather events, rising sea levels, floods, droughts, or temperature extremes, most communities have yet to prepare for these changing conditions.

Natural disasters do not recognize political boundaries, so interjurisdictional collaborations—a centerpiece of HUD's Regional Planning Grants—have proven to be essential in reducing the effects of climate change. The New York-Connecticut Sustainable Communities Consortium, supported by a HUD Regional Planning Grant, completed two climate-resilience studies less than a month before Hurricane Sandy hit the region in 2012. Thanks to that collaboration, the Consortium members were able to respond quickly and strategically to the widespread damage from the storm. HUD's work has increasingly focused on helping communities become more resilient to the effects of climate change and reducing climate-altering emissions.

[2] The Imagine Flint Master Planning Process was awarded a 2014 Planning Excellence Award for Public Outreach by the Michigan Association of Planning.

Climate-resilience strategies do not have to be highly technical to be effective. Although some SCI grantees—like the Washington County Council of Governments in Maine—have produced sophisticated mapping, modeling, and vulnerability assessments for their communities, many communities have found creating a regional framework for working together on climate issues to be enormously valuable. Communities in Gulfport, Mississippi, and southeastern Florida have convened working groups that agreed on adaptation priorities to target the most serious threats to vulnerable populations and essential community infrastructure. This approach allowed for the alignment of local policies from straightforward land use changes, existing planning processes, or prospective infrastructure investments to be modified with a climate-resilience lens to reduce vulnerability to future shocks and stresses.

Without Equity, There Is No Sustainability

Vulnerability is a concept that cuts across every arena of planning. In a disaster, the most vulnerable populations are often the ones with the fewest resources to help them bounce back. Households with limited housing and transportation options will have less ability to weather prolonged economic downturns or displacement pressures. Resilience and sustainability require diversity, innovation, economic mobility, and social connectedness. The elements that make a community walkable, livable, economically competitive, and equitable will also help make that community more resilient.

Severe wealth and income inequities are placing limits on choice, opportunity, and stability for a large percentage of the population, which in turn diminishes the resilience of regions as a whole. Inclusive communities are inherently more sustainable communities. The SCI set a new and higher bar for equity assessments and public engagement in regional planning. Regional Planning grantees were required to conduct Fair Housing and Equity Assessments, which are now being used as the basis of a new fair housing tool that would enable HUD to more effectively fulfill its obligations to affirmatively further fair housing under Title VIII of the Civil Rights Act.[3] These assessments revealed regional patterns of racial and ethnic concentrations of poverty; major gaps in access to basic services like health care and education; and transportation challenges that limited the mobility of low-income families, the elderly, and residents with disabilities. Community engagement was also a critical component of this work, because data simply cannot capture some underlying conditions. A more inclusive process produced very different outcomes.

- Federal seed money helped the Puget Sound region in Washington State achieve more equitable growth by preserving and expanding affordable housing near transit. As part of the Puget Sound Regional Council's Growing Transit Communities initiative, funded by a HUD Regional Planning Grant, the city of Seattle committed $1 million to establish a Regional Equitable Development Fund, which will help leverage additional funds and be used to purchase properties near light rail stations. This fund will help the region preserve, rehabilitate, and develop higher density, mixed-use housing that will remain affordable to residents with a wide range of income levels. The families along the new transit line will benefit from the reduced risk of displacement caused by rising demand and housing prices that often accompany major transit investments, thanks

[3] Public Law 90–284.

> to the regional collaboration of public, private, and nonprofit stakeholders under the Growing Transit Communities framework. Moreover, the entire region will benefit from both expanded transportation options and more vibrant, walkable neighborhoods.

The research presented in this issue of *Cityscape* highlights the incredible progress we have made in the field of sustainable community development. Todd Nedwick and Kimberly Burnett referenced the widespread belief that housing developers recognize the benefits of locating affordable housing near transit (Nedwick and Burnett, 2015). Andrew P. McCoy, C. Theodore Koebel, Andrew R. Sanderford, Christopher T. Franck, and Matthew J. Keefe find that energy-efficient construction is now a sign of excellence in the trade (McCoy et al., 2015). James Svara, Tanya Watt, and Katherine Takai point to the mainstreaming of sustainability in the political sphere; local governments are advancing ambitious sustainability plans for their towns, cities, and regions, many with an equity orientation (Svara, Watt, and Takai, 2015). Given the wide range of interpretations of the term "equity" in their national survey of local governments, Svara et al. (2015) provide a useful working definition with their analysis of a comprehensive approach to sustainability, asserting that without attention on equity, local governments are not reaching their sustainability goals.

Many of the articles touch on the overwhelming demand for walkable, livable, and accessible environments and the accompanying pressures that demand is putting on the affordability of those places. Julia Koschinsky and Emily Talen find in their national analysis of the affordability of walkable neighborhoods that the current supply of these walkable and amenity-rich environments falls drastically short of the current demand from people of many different ages and backgrounds (Koschinsky and Talen, 2015). They find that only 14 percent of all metropolitan neighborhoods are walkable and accessible, and increased demand could mean that such neighborhoods could soon be a luxury only for the most affluent residents. Adkins (2013) found that only 27 percent of low-income households with a preference for accessible neighborhoods were able to move to a very walkable area compared with 53 percent of higher income households.

These places are not strictly urban, of course. Suburban and rural communities have made very effective use of HUD Planning Grants. As Koschinsky and Talen (2015) emphasize, the important distinction is between accessible and inaccessible places in both urban and suburban locations that are not compromised by crime or poor quality of the walking environment, rather than between urban and suburban. Their proposals for strategies to expand the access that low-income and HUD-supported households have to these desirable neighborhoods are pragmatic and intriguing. These studies also highlight important tensions in longstanding approaches to planning that deserve thoughtful debate. Given the forces discussed previously, planners must be constantly assessing, evaluating, gathering data, monitoring progress, and making adjustments to keep pace with sometimes rapidly changing circumstances. Technology has revolutionized our ability to do just that and make plans in real time. The studies by Rolf Pendall, Christopher Hayes, Arthur (Taz) George, Casey Dawkins, Jae Sik Jeon, Elijah Knaap, Evelyn Blumenberg, Gregory Pierce, and Michael Smart and by Blumenberg, Pierce, and Smart propose tailoring HUD housing assistance to a household's individual transportation needs and assets, including access to a car (Blumenberg, Pierce, and Smart, 2015; Pendall et al., 2015). With the sharing economy expanding our notion of mobility and car ownership, providing more transportation options to low-income families would add another tool to reach the ultimate goal of household stability and economic opportunity. These analyses also reveal the limitations of transit when funding cannot maintain adequate levels of service. Again, given the new fiscal reality of community development, government alone cannot solve the biggest challenges. Innovative solutions are required that can leverage public resources through partnerships with leaders in the community development, business, and philanthropic realms.

Where Do We Go From Here?

How can local leaders position their communities for success in this uncertain environment? The key is thoughtful and deliberate planning that gazes fearlessly and clear-eyed into the future. Resilience recognizes that the future is going be significantly different than the past, and communities will have to decide what kind of future they want to have and take the deliberate steps to get there. Doing things the way they have always done them will not serve communities that are rapidly changing. A sustainable and resilient community will broadly engage its citizens, including those with the most modest means; collaborate effectively across jurisdictional and departmental boundaries; creatively use all its assets; harness new technologies and integrate new information; engage new business, institutional, and nonprofit partners; build on regional strengths; and provide choice and opportunity to all.

HUD has supported community vitality through many different programs during the past 50 years. We have an ambitious mission to create strong, sustainable, and inclusive communities and quality affordable homes for all. SCI provides strong evidence that our place-based strategies have seeded the innovation needed to help accomplish this mission and meet the challenges ahead.

Dive into these innovative approaches with our Sustainable Communities Initiative Resource Library, which houses the growing body of products and best practices produced by our landmark Regional Planning and Community Challenge grantees. For more information about SCI, see https://www.hudexchange.info/programs/sci/resources.

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Author

Harriet Tregoning is Principal Deputy Assistant Secretary for Community Planning and Development and the former Director of the Office of Economic Resilience at the U.S. Department of Housing and Urban Development.

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Will My Neighbors Rebuild? Rebuilding Outcomes and Remaining Damage Following Hurricanes Katrina and Rita

Jonathan Spader
Abt Associates Inc.

Abstract

This article describes the rebuilding outcomes of hurricane-damaged properties in Louisiana and Mississippi using direct measures of remaining damage collected using onsite observation of properties' exterior conditions. The empirical analysis presents representative estimates of the rebuilding outcomes of owner-occupied properties and renter-occupied properties in early 2010, which is between 4 and 5 years after the 2005 hurricanes. The article then examines the extent to which damaged structures were clustered in concentrated pockets of remaining damage.

Introduction

Hurricanes Katrina and Rita created unprecedented damage to the housing stock in communities along the Gulf Coast. In Louisiana and Mississippi, in particular, the scale of the damage led policymakers to reconsider their approach to rebuilding assistance for residential housing recovery. This article provides representative estimates of the rebuilding outcomes of owner-occupied properties and renter-occupied properties in early 2010—between 4 and 5 years after the 2005 hurricanes. It then examines the extent to which properties with remaining damage were clustered in concentrated pockets or distributed among properties where other property owners had invested in rebuilding.

This information provides valuable insight into the rebuilding patterns of owner-occupied and renter-occupied properties following a natural disaster. Although the immediate goal of hurricane-recovery efforts should be to rebuild an adequate supply of habitable housing units, the design of housing recovery programs must also consider the longer term rebuilding outcomes of damaged properties and neighborhoods. In particular, properties that contain visible repair needs for sustained periods of time may reduce the property values and rebuilding outcomes of surrounding properties. Such externality effects represent social costs that are frequently used to justify the allocation of public funds to the rehabilitation or demolition of blighted structures. Documenting the extent and concentration of sustained damage therefore helps to inform the tradeoffs policymakers face when allocating limited funds between rebuilding assistance and blight remediation programs and when determining whether to incentivize property owners to rebuild in place or relocate to other areas.

An emerging literature reviews the process that the city of New Orleans used to develop a revised city plan (Nelson, Ehrenfeucht, and Laska, 2007; Olshansky, 2006; Olshansky et al., 2008). These discussions involved difficult decisions about how to define the future footprint of the city, thus charting the course for public investments in infrastructure, schools, and neighborhood-level rebuilding efforts. Lowe (2012) presented a similar discussion of the policy development and planning process in Mississippi, describing the political influences that shaped the design of housing recovery programs. Subsequent studies have also conducted detailed assessments of the Road Home program administered by the State of Louisiana, examining its calculation rules (Green and Olshansky, 2012; Spader and Turnham, 2014), implementation experience (GAO, 2010), distributional consequences (Gotham, 2014), and impact on households' locational and resettlement decisions (Gregory, 2012). Less evidence exists, however, regarding property owners' rebuilding activities and the longer term reconstruction of hurricane-damaged properties.

This article contributes to this literature by examining the patterns of rebuilding activity and sustained damage that were present following Hurricanes Katrina and Rita. First, it provides representative estimates of rebuilding outcomes for hurricane-damaged properties on significantly affected blocks and documents the presence of sustained damage. The results show that a substantial percentage of hurricane-damaged properties continued to show visible repair needs more than 4 years after the storms. Second, it examines the extent of spatial clustering among properties with sustained damage. The descriptive results show that damaged and uninhabitable properties were not isolated on a few abandoned blocks, but rather were distributed across blocks where other owners had invested in rebuilding. The analyses then estimate a census block-level fixed effects model that examines the extent of within-block clustering of damaged and uninhabitable structures on neighboring properties. The results show that the rebuilding outcomes of renter-occupied properties are significantly associated with the rebuilding outcomes of their neighboring properties, but that the extent of within-block clustering is weaker and not statistically significant among owner-occupied properties. Although these estimates are consistent with the presence of externality effects, the estimation strategy cannot rule out the potential for unobservable sources of within-block variation in rebuilding outcomes. Instead, the article uses these estimates to measure the extent to which damaged and uninhabitable structures were clustered in pockets of remaining damage.

Reconstruction of Damaged Properties Following Hurricanes Katrina and Rita

The nature of housing reconstruction following natural disasters is not well understood (National Research Council, 2006). Reviewing the literature on housing recovery following natural disasters, Peacock, Dash, and Zhang (2007) argued that insurance payouts, rebuilding assistance, and other sources of rebuilding funds play a central role in determining whether properties are rebuilt. Little empirical evidence exists, however, to document the rebuilding decisions of property owners or the reconstruction outcomes of damaged properties following natural disasters.

Zhang and Peacock (2010) analyzed the housing recovery process following Hurricane Andrew, describing changes in home sales, tax appraisals, and vacant parcels in Miami-Dade County. Their analysis found that the tax-appraised values of hurricane-damaged homes remained below their prestorm levels for many years after the storm. The authors also showed that housing recovery occurred unevenly across property types and neighborhoods, with rebuilding outcomes lagging among renter-occupied properties and properties in neighborhoods with greater shares of minority residents. Other case studies of previous natural disasters suggest that low-income and minority households suffered disproportionately high levels of damage and faced greater gaps in their access to sources of rebuilding assistance.[1] The literature unfortunately is less developed regarding the reconstruction outcomes of the permanent housing stock.

Empirical evidence is needed to document the extents and patterns of rebuilding activity on hurricane-damaged properties. Beyond the implications for individual property owners, the presence of sustained damage may negatively impact housing recovery outcomes at the neighborhood level. No existing studies examine the extent of spatial clustering in rebuilding outcomes or the presence of externalities from sustained damage. Instead, the most recent evidence on externality effects resulting from property conditions comes from the literature on the spillover effects of foreclosures (Campbell, Giglio, and Pathak, 2011; Fisher, Lambie-Hanson, and Willen, 2012; Frame, 2010; Gerardi et al., 2012; Goodstein et al., 2011; Harding, Rosenblatt, and Yao, 2009; Hartley, 2011; Immergluck and Smith, 2006; Lee, 2008; Leonard and Murdoch, 2009; Lin, Rosenblatt, and Yao, 2009; Mikelbank, 2008; Schuetz, Been, and Ellen, 2008; Whitaker and Fitzpatrick, 2011). Although these studies cannot isolate the contribution of deferred maintenance and visual blight apart from other potential mechanisms, they highlight the potential for property values to capitalize the presence of nearby disamenities.

In the case of Hurricanes Katrina and Rita, both the initial damage and the subsequent policy response were unique in scale relative to previous disasters in the United States. The rebuilding outcomes of hurricane-damaged properties must therefore be understood within the context of both the initial storms and the associated disaster recovery effort. Following the hurricanes, the largest source of rebuilding funds for most property owners came from insurance payouts—including any flood insurance from the National Flood Insurance Program. Aside from property owners'

[1] See Peacock, Dash, and Zhang (2007) for a literature review of housing recovery after natural disasters. See also Comerio (1998) and Wu and Lindell (2004) for case studies of the housing recovery response after other natural disasters in the United States.

insurance policies, the next largest source of rebuilding funds came from federal Community Development Block Grants (CDBGs) to the five states (Alabama, Florida, Louisiana, Mississippi, and Texas) along the Gulf Coast (Turnham et al., 2011). Although other sources of assistance existed, the percentage of households that received rebuilding funds from the Federal Emergency Management Agency's (FEMA's) Individual Assistance (IA) program, Small Business Administration (SBA) loans, or other sources is much smaller than the coverage of the CDBG assistance programs.[2]

The scale of the CDBG rebuilding assistance programs meant that these programs played a central role in determining the rebuilding funds available to property owners and the incentives associated with repairing damaged structures. The remainder of this section therefore provides a brief overview of the CDBG rebuilding assistance programs available to owner-occupants and rental property owners in Louisiana and Mississippi. For owner-occupants, the CDBG assistance programs provided grants directly to owners whose insurance payments and other sources of assistance did not fully cover the estimated cost to rebuild. In each state, the grant amount was defined to approximate the estimated cost to rebuild minus any insurance payouts and FEMA IA awards for structural repairs, with a maximum grant amount of $150,000.[3] The amount of any outstanding SBA loan was also deducted from the grant amount in order to pay off the SBA loan—that is, the CDBG grants replaced SBA loans with grant funds.

For owners of one- to four-unit rental properties, the CDBG assistance programs were substantially smaller than the programs available to owner-occupants, both in the number of grants distributed and in their coverage of damaged properties (Turnham et al., 2010). Using the Road Home Small Rental Property Program in Louisiana and Mississippi's Small Rental Property Assistance Program, owners of one- to four-unit rental properties could receive a rebuilding grant that required the owner to rebuild the damaged housing units and rent the rebuilt units to low- and moderate-income tenants.[4] In March 2010, only 4,449 rental properties in Louisiana and 2,149 properties in Mississippi had received grants from the small rental property programs. By contrast, the grant programs for owner-occupants distributed 124,516 grants in Louisiana and 25,086 in Mississippi during the same period.

These grant award outcomes highlight the extent to which policymakers in both Louisiana and Mississippi allocated larger amounts of funding to support rebuilding assistance for owner-occupants than for rental property owners. Accounting for the broader set of federal assistance programs, the Government Accountability Office (GAO, 2010: summary page) concluded that, "when the estimated number of assisted units is compared to the estimated number of damaged units,

[2] In the immediate aftermath of the hurricanes, FEMA's IA program included support for temporary housing needs and limited funding for structural repairs. SBA loans were also available to support property owners' rebuilding activities. A small number of property owners also used assistance from churches, charities, friends, relatives, state and local government programs, and other sources to support rebuilding activities (Turnham et al., 2011).

[3] Program guidelines—including the precise calculation rules—are available at the program websites, http://www.Road2LA.org and http://www.MSDisasterRecovery.com.

[4] These programs also had more restrictive eligibility rules—and more complex calculations for determining the grant amount—than the programs for owner-occupants.

62 percent of damaged homeowner units and 18 percent of damaged rental units were assisted.”[5] Among owner-occupants, some variation existed in the extent to which the CDBG grants covered the full cost of rebuilding. In particular, the prestorm value rule in Louisiana reduced the grant amount below the full estimated cost to rebuild for many owner-occupants (Green and Olshansky, 2012; Spader and Turnham, 2014). Nonetheless, the coverage estimates suggest that CDBG grants helped to reduce the extent of resource constraints for many owner-occupants.

Although these programs delivered billions of dollars in rebuilding assistance to owner-occupied and renter-occupied properties, they did not guarantee investment in all hurricane-damaged properties (Spader and Turnham, 2014). The programs for owner-occupants in both states included options for owners who chose not to rebuild their damaged property. In Louisiana, the Road Home Homeowner Program provided 100 percent of the potential grant amount to owner-occupants who chose to relocate to another property within the state and 60 percent of the potential grant amount to owner-occupants who chose to relocate to another state. Owner-occupants who exercised these options transferred their damaged properties to the Louisiana Land Trust (LLT) for sale, rehabilitation, or demolition by the state. In Mississippi, the Homeowner Assistance Program compensated owner-occupants for their loss and did not require recipients to rebuild. For renter-occupied properties, the CDBG program rules required grant recipients to invest in the hurricane-damaged property, but the size of these programs meant that only a small percentage of rental property owners received CDBG funds.

The analysis in the remainder of this article contributes to the literature on housing recovery by documenting the extent to which hurricane-damaged properties continued to show visible repair needs for many years following Hurricanes Katrina and Rita. The objective of this analysis is to determine the extent of housing recovery among hurricane-damaged properties, providing representative estimates of sustained damage and examining the patterns of spatial clustering among properties with remaining repair needs. Although the CDBG assistance programs played an important role in supporting housing recovery, evaluation of the impact of CDBG assistance is beyond the scope of this article.[6] Instead, the rebuilding outcomes described in this article should be interpreted as the cumulative result of initial hurricane damage, access to CDBG and other sources of rebuilding assistance, and all other factors that shaped the housing recovery process following Hurricanes Katrina and Rita.

Data and Methods

The empirical analysis examines the patterns of rebuilding activity and remaining damage following the 2005 hurricanes. The analysis dataset draws on two sources of information. First, FEMA’s initial damage assessments were used to provide baseline information on property damage and serve as the basis for the sampling approach. Second, updated information on property conditions was collected using onsite observation of each property’s exterior conditions in early 2010.

[5] Spader and Turnham (2014) provided similar estimates specific to the CDBG program’s coverage of owner-occupied properties and renter-occupied properties with major or severe damage on significantly affected blocks. They estimated that 58 percent of owner-occupied properties in the most severely affected neighborhoods of Louisiana and Mississippi received rebuilding grants compared with 10 percent of renter-occupied properties.

[6] Spader and Turnham (2014) provided a more detailed analysis of the CDBG housing recovery programs, including analysis of the grants’ coverage and adequacy and estimates of rebuilding outcomes for grant recipients who chose each of the programs’ grant options.

The FEMA data include all residential housing units that received a FEMA damage assessment in the wake of the 2005 hurricanes. These data are not exhaustive of all properties that experienced hurricane damage; however, they provide the most comprehensive source of information on damaged units (Richardson and Renner, 2007).[7] The FEMA inspections classify housing units into four levels of damage.

1. Severe damage: The damage estimate is more than 50 percent of the value.
2. Major damage: The damage estimate is more than $5,200 but not more than 50 percent of the value.
3. Minor damage: The damage estimate is less than $5,200.
4. No damage: The unit did not sustain hurricane damage.

The analysis sample includes hurricane-damaged properties on a stratified sample of significantly affected blocks. A significantly affected block is defined as a census block on which three or more housing units received FEMA assessments of major or severe damage. For the empirical analysis in this article, the unit of analysis is the property—defined as a residential structure. Properties that contain multiple housing units are classified according to the most severely damaged unit, and the onsite property observations document the exterior condition of the structure as a whole. The initial sample from the FEMA data includes all properties with major or severe damage on a stratified sample of significantly affected blocks in Louisiana and Mississippi (Turnham et al., 2010). The analysis sample for this article is limited to properties with FEMA assessments of major or severe damage on blocks with at least four properties with major or severe damage.[8]

The analysis sample includes 2,393 properties on 160 blocks in Louisiana and Mississippi. Of the 160 blocks, 11 (7 percent) contain the minimum of 4 properties with major or severe damage. The remaining blocks vary widely in the number of observed properties. 82 percent contain 6 or more properties and 57 percent contain 10 or more properties.

The second source of data comes from windshield observations of exterior property conditions in January and February 2010. For each of the 2,393 properties in the analysis sample, trained observers assessed the exterior condition of each property from the street or sidewalk using a structured observation guide. The observations document housing repair needs, signs of occupancy, and signs of ongoing repair activity. Turnham et al. (2010) provided detailed documentation of the observation instrument and data collection methodology. They also defined a measure—substantial repair needs—that aggregates the information about housing repair needs into a single measure

[7] HUD estimates suggest that properties that received a FEMA damage estimate constitute between 50 and 95 percent of all housing units in the areas covered by the sample. The estimates of coverage range from 53 percent of housing units in Jefferson Parish to 90 percent of housing units in Cameron Parish. Estimates for the New Orleans Planning Districts range from 61 percent in Uptown to 99 percent in New Orleans East.

[8] The requirement of at least four properties is necessary to conduct the analysis of clustering defined by Equation 1, where each property is compared with two neighboring properties (not necessarily adjacent) and at least one more distant property on the same block.

that reflects the extent of property damage visible to the observer. According to this definition, a property exhibits substantial repair needs if the exterior of the structure has one or more observable repair needs and the overall condition is fair or poor.[9]

The windshield observations were used to construct four measures of rebuilding outcomes.

1. Cleared lot: A property is assessed as a cleared lot if it contains an empty lot or a foundation with no standing residential structure. Because the sample is drawn from the population of properties with assessed damage to a housing unit, we infer that residential structures have been cleared from these properties.
2. Damaged structure: A property is assessed as a damaged structure if it contains a residential structure that shows substantial repair needs using the definition in Turnham et al. (2010).
3. Uninhabitable structure: A property is assessed as an uninhabitable structure if it contains a residential structure in which any housing unit does not meet the census definition of habitability. According to this definition, housing units are habitable if they are closed to the elements with intact roof, windows, and doors and no positive evidence—such as a sign on the house or block—that the unit is to be demolished or condemned. All uninhabitable structures also meet the definition of damaged structures, so these properties are a subset of the damaged structures.
4. Rebuilt structure: A property is assessed as a rebuilt structure if it contains a residential structure that does not meet the definition of a damaged structure. Thus, the measures of cleared lots, damaged structures, and rebuilt structures are mutually exclusive and exhaustive.

Because the property observations were made in January and February 2010, the observers could not determine whether the observed damage was caused by the 2005 hurricanes, deferred maintenance by the owner, or some other cause. Although the structured observation guide focused on repair needs associated with hurricane damage—such as missing shingles, observable flood lines, and so on—it is possible that some of the observed damage was not the result of the hurricanes. The measure of damaged structures may be particularly susceptible to this issue, so all the analyses are replicated using the measure of uninhabitable structures, which provides a more conservative measure that reflects severe damage to the property's exterior.

The first component of the analysis uses these property observations to produce representative information about properties' rebuilding outcomes. The analysis sample is representative of the population of properties that had major or severe damage assessments on significantly affected blocks in Louisiana and Mississippi with at least four hurricane-damaged properties. All analyses use probability weights to account for the sampling design.[10]

[9] Properties in fair or poor condition exhibit one or more repair needs and show major signs of deterioration, such as cracked or broken windows, missing roof materials, rotted porches, or large areas of peeling paint. See Turnham et al. (2010) for additional documentation regarding how this measure was constructed.

[10] The strata for sampling reflect counties in Mississippi and parishes in Louisiana. The sampling design oversampled blocks in strata with relatively fewer significantly affected blocks (Turnham et al., 2010).

The second component of the analysis examines the extent to which damaged and uninhabitable structures are clustered in concentrated pockets of remaining damage. The objective of these analyses is to examine the extent to which property owners' rebuilding decisions left blocks or sections of blocks with clusters of damaged or uninhabitable structures. The analysis first describes the distribution of remaining damage across blocks. It then examines the extent to which damaged and uninhabitable structures are clustered next to one another within blocks.

To measure the extent of spatial clustering, the analysis defines a variable that reflects the presence of damaged or uninhabitable structures on neighboring properties N_{pb}. Neighboring properties are defined as the two closest properties with major or severe initial hurricane damage.[11] Because the sample is limited to properties with major or severe damage, it excludes properties that either were not assessed by FEMA or that suffered minor or no damage from the 2005 hurricanes. As a result, the neighboring properties are not always the properties directly adjacent to the property. Instead, they are the two closest properties with FEMA assessments of major or severe damage. When properties are plotted to point locations in a Geographic Information System, or GIS, the centroid-to-centroid distances to the two closest properties are, on average, 17 and 33 meters, respectively. By comparison, the average centroid-to-centroid distance to the most distant nonneighboring property on the block is 139 meters. The measure of neighboring properties' rebuilding outcomes N_{pb} reflects the average value for the two neighbors. For example, the measure of remaining damage on neighboring properties would be equal to 0.5 if one of the properties contains a damaged structure and equal to 1 if both neighboring properties contain damaged structures.

The empirical model tests whether a property is more likely to contain a damaged structure if the neighboring properties also have remaining damage. A general form for the estimation model can be defined by—

$$D_{pb} = N_{pb}\beta_1 + X_{pb}\beta_2 + B_b + \varepsilon_{pb} , \qquad (1)$$

where p indexes the property and b indexes the census block. The outcome measure D_{pb} is an indicator variable for whether the property contains a damaged or uninhabitable structure. The set of baseline property characteristics X_{pb} includes measures that reflect the assessed level of initial hurricane damage and the ownership status of the property—owner-occupied property versus renter-occupied property. The census block-level fixed effects B_b isolate within-block variation, comparing the rebuilding outcome of each property with the rebuilding outcomes of other properties on the same block.

The coefficient β_1 therefore identifies whether a property is more or less likely—relative to the average rebuilding outcomes of nonneighboring properties on the same block—to contain a damaged or uninhabitable structure if the neighboring properties contain damaged or uninhabitable structures. If the within-block clustering of unobservables is minimal and the baseline property characteristics X_{pb} account for any within-block clustering of factors associated with rebuilding, the coefficient β_1 will measure the externality effect of neighboring damage. Because the set of baseline characteristics X_{pb} is limited, however, this interpretation requires an assumption about the absence

[11] An alternative is to define neighbors as the nearest observed property in either direction. This alternative selects the same set of neighboring properties for more than 80 percent of the analysis sample.

of within-block clustering of unobservables. The discussion therefore interprets this coefficient as a measure of the extent to which damaged and uninhabitable structures are clustered in pockets of remaining damage within blocks.

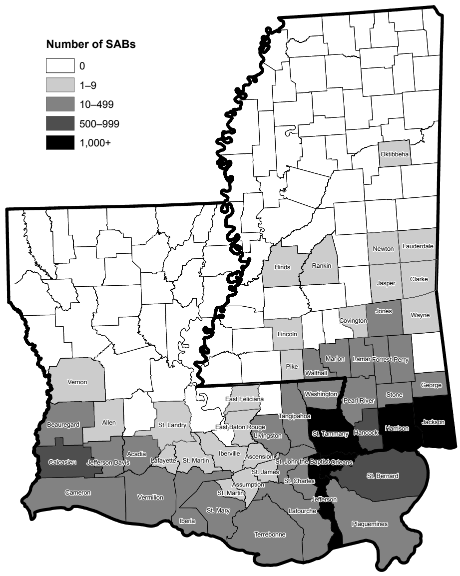
Equation 1 is estimated as a linear probability model using ordinary least squares (OLS).[12] To estimate this model with the analysis dataset, the analysis sample is separated into an estimation sample and the set of neighboring properties, which are omitted from the estimation sample. For each block, the process randomly selects an initial property as a sample property. It then identifies the neighboring properties and works in each direction to categorize properties as sample or neighboring properties. Continuing this process around each block produces an estimation sample of 948 properties, with 1,445 properties identified as neighboring properties.[13]

Estimates of Remaining Damage

Exhibit 1 shows the distribution of significantly affected blocks across parishes and counties in Louisiana and Mississippi—the states that experienced the most extensive hurricane damage. The shading

Exhibit 1

Distribution of Significantly Affected Blocks Across Parishes and Counties



SAB = significantly affected block.

Note: An SAB is a census block with at least three housing units that received Federal Emergency Management Agency assessments of major or severe damage after Hurricanes Katrina and Rita in 2005.

[12] Estimation with OLS is preferred because of limitations with the fixed-effect logit model, most notably the loss of sample on blocks with no variation in the outcome variable.

[13] Neighboring properties can be a neighbor to more than one property in the estimation sample. The number of neighboring properties is not a perfect multiple of the estimation sample because many blocks in the sample have an odd number of properties, a nonstandard shape, or both.

in exhibit 1 highlights the concentration of significantly affected blocks in a handful of parishes and counties. Although 20 Louisiana parishes contained 10 or more significantly affected blocks, 3 parishes—Orleans, Jefferson, and St. Tammany—contained more than 1,000 significantly affected blocks. Similarly, although 12 Mississippi counties contained 10 or more significantly affected blocks, 2 counties—Harrison and Jackson—contained more than 1,000 significantly affected blocks.

The analysis sample described in the previous section produces representative estimates of the rebuilding outcomes of properties that have major or severe hurricane damage on significantly affected blocks with at least four damaged properties. Before the hurricanes, 70 percent of such properties were owner-occupied properties and 30 percent were renter-occupied properties. The FEMA assessments for these properties indicate that 60 percent of properties received assessments of severe damage—59 percent among owner-occupied properties and 63 percent among renter-occupied properties—and 40 percent received assessments of major damage.

Exhibit 2 describes the estimated rebuilding outcomes, showing the percentage of properties in the analysis sample that contained rebuilt structures, cleared lots, damaged structures, and uninhabitable structures in early 2010. An initial finding from these estimates is that a substantial percentage of the properties contained damaged and uninhabitable structures 4 to 5 years after the initial hurricane damage. Although 70 percent of properties contained rebuilt structures, more than 17 percent of properties contained a residential structure with remaining damage that could be

Exhibit 2

Percent of Properties With Remaining Damage in Early 2010, by Geography

		Rebuilt Structures		Cleared Lots		Damaged Structures		Uninhabitable Structures	
	N	%	SE	%	SE	%	SE	%	SE
All	2,393	69.9	(0.025)	13.1	(0.028)	17.1	(0.020)	8.1	(0.012)
Louisiana	1,748	69.1	(0.027)	10.9	(0.032)	20.0	(0.027)	9.9	(0.015)
Jefferson Parish	199	96.0	(0.015)	1.0	(0.007)	3.0	(0.013)	1.5	(0.011)
Orleans Parish	1,177	64.5	(0.032)	7.3	(0.012)	28.2	(0.031)	14.4	(0.020)
MidCity Planning District	156	42.3	(0.079)	3.8	(0.014)	53.8	(0.083)	19.2	(0.055)
Lakeview Planning District	145	74.5	(0.059)	14.5	(0.046)	11.0	(0.047)	4.8	(0.021)
Gentilly Planning District	176	76.7	(0.050)	5.7	(0.035)	17.6	(0.049)	11.4	(0.053)
ByWater Planning District	165	50.9	(0.056)	8.5	(0.039)	40.6	(0.052)	25.5	(0.051)
Lower Ninth Ward Planning District	156	48.1	(0.077)	28.8	(0.093)	23.1	(0.040)	21.8	(0.038)
New Orleans East Planning District	192	82.3	(0.056)	2.1	(0.010)	15.6	(0.055)	7.8	(0.036)
Uptown Planning District	118	72.0	(0.098)	3.4	(0.031)	24.6	(0.087)	14.4	(0.049)
St. Bernard Parish	271	61.3	(0.069)	32.1	(0.080)	6.6	(0.052)	1.1	(0.006)
Mississippi	645	72.9	(0.062)	21.8	(0.065)	5.2	(0.011)	1.2	(0.005)
Harrison County	183	61.5	(0.055)	27.9	(0.065)	10.6	(0.025)	3.0	(0.012)
Biloxi	89	48.2	(0.078)	40.0	(0.110)	11.8	(0.049)	1.2	(0.011)
Jackson County	328	81.3	(0.099)	17.2	(0.103)	1.5	(0.010)	0.0	(0.000)
Pascagoula	219	89.0	(0.054)	11.0	(0.054)	0.0	(0.000)	0.0	(0.000)

SE = standard error.

observed from the street. Approximately one-half of these properties—8 percent of all properties in the sample—contained structures that did not meet the standard for habitability. The remaining 13 percent of properties contained cleared lots.

These rebuilding outcomes vary substantially between Louisiana and Mississippi. Although the proportion of previously damaged properties with rebuilt structures in both states is near 70 percent, Mississippi properties are more likely than Louisiana properties to be cleared of any remaining damaged structure. Of the Louisiana properties, 11 percent contained cleared lots and 20 percent contained damaged structures. By contrast, 22 percent of Mississippi properties contained cleared lots and only 5 percent contained damaged structures.

The variation in rebuilding outcomes across parishes, counties, and the other subgeographies shown in exhibit 2 is even larger than the differences between the state-level outcomes for Louisiana and Mississippi.[14] Although 70 percent of all properties contained rebuilt structures, the proportion of properties with rebuilt structures ranges from 96 percent in Jefferson Parish to 42 percent in the Mid-City Planning District of New Orleans. Similarly, the percentage of uninhabitable structures ranges from 0 percent in Pascagoula to 26 percent in the ByWater Planning District of New Orleans.

Exhibit 3 presents separate estimates for owner-occupied properties and renter-occupied properties. These estimates reveal much greater levels of remaining damage among the renter-occupied properties than among owner-occupied properties. Nearly 74 percent of owner-occupied properties were rebuilt compared with 60 percent of renter-occupied properties. This difference is entirely accounted for by the greater proportion of damaged structures among renter-occupied properties. Of owner-occupied properties, 13 percent contained damaged structures compared with nearly 28 percent of renter-occupied properties. With limited exceptions, the presence of remaining damage is greater among renter-occupied properties than owner-occupied properties in each state, county, and parish in exhibit 3.

The greater incidence of damaged and uninhabitable structures among renter-occupied properties is only partially explained by differences in initial hurricane damage and the geography of owner-occupied properties and renter-occupied properties. Exhibit 4 shows the results of regressions that test whether the differences in rebuilding outcomes between owner-occupied properties and renter-occupied properties are statistically significant after controlling for the initial damage assessment and for geography using census block-level fixed effects. Panel 1 presents the results from OLS regressions where the dependent variable indicates whether a property contained a damaged structure. Panel 2 presents similar estimates for uninhabitable structures.[15]

[14] Estimates for parishes, counties, and subgeographies are reported if the geography contains a minimum of 25 owner-occupied properties and 25 renter-occupied properties.

[15] Estimation with OLS is preferred because of the fixed-effect logit model's loss of sample from blocks that do not have any within-block variation in the outcome measure. The estimated differences between renter-occupied properties and owner-occupied properties are robust in sign, significance, and approximate magnitude when the models are replicated using fixed-effects logistic regression on the subsample of properties on blocks with variation.

Exhibit 3

Percent of Properties With Remaining Damage in Early 2010, by Tenure Status

	Owner-Occupied Properties		Renter-Occupied Properties		Owner-Occupied Properties		Renter-Occupied Properties	
	%	SE	%	SE	%	SE	%	SE
Panel 1	**Rebuilt Structures**				**Cleared Lots**			
All	73.9	(0.028)	60.3	(0.036)	13.5	(0.034)	12.0	(0.020)
Louisiana	73.1	(0.031)	60.5	(0.040)	11.9	(0.041)	8.6	(0.017)
Jefferson Parish	97.6	(0.012)	93.2	(0.038)	1.6	(0.010)	0.0	(0.000)
Orleans Parish	70.1	(0.032)	55.0	(0.042)	7.3	(0.013)	7.4	(0.015)
St. Bernard Parish	64.4	(0.075)	40.0	(0.076)	31.8	(0.083)	34.3	(0.107)
Mississippi	76.6	(0.061)	58.7	(0.077)	18.9	(0.063)	33.2	(0.083)
Harrison County	70.9	(0.046)	43.9	(0.073)	21.6	(0.044)	39.8	(0.109)
Jackson County	82.5	(0.090)	75.5	(0.144)	15.7	(0.096)	24.5	(0.144)
Panel 2	**Damaged Structures**				**Uninhabitable Structures**			
All	12.6	(0.018)	27.7	(0.030)	6.2	(0.010)	12.6	(0.022)
Louisiana	15.0	(0.025)	30.9	(0.036)	7.8	(0.014)	14.3	(0.025)
Jefferson Parish	0.8	(0.008)	6.8	(0.038)	0.0	(0.000)	4.1	(0.034)
Orleans Parish	22.6	(0.031)	37.7	(0.039)	12.2	(0.020)	18.1	(0.031)
St. Bernard Parish	3.8	(0.024)	25.7	(0.151)	0.8	(0.005)	2.9	(0.033)
Mississippi	4.5	(0.011)	8.1	(0.028)	0.9	(0.005)	2.3	(0.010)
Harrison County	7.5	(0.027)	16.3	(0.058)	1.7	(0.016)	5.4	(0.021)
Jackson County	1.9	(0.012)	0.0	(0.000)	0.0	(0.000)	0.0	(0.000)

SE = standard error.

The results in exhibit 4 show that controlling for properties' initial damage assessment and geography does not eliminate the differences in rebuilding outcomes between owner-occupied and renter-occupied properties. In Louisiana, the coefficients in Panels 1 and 2 show that the percentage of damaged and uninhabitable structures are 16 and 7 percentage points greater among renter-occupied properties than among owner-occupied properties. In Mississippi, these differences are 4 and 2 percentage points, respectively. In both states, these estimates closely mirror the differences between renter-occupied properties and owner-occupied properties in the descriptive statistics for damaged and uninhabitable structures shown in exhibit 3.

Controlling for geography with the census block-level fixed effects reduces but does not eliminate these differences. In Louisiana, the percentage of damaged and uninhabitable structures are, on average, 7 and 5 percentage points greater among renter-occupied properties than among owner-occupied properties on the same block. In Mississippi, these differences are 2 and 1 percent, respectively. The differences in Mississippi are small and not statistically significant, an outcome that appears to reflect the more frequent presence of cleared lots in Mississippi. The descriptive statistics in exhibit 3 show that—in addition to reducing the overall number of damaged structures in Mississippi—cleared lots appeared more frequently among renter-occupied properties than owner-occupied properties.

In Louisiana, the finding that small renter-occupied properties showed greater levels of sustained damage than owner-occupied properties in early 2010 is consistent with previous literature,

Exhibit 4

OLS Regressions of Differences in Rebuilding Among Owner-Occupied and Renter-Occupied Properties

	Louisiana		Mississippi	
	Coefficient (SE)	**Coefficient (SE)**	**Coefficient (SE)**	**Coefficient (SE)**
Panel 1: Outcome—Damaged Structure				
Renter-occupied property	0.161**	0.066**	0.040	0.021
	(0.034)	(0.025)	(0.031)	(0.026)
Severe damage	0.067***	– 0.020	– 0.029	– 0.005
	(0.035)	(0.029)	(0.025)	(0.062)
Block fixed effects	No	Yes	No	Yes
N	1,748	1,748	645	645
Panel 2: Outcome—Uninhabitable Structure				
Renter-occupied property	0.067**	0.051**	0.015	0.012
	(0.024)	(0.022)	(0.011)	(0.010)
Severe damage	0.038	0.002	– 0.009	– 0.020
	(0.024)	(0.020)	(0.008)	(0.030)
Block fixed effects	No	Yes	No	Yes
N	1,748	1,748	645	645

OLS = ordinary least squares. SE = standard error.
***p < .001. ***p < .10.*

suggesting that housing recovery takes more time for renter-occupied properties than owner-occupied properties (Peacock, Dash, and Zhang, 2007; Zhang and Peacock, 2010). Differences in insurance payouts, resource constraints, local rental requirements, and the other incentives facing owner-occupants versus rental property owners may each contribute to the slower pace of housing recovery among rental properties. The smaller size of the CDBG small-rental assistance programs described in the initial sections of this article may also contribute to the differences in rebuilding outcomes between owner-occupied properties and renter-occupied properties.

A final finding from exhibit 4 is that the severity of a property's initial hurricane damage is not a significant predictor of whether the property contained a damaged or uninhabitable structure. Although the measure of initial damage severity may not capture the full extent of variation in initial hurricane damage, the results in exhibit 4 do not provide any evidence that damaged or uninhabitable structures were more frequent among properties that suffered more severe levels of initial hurricane damage.

Taken together, the rebuilding outcomes described in this section document the potential for damaged and uninhabitable structures to remain unrepaired for many years. More than 4 years after Hurricanes Katrina and Rita, 17 percent of hurricane-damaged properties on significantly affected blocks continued to show repair needs that were visible from the street. This outcome highlights the need for disaster recovery efforts to anticipate the presence of sustained damage and to plan for blight remediation options that prevent unrepaired damage from becoming long-term sources of blight for neighboring residents.

Spatial Clustering of Remaining Damage

This section explores the patterns of rebuilding activity, examining the extent to which damaged and uninhabitable structures were clustered together in concentrated pockets of sustained damage. The analysis seeks to answer three questions about the spatial patterns of rebuilding activity and remaining damage. First: Were properties with damaged and uninhabitable structures concentrated on a few abandoned blocks or were they distributed across blocks where other property owners invested in rebuilding? Second: Were properties more likely to contain a damaged or uninhabitable structure if their neighboring properties contained damaged or uninhabitable structures? Third: To what extent were properties with sustained damage concentrated in neighborhoods with more vulnerable populations?

The first question—whether properties with damaged and uninhabitable structures were concentrated on a few abandoned blocks with no rebuilding activity—is straightforward to answer. It is not the case. Less than 3 percent of significantly affected blocks contained only damaged structures and cleared lots.[16] Instead, damaged and uninhabitable structures were primarily on blocks where other property owners returned to rebuild their hurricane-damaged properties. Of the significantly affected blocks, 57 percent contained both damaged structures and rebuilt structures. To the extent that damaged and uninhabitable structures create negative externalities for neighboring properties, this finding raises concerns about the potential for sustained damage to become a long-term disamenity for neighborhood residents. The remaining 40 percent of significantly affected blocks contained only rebuilt structures and cleared lots.

The second question explores the extent to which damaged or uninhabitable structures were clustered next to one another within blocks. Exhibit 5 presents descriptive statistics that show the percent of properties whose neighboring properties contained damaged or uninhabitable structures. The column for rebuilt properties suggests that many property owners who invested in rebuilding their properties continued to face visual blight from neighboring properties in early 2010. The figures for rebuilt properties show that 15 percent of rebuilt owner-occupied properties and 19 percent of rebuilt renter-occupied properties had at least one neighboring property with a damaged structure. Similarly, 8 percent of rebuilt owner-occupied properties and 10 percent of rebuilt renter-occupied properties had at least one neighboring property with an uninhabitable structure.

The figures for damaged and uninhabitable structures in exhibit 5 highlight the extent of clustering among properties with remaining damage. The figures for damaged structures show that 60 percent of damaged owner-occupied properties and 76 percent of damaged renter-occupied properties had at least one neighboring property with a damaged structure. Similarly, 43 percent of uninhabitable owner-occupied properties and 58 percent of uninhabitable renter-occupied properties had at least one neighboring property with an uninhabitable structure. These figures are substantially greater than the figures for rebuilt properties, reflecting the presence of clustering among damaged and uninhabitable structures.

[16] The estimates for block-level rebuilding outcomes use probability weights to account for the stratified sampling design. The resulting estimates are representative of the population of significantly affected blocks that contain four or more properties that received FEMA assessments of major or severe damage.

Exhibit 5

Clustering of Sustained Damage on Neighboring Properties

	Rebuilt Properties				Damaged Structures			
	Owner-Occupied Properties		Renter-Occupied Properties		Owner-Occupied Properties		Renter-Occupied Properties	
	%	SE	%	SE	%	SE	%	SE
Percent of properties where at least one neighboring property contains a damaged structure								
All	14.9	(0.022)	18.7	(0.027)	60.1	(0.048)	76.1	(0.038)
Louisiana	17.4	(0.029)	20.6	(0.031)	63.9	(0.048)	77.7	(0.038)
Mississippi	6.7	(0.027)	6.9	(0.031)	17.3	(0.091)	39.9	(0.205)
Percent of properties where at least one neighboring property contains an uninhabitable structure								
All	7.6	(0.014)	9.7	(0.020)	43.1	(0.059)	57.5	(0.073)
Louisiana	9.6	(0.019)	11.0	(0.024)	44.5	(0.059)	58.9	(0.074)
Mississippi	1.2	(0.007)	1.0	(0.010)	0.0	(0.000)	0.0	(0.000)

SE = standard error.

Notes: N = 1,188 rebuilt properties, 352 damaged structures, and 185 uninhabitable structures in Louisiana. N = 481 rebuilt properties, 35 damaged structures, and 8 uninhabitable structures in Mississippi.

Exhibit 6 measures the extent to which this clustering is explained by differences in properties' initial hurricane damage, tenure status, and the overall level of rebuilding on the block. The first column shows OLS coefficients for the estimation of equation (1) on all properties in the estimation sample.[17] The second and third columns present OLS estimates when the sample is separated into owner-occupied and renter-occupied properties. In each model, the coefficient of interest is the measure of neighboring damaged structures, which identifies the association between properties' rebuilding outcomes and the presence of damaged structures on neighboring properties. The covariate measures of damage and ownership reflect the baseline attributes of properties from the FEMA damage assessment.

The estimates in Panel 1 suggest that damaged structures are significantly clustered next to one another within blocks, even after controlling for initial damage and tenure status. Among all properties, the coefficient of 0.26 implies that the proportion of damaged structures is 26 percentage points greater when both of the neighboring properties contain damaged structures—or 13 percentage points greater when one of the neighboring properties contains a damaged structure. The second and third columns show that this clustering results primarily from the rebuilding patterns of renter-occupied properties. Among owner-occupied properties, the coefficient shrinks to 0.12 and is not statistically significant. By contrast, the proportion of damaged structures on renter-occupied properties is 44 percentage points greater when both neighboring properties contain damaged structures—or 22 percentage points greater when one neighboring property contains a damaged structure.

Panel 2 replicates these estimates for the more restrictive measure of blight—uninhabitable structures. The results show that neighboring uninhabitable structures are associated with a

[17] Estimation with OLS is preferred because of the fixed-effect logit model's loss of sample from blocks that do not have any within-block variation in the outcome measure. The substantive conclusions are similar when the estimates are replicated using fixed-effects logistic regression on the subsample of properties on blocks with variation.

Exhibit 6

OLS Estimates of Spatial Clustering in Rebuilding Outcomes

	All Properties		Owner-Occupied Properties		Renter-Occupied Properties	
	Coefficient	SE	Coefficient	SE	Coefficient	SE
Panel 1: Outcome—Damaged Structure						
Neighbors: Damaged structure	0.257**	(0.065)	0.121	(0.093)	0.442**	(0.093)
Neighbors: Cleared lot	0.052	(0.045)	0.029	(0.043)	0.136	(0.159)
Severe damage	– 0.010	(0.039)	0.055	(0.057)	– 0.077	(0.070)
Owner occupied	– 0.051***	(0.028)				
Panel 2: Outcome—Uninhabitable Structure						
Neighbors: Uninhabitable structure	0.121	(0.084)	0.038	(0.104)	0.354*	(0.159)
Neighbors: Cleared lot	0.046	(0.037)	0.046	(0.035)	0.043	(0.145)
Severe damage	– 0.022	(0.030)	0.001	(0.038)	– 0.006	(0.072)
Owner occupied	– 0.042***	(0.024)				

OLS = ordinary least squares. SE = standard error.

Note: N = 948 properties on 160 blocks (626 owner-occupied and 322 renter-occupied properties).

*p < .05. **p < .001. ***p < .10

35-percentage-point increase in the proportion of uninhabitable structures among renter-occupied properties. Among owner-occupied properties, the coefficient shrinks to 0.04 and is not statistically significant. These estimates are consistent with the findings for damaged structures.

These findings imply that renter-occupied properties are significantly more likely to contain damaged structures if their neighboring properties contain damaged structures—even after controlling for initial hurricane damage and the block fixed effects. Only six of the neighboring properties in the analysis sample are owned by the same property owner, so these patterns are not due to a single property owner making a coordinated decision about neighboring properties. Instead, these findings confirm the presence of clustering in the rebuilding outcomes of renter-occupied properties. To the extent that within-block clustering of unobservables is minimal, this finding is consistent with the presence of externality effects, suggesting that neighboring damage may influence the rebuilding decisions of rental property owners.

By contrast, the rebuilding outcomes of owner-occupied properties are less sensitive to the presence of neighboring damage. Although the estimated coefficients for owner-occupied properties are positive in both panels of exhibit 6, the magnitude of these estimates is much smaller than the estimates for renter-occupied properties and do not reach statistical significance. As a result, these estimates fail to confirm that clustering is present among owner-occupied properties.

One possible explanation for this finding is that greater levels of rebuilding assistance among owner-occupied properties enabled owner-occupants to rebuild in place when it was their preferred option, reducing their sensitivity to the presence of neighboring damage. Alternatively, the findings in exhibit 6 may reflect differences in the future incentives facing owner-occupants versus rental property owners. For example, because rental property owners have to anticipate the expected rent and occupancy rate of any rebuilt unit(s), the presence of neighboring damage may carry more immediate financial consequences for rental property owners than for owner-occupants. The analyses unfortunately are not able to distinguish between these possible explanations for the observed patterns of clustering.

The covariates in exhibit 6 provide insight into the determinants of properties' rebuilding outcomes and the potential for bias due to within-block clustering of unobservables. First, the FEMA initial damage assessment is not associated with the presence of a damaged or uninhabitable structure on the property in any of the models. These estimates suggest either that the FEMA assessment is a weak measure of damage or that rebuilding activity is not strongly predicted by the initial level of property damage. Second, the measure of properties' ownership status shows differences in the overall rates of rebuilding among owner-occupied properties and renter-occupied properties. Consistent with the estimates in exhibit 3, owner-occupied properties contained fewer damaged and uninhabitable structures than renter-occupied properties.

Lastly, the covariates in exhibit 6 report the estimated coefficients for neighboring cleared lots—testing the extent to which damaged structures and cleared lots cluster together. This measure provides an empirical test of whether initial hurricane damage or other unobserved factors contribute to the estimated coefficient for spatial clustering. Because cleared lots may be a preferable option for properties with intensive damage, significant clustering between cleared lots and damaged structures would suggest that unobserved initial damage may be responsible for the clustering of damaged structures—that is, the FEMA assessment inadequately controls for bias from unobserved clustering of initial damage. The estimates do not suggest that this scenario is the case. Instead, the results in exhibit 6 suggest that the distribution of damaged structures is not correlated with the relative presence of neighboring cleared lots versus rebuilt structures.[18]

To further examine the potential for bias due to within-block clustering of unobservable factors, a second empirical test is to replicate the estimates in exhibit 6 using only the subsample of properties that experienced severe initial hurricane damage. For the estimates shown in exhibit 6, the research design acts as the primary precaution against bias, limiting identification to within-block variation across properties with major or severe hurricane damage. Because each property in the sample suffered major or severe damage, the outcome measures should capture variation in rebuilding activities rather than initial hurricane damage or longer term deferred maintenance. As a further precaution, the sample can be tightened to include only those properties that suffered severe damage—limiting the sample to residential properties that were more than 50 percent damaged. The coefficients in exhibit 6 are robust in sign, significance, and magnitude when the models are replicated on the sample of properties with severe damage. Although the analyses cannot rule out the potential for unobservable sources of within-block variation, these results do not provide any evidence that the estimates in exhibit 6 reflect bias due to such factors.

The remainder of this section focuses on the third question, describing the attributes of the neighborhoods that contain unrepaired damage and clusters of damage. Because damaged and

[18] One possible explanation is that damaged structures and cleared lots largely appear on different blocks. The overlap appears sufficient, however, to identify clustering between damaged structures and cleared lots if it existed. Of the cleared lots, 62 percent are on blocks with at least one damaged structure, and 41 percent of damaged structures are on blocks with at least one cleared lot. The coefficients in exhibit 6 are robust in sign, significance, and magnitude when the models are replicated for the sample of properties on blocks that contain both damaged structures and cleared lots.

uninhabitable structures are likely to create disamenities for neighborhood residents, these attributes describe the extent to which the consequences of sustained damage primarily affect less advantaged neighborhoods. Exhibit 7 provides descriptive information from the 2000 census defined at the block-group level to describe mean neighborhood characteristics. Panel 1 describes the neighborhood-level characteristics of blocks that contain at least one property with the specified rebuilding outcome. The second, third, and fourth columns describe the set of blocks that contain cleared lots, damaged structures, and uninhabitable structures. Because many blocks contain properties with more than one type of rebuilding outcome, the blocks described by each column are not mutually exclusive. The initial column provides similar information for the 36 blocks (23 percent) that contain only rebuilt structures.

Exhibit 7

Neighborhood Characteristics of Blocks With Remaining Damage and Clusters of Damage

Block Contents	All Rebuilt	Cleared Lot	Damaged Structure	Uninhabitable Structure
Neighborhood attributes by presence of at least one cleared lot or damaged structure				
Severe damage (%)	19	62	61	69
Owner occupied (%)	72	65	58	58
Occupied (%)	93	88	89	88
Median home value ($)	128,980	81,341	74,710	73,010
Median household income ($)	45,639	32,355	28,486	28,061
Households with income below 150% of the poverty threshold (%)	19	32	36	38
White (%)	69	54	34	26
Black (%)	21	40	60	68
Hispanic (%)	4	3	3	3
Other race/ethnicity (%)	5	4	3	3
N	36	78	94	64
Block Contents	**No Clusters**	**Cleared Lots**	**Damaged Structures**	**Uninhabitable Structures**
Neighborhood attributes by presence of at least one cluster of cleared lots or damaged structures				
Severe damage (%)	32	69	75	83
Owner occupied (%)	69	68	50	46
Occupied (%)	92	86	87	87
Median home value ($)	103,448	81,570	70,894	69,649
Median household income ($)	38,447	35,107	25,400	23,949
Households with income below 150% of the poverty threshold (%)	25	30	41	44
White (%)	61	59	16	7
Black (%)	30	35	80	89
Hispanic (%)	4	2	2	2
Other race/ethnicity (%)	5	5	3	2
N	82	39	51	27

The census attributes in exhibit 7 show striking differences in the characteristics of blocks where cleared lots and damaged structures appear. The first row shows that cleared lots, damaged structures, and uninhabitable structures each appear more frequently on blocks with greater proportions of severe damage. The census characteristics then show that damaged and uninhabitable structures are more likely to appear in neighborhoods with more vulnerable populations. This contrast is particularly sharp regarding the median income of residents in the block group, the percent of residents in poverty, and the percent of Black residents.

Panel 2 presents similar figures for the set of blocks that contain clusters of each rebuilding outcome. The second column describes the set of blocks that contain a cluster of cleared lots, defined as two consecutive cleared lots—that is, a cleared lot with at least one neighboring cleared lot. Similarly, the third and fourth columns identify the set of blocks that contain clusters of damaged structures and uninhabitable structures. The first column describes the set of blocks that do not contain any of the defined clusters. These figures show that the differences in Panel 1 are magnified by the patterns of clustering. Blocks with clusters of cleared lots closely resemble the 82 blocks with none of the defined clusters, whereas blocks with clusters of damaged structures are concentrated in lower income neighborhoods and neighborhoods with high proportions of Black residents. These results suggest that any disamenities created by sustained damage were concentrated in low-income and predominately Black neighborhoods.

Conclusions

This article contributes to the literature on housing recovery by documenting the rebuilding outcomes of hurricane-damaged properties following Hurricanes Katrina and Rita and examining the patterns of spatial clustering among properties with sustained damage. The analysis first presents representative estimates of the rebuilding outcomes of hurricane-damaged properties in early 2010—between 4 and 5 years after Hurricanes Katrina and Rita. This information provides unique insight into the potential for property damage to remain unrepaired following a natural disaster. Among properties that received FEMA assessments of major or severe hurricane damage and that were on significantly affected blocks, 17 percent contained a damaged structure in early 2010—with 8 percent containing a structure that did not meet the census definition of a habitable housing unit.

These damaged and uninhabitable structures were distributed widely across a large number of neighborhoods. Less than 3 percent of significantly affected blocks had been largely abandoned, containing only cleared lots and damaged structures. Instead, most damaged and uninhabitable structures were on the 57 percent of significantly affected blocks that contained both damaged structures and rebuilt structures. Within these blocks, the evidence of clustering among properties with sustained damage is mixed. Where the rebuilding outcomes of renter-occupied properties are significantly associated with the rebuilding outcomes of their neighboring properties, the estimates for owner-occupied properties are weaker and do not reach statistical significance.

Taken together, these rebuilding outcomes highlight both the extent of sustained damage and the widespread presence of damaged and uninhabitable structures in many neighborhoods. Although these properties frequently appeared in clusters of two or more neighboring properties with sustained damage, the clusters were not geographically isolated in pockets of intensive damage. Instead, they were predominately located in proximity to other properties whose owners had invested in rebuilding.

These patterns of rebuilding outcomes suggest that disaster recovery efforts should anticipate the presence of sustained damage and consider potential strategies for preventing damaged properties from becoming long-term disamenities for neighboring property owners. For example, Options 2 and 3 of Louisiana's Road Home program provide examples of program design that both allows for relocation and addresses the presence of damage on the abandoned properties. Using Options 2 and 3, owner-occupants could receive a CDBG grant to support their relocation to a different property, transferring their hurricane-damaged property to the Louisiana Land Trust for sale, rehabilitation, or demolition by the state. The slow speed of blight removal among LLT properties has been a limitation in practice.[19] However, this approach illustrates a program design that attempts to mitigate the potential for sustained damage on program-eligible properties. Each state might have alternatively set aside some portion of its initial CDBG funds for programs focused exclusively on longer term blight remediation among the broader population of hurricane-damaged properties.

The caveat to these recommendations is that additional research is necessary to determine the relative cost-effectiveness of such strategies. Specifically, determining the socially optimal allocation of funding between rebuilding assistance and blight remediation efforts requires a more detailed understanding of the extent to which sustained damage—and clusters of damage—impose externality costs on neighboring property owners. For example, if the presence of sustained damage imposes only minimal externality costs on other residents, then remediation efforts may not be necessary and rebuilding assistance grants are likely to be the most cost-efficient mechanism for supporting the reconstruction of hurricane-damaged properties. This question is empirical and additional research that measures the presence and size of such externality costs is critically needed.

In the interim, the estimates in this article provide evidence regarding the extent of sustained damage—and concentrated pockets of sustained damage—more than 4 years after Hurricanes Katrina and Rita occurred. This evidence provides initial insight into the patterns of longer term reconstruction among damaged residential properties following a major natural disaster.

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Author

Jonathan Spader is a senior associate at Abt Associates Inc.

[19] See, for example, *Times-Picayune* editorial board (2012).

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Looking Through the Lens of Size: Land Use Regulations and Micro-Apartments in San Francisco

C.J. Gabbe
University of California, Los Angeles

Abstract

Small studio apartments, or micro-apartments, represent a market response to high housing costs in several major American cities. San Francisco, California, is one of the nation's most expensive housing markets and the location of an innovative pilot micro-apartment policy. The literature on regulatory barriers to affordable housing has yet to pay much attention to minimum unit-size requirements. This article uses two prototype buildings to illustrate regulatory barriers to smaller units, including minimum parking standards in some parts of the city, outdoor open-space and indoor common-space provisions, unit-mix stipulations, and inclusionary zoning requirements. I recommend that cities review their codes through the lens of unit size and eliminate unnecessary impediments to small units.

Introduction

Considerable debate exists about how land use regulations affect housing prices and about the prevalence of regulatory barriers to affordable housing. Whereas much of the academic literature focuses on the ills of minimum *lot* size, a gap in the literature is related to minimum *unit* size. This gap has both scholarly and policy implications, because very small studio apartments—often called *micro-apartments*—represent an emerging market-based approach to high housing prices in certain major American cities. This article aims to fill this gap by answering two questions: (1) Do regulatory barriers to developing new small housing units exist, and (2) if so, what are the greatest barriers? I focus on San Francisco, California, because it is one of the nation's most expensive housing markets and the site of an innovative pilot micro-apartment policy.

I begin by reviewing the literature on regulatory barriers to low-cost housing and then proceed to creating an inventory of possible barriers to small units. I describe the modern micro-apartment as a space-efficient type of housing, usually with lower overall rents compared with rents in nearby, conventionally sized units (Urban Land Institute, 2014). I detail the San Francisco case and then use two prototype buildings to analyze the city's written land use regulations. I find that much of the city's planning code is progressive in terms of unit size. Some regulations, however, geographically constrict where small units can be developed, and other regulations disproportionately add costs to smaller units. Parking is a regulatory obstacle in some parts of the city, and other regulatory barriers include outdoor open-space and indoor common-space requirements, unit-mix stipulations, and inclusionary zoning requirements. The findings suggest that cities review their codes from the perspective of builders developing different unit sizes and eliminate unnecessary regulatory barriers to small units.

Regulatory Barriers to Affordable Housing

The literature suggests that local regulations can lead to higher housing prices in several ways. Regulations may raise the cost of construction, limiting the supply of new housing. Regulations may make an area more desirable, thereby increasing demand. Some regulations push developers to build larger, more profitable units (Levine, 1999). Land use regulations may make it particularly difficult to expand the supply of compact, lower cost housing. Glaeser, Gyourko, and Saks (2005a: 7) wrote that supply restrictions "have become increasingly important in preventing suppliers from responding to high prices by building additional units," resulting in a "man-made" housing scarcity. Such barriers can arise in the form of land use regulations, building codes, and environmental regulations (Downs, 1991). In this article, I choose to focus specifically on local land use regulations.

Some economists view zoning as a form of regulatory tax that adds to the fixed costs of new development (Glaeser, Gyourko, and Saks, 2005b). Deakin's (1989) taxonomy provides a useful framework for thinking about how land use regulations may add development costs and inhibit the development of small units. Deakin argued that regulations can limit where development occurs and the density of that development, add new standards for lots and buildings, shift costs from the municipality to the developer, and create other direct and indirect controls on growth (Quigley and Rosenthal, 2005). In exhibit 1, I adapt Deakin's observations to organize potential regulatory barriers to micro-apartments.

Exhibit 1

Potential Land Use Regulatory Barriers to Small Units

Regulations That Explicitly or Implicitly Limit the Density of Development	Regulations That Impose Design and Performance Standards	Regulations That Shift Costs From the Locality to the Developer
Direct density restrictions	Design guidelines	Development impact fees
Parking requirements	Dwelling unit-mix requirements	Inclusionary zoning
Setback requirements		
Side-yard requirements		
Minimum lot sizes		
Open-space requirements		

Source: Adapted by author from Deakin's (1989) taxonomy

Some density restrictions, like limits on housing unit density, are explicitly stated in the zoning code, whereas others are implicit, indirectly capping density. Examples of implicit density limits include parking requirements, setback requirements, side-yard requirements, and minimum lot sizes (Downs, 1992). Parking requirements play a significant role in American land use regulation and often serve as a de facto density restriction (McDonnell, Madar, and Been, 2011; Shoup, 2005). Minimum parking requirements also represent a regulatory floor that deprives households of the option to buy or rent a unit without parking (Manville, 2013). Minimum unit sizes similarly deprive households of the opportunity to rent or buy smaller units than are allowed. Empirical research shows that parking requirements are associated with higher housing sales prices. Jia and Wachs (1999) used hedonic models to find that the average condominium unit with off-street parking sold for 13 percent more than one without off-street parking. Studying a natural experiment in the form of the Los Angeles, California Adaptive Reuse Ordinance, Manville (2013) found bundled parking to be associated with a $200 higher monthly rent for apartments and a $43,000 higher asking price for condominiums.

Impact fees and inclusionary zoning are other municipal interventions that may shape or hinder the development of small apartments. Impact fees are defined as one-time levies intended to fund public infrastructure that serves new development (Burge and Ihlanfeldt, 2006). These fees are quite common in the United States, used by 37 percent of jurisdictions representing 56 percent of the population in the 50 largest metropolitan areas (Pendall, Martin, and Puentes, 2006). Impact fees present a barrier when they are "regressive or disproportionate to actual development costs" (HUD, 2005: 8). Little research related to impact fees and multifamily development has been conducted, however (Burge and Ihlanfeldt, 2006). Few empirical studies likewise have focused on the effects of inclusionary zoning. Despite ominous theoretical predictions, the few empirical studies on the topic have found inclusionary zoning to have generally neutral or minimal effects on housing markets (Mukhija et al., 2010; Schuetz, Meltzer, and Been, 2011). In fact, inclusionary zoning may actually produce fewer units than other programs targeted to low-income households. Schuetz, Meltzer, and Been (2011) found that, in the San Francisco Bay Area through 2003, inclusionary zoning produced nearly 9,200 housing units, while the federal government's low-income housing tax credit, or LIHTC, subsidized nearly 30,000 units.

Speaking specifically to building in the San Francisco Bay Area, today's leading developer of micro-apartments in the metropolitan area, Patrick Kennedy, once wrote that the greatest barriers to infill development were density restrictions, burdensome parking requirements, and unnecessary open-space provision (Kennedy, 1995). These regulations are binding constraints if, in their absence, developers would build more densely, with fewer parking spaces and less open space. A recent study of Austin, Texas; Denver, Colorado; New York City; Seattle, Washington; and Washington, D.C., echoed Kennedy's findings, suggesting that the most significant barriers to small units relate to unit size, parking, density, and open-space requirements (Been, Gross, and Infranca, 2014).

Beyond understanding the written regulations themselves, it is crucial to understand how the regulations are being applied (May, 2005). Regulatory processes may delay housing development or even discourage development altogether. Cities may adopt "business-friendly" or "by-the-book" approaches, meaning that the same regulation can be implemented differently in different jurisdictions (May, 2005). In a recent national survey, developers showed preferences for fast-tracking projects, reducing fees, loosening building codes, and eliminating prescriptive design requirements (Talen, 2013). These process considerations reinforce the importance of allowing less expensive housing types "by right" instead of through a discretionary process, which can add uncertainty and cost.

The Promise of Micro-Apartments

A growing interest—from planners, architects, developers, and the general public—in modern micro-apartments exists. Demographic shifts, economic changes, and environmental trends are fueling this interest. These trends have brought micro-apartments to some of the nation's high-demand housing markets, including San Francisco; Boston, Massachusetts; New York City; Portland, Oregon; and Seattle (Been, Gross, and Infranca, 2014; Christie, 2013; Infranca, 2014). In these markets, the average micro-apartment rents for about 20 to 30 percent less than a conventionally sized unit nearby, although they rent at a higher rate on a per-square-foot basis (Urban Land Institute, 2014). Although micro-apartments are often portrayed in the media as a new concept, in reality they are not. Other countries, like China and Japan, have a history of even smaller unit sizes (Goodale, 2012; Orlik and Fung, 2012).

Several demographic trends support future heightened demand for micro-apartments (Shore, 2014). First, the growth in one-person households may increase the potential market for smaller apartments (Infranca, 2014; Nelson, 2009). Second, the preferences of the Echo Boom generation—the children of the Baby Boomers—may support a resurgence in higher density housing styles in transit-oriented settings (Wegmann and Nemirow, 2011). Third, Baby Boomers may be the housing market's "central driving factor in the next three decades," (Pitkin and Myers, 2008: 2) as the decisions aging Baby Boomers make will be of major consequence to the housing market (Myers and Pitkin, 2009; Pitkin and Myers, 2008). Even a small subset of Baby Boomers choosing small, centrally located studio apartments and condominiums could considerably increase demand for micro-apartments. Future demand is far from certain, however; some developers are hedging their bets by building micro-units that can be easily reconfigured into larger apartments in the future (Infranca, 2014; Urban Land Institute, 2014).

Micro-apartments may provide environmental benefits. The combination of small unit sizes, little onsite parking, and transit-rich neighborhoods means that micro-apartments may lead to less building and transportation energy use and to reduced greenhouse gas emissions (Brownstone and Golob, 2009; Ewing and Cervero, 2010; Ewing and Rong, 2008). Beyond environmental sustainability, lower energy costs are also an attractive feature for prospective renters (Urban Land Institute, 2014). Although the energy use in a micro-apartment is probably less than that of a larger studio or one-bedroom apartment, the question remains: How will the energy use of the typical micro-apartment compare with the per capita energy use of shared housing?

Micro-apartments may also fit well with the changing fiscal environment in America. Waning public subsidies create an imperative for creating less expensive, market-driven housing (Belsky, 2012; San Francisco Budget and Legislative Analyst, 2012). By permitting micro-apartments, cities may enable housing markets to operate more efficiently. Urban infill developers have become interested in smaller, better designed units, according to the results of Talen's (2013) survey of developers.

About one-half of these developers reported that they used smaller unit sizes to maintain affordability. Developers were also optimistic about small units because they meant smaller utility bills and less maintenance (Talen, 2013). In addition, micro-apartments may also help a city with high housing demand better allocate its existing housing stock, particularly if micro-apartments reduce pressure on larger, family-sized units (SPUR, 2007). These small units may serve as an alternative to tenants doubling or tripling up in larger units (Downs, 1992).

Micro-Apartments in San Francisco

San Francisco is a paradoxical case for urbanists. On one hand, the city's density, walkability, and public transit embody many of the core principles of "smart growth." On the other hand, San Francisco has been criticized for its extensive land use regulations, and the combination of strong demand and major supply restrictions has resulted in some of the highest housing prices in the nation (Glaeser and Gyourko, 2002; Pendall, Puentes, and Martin, 2006). San Francisco's supply constraints are the product of both geographical and human-made factors (Saiz, 2010). Despite strong demand, new housing production in San Francisco has been relatively minimal; an average of only 1,500 units per year have been built in the past 20 years (Metcalf and Warburg, 2012).

San Francisco has a rich history of small apartments and residential hotels in the early 20th century. Small units were available in a spectrum of residential hotels—from cheap lodging houses to palace hotels (Groth, 1994). During a period of decades, most small unit types were forbidden through building and zoning regulations. Much of the rationale for this restriction was concern about the health and safety effects of overcrowding. Societal norms and regulations have begun reversing course, however. In 2012, San Francisco piloted a change to its building code that allows 220 square feet as the minimum size for market-rate units, including a bathroom and closet (City of San Francisco, 2012). Subsidized units and student housing previously were allowed at that size, but market-rate units were not. The pilot legislation included an initial cap of 375 units. After about 325 units are approved, the planning department will be required to submit a report to the city's Board of Supervisors "in order to assist the Board in evaluating the requirements, including consideration as to whether more reduced size efficiency units should be allowed" (City of San Francisco, 2012: 2). This policy change was not without controversy. Some affordable housing advocates were concerned that this approach will worsen the affordability problem by creating small luxury housing that caters to a "young, high-tech set" and will not directly add to the options for families (Wollan, 2012: 1).

During the past decade, a handful of new *subsidized*, small-unit developments have been completed in San Francisco. At the time of writing, based on an extensive search of secondary sources and conversations with developers, the *market-rate* micro-housing developments consist of only one condominium project, one micro-apartment complex master-leased as student housing, and several market-rate apartment buildings at some stage of completion. In addition, some micro-apartments are within buildings that include larger units.

Data and Methodology

I analyze San Francisco's planning code, specifically focusing on how housing units of different sizes are treated. San Francisco has several dozen zoning districts in its code, ranging from low-density single-family zones to industrial zones and high-density, mixed-use zones (City of San Francisco, 2013a). Some zoning districts are small and geographically focused, and others can be found citywide. Because of the nature of micro-apartments, this analysis focuses on the most common medium- and high-density residential and mixed-use zones that allow residential development, as summarized in exhibit 2. I use two prototype buildings, described further in the next paragraph, to test whether local land use regulations impose additional requirements on micro-apartments as compared with conventionally sized apartments and whether the magnitude of these additional requirements is enough to be considered a barrier to new development.

Only a few micro-apartment developments have been completed at the time of writing, so I put forward two hypothetical prototype apartment buildings for comparing the possible effects of regulations (exhibit 3). The prototype buildings would look similar from the street, each with four stories and 11,250 square feet on a 3,750-square-foot infill site. Beyond their equivalent building envelopes, the two hypothetical prototypes diverge. The micro-apartment building has 24 small studio apartments that average 325 square feet, and the conventional building has 14 apartments

Exhibit 2

Major San Francisco Medium- and High-Density Zones

Category	Representative Zones
Residential mixed (medium density)	RM-3
Residential-commercial combined (medium density)	RC-3
Residential mixed (high density)	RM-4
Downtown commercial (high density)	C-3-S, C-3-G
Residential-commercial combined (high density)	RC-4
Residential services district (high density)	RSD

Source: Adapted by author from City of San Francisco (2013a)

Exhibit 3

Key Prototype Building Characteristics

	Micro-Apartment Prototype Development	Conventional Prototype Development
Site size (square feet)	3,750	3,750
Building height (stories)	4	4
Building size (square feet)	11,250	11,250
Average unit size (square feet)	325	650
Total units	24	14
Residential density (units per acre)	281	161

that average 650 square feet. Each building includes ample indoor bicycle parking, has no automobile parking spaces, and provides open space in the form of a rooftop deck. The micro-apartment building includes 240 square feet of indoor communal space for residents, with a fireplace and armchairs, but the conventional prototype does not have any such space.

Findings

In this section, I analyze and compare the two prototype buildings based on Deakin's (1989) framework of potential regulatory barriers: density limits, design and performance standards, and cost-shifting requirements (exhibit 1).

Regulations That Limit the Density of Development

First, I consider setback requirements, side-yard requirements, and minimum lot-size requirements. Setback requirements potentially reduce the amount of developable area on a parcel, which is problematic for small parcels. The higher density zones in San Francisco do not require any setbacks or side yards. Rear-yard requirements are a minimum of 15 feet or 25 percent of lot depth (whichever is smaller). As such, setbacks and yard requirements are not tied to unit size and are not a barrier to micro-apartments. The minimum lot size is 2,500 square feet in all of San Francisco's zones, except in the lowest density residential district. In an analysis of California's infill potential, Landis et al. (2006: 706) excluded lots smaller than 2,500 square feet from his inventory because, for sites smaller than that, the "challenge of designing a marketable housing project that also meets local parking and regulatory requirements becomes so great as to render the lot almost impossible to build on." Both prototype apartment buildings described previously would be permitted under these requirements, and the minimum lot-size requirement is not a barrier to infill micro-apartment development.

Direct density restrictions certainly deserve attention. San Francisco's planning code restricts residential density through minimum lot sizes *defined on a per-unit basis*. The city allows some flexibility in terms of minimum lot size per unit for housing for seniors and small units. For example, in some high-density mixed-use zones, minimum lot sizes per unit are reduced because the code allows a studio unit of up to 500 square feet to be counted as three-quarters of a unit for density purposes. The high-density mixed-use zones are the most conducive to micro-apartments. The high-density C-3 zone (downtown commercial) allows about 348 units per acre. The South of Market Residential Service District (RSD zone) allows about 217 units per acre by right, as do the city's high-density RM-4 (residential mixed) and RC-4 (residential-commercial combined) zones. Given that small studio units can be counted as three-quarters of a unit, however, micro-apartments are effectively allowed at up to 289 units per acre. Direct density restrictions would not be a barrier for the conventional prototype (its density is equivalent to 161 dwelling units per acre) or the micro-apartment prototype building in the city's high-density zones. Alternatively, either prototype might be built less densely to be allowed in a medium-density zone.

Parking and open-space requirements may reduce a site's buildable potential, serving as indirect density restrictions, or may impose additional costs on the project, or may do both. One developer whom I interviewed suggested that micro-apartments are not economically feasible in zones that require onsite parking because the cost of developing parking drives unit rents too high for potential consumers, which suggests that parking regulations, where required, act as a binding constraint on micro-apartment development. San Francisco's parking requirements vary considerably by zone. The high-density mixed-use zones generally have the least restrictive parking requirements, with no parking required and no parking maximums. One exception, however, is the RC-4 zone, which requires 0.25 parking spaces per unit. The medium-density residential and mixed-use zones generally require 1 space per dwelling unit. In these zones, micro-apartments are much less feasible because a developer would either need to develop expensive underground parking or sacrifice the development potential of a site by building parking above ground. No particular parking-related regulatory barriers affect a micro-apartment building in most high-density zones; it would be a different story in the RC-4 zone, where our micro-apartment prototype would require eight parking spaces compared with three in the conventional prototype.

Outdoor open space and indoor communal space are valuable amenities to city dwellers and may be particularly important to residents of smaller units. Outdoor open space may include private space accessible from an individual unit (for example, a balcony or terrace) or shared space accessible from a building's common area (for example, a rooftop deck or courtyard). Rooftop decks are the predominant form of open space in San Francisco's first market-rate micro-apartment developments (Panoramic Interests, n.d.). In San Francisco's high-density zones, a developer generally must provide 36 square feet of private open space or 48 square feet of shared open space per unit. In medium-density zones, a developer is required to provide 60 square feet of private open space or 80 square feet of shared open space per unit. In a high-density zone, the conventional prototype developer would need to provide at least 665 square feet of shared open space, but the micro-apartment prototype developer would need to provide at least 1,152 square feet. The cost of this additional square footage can be viewed as a regulatory tax on the micro-apartment prototype development. In addition to requiring the outdoor open space, the city recently added a common room requirement applicable only to micro-apartments (City of San Francisco, 2012). The code now requires an indoor common room—a library, shared kitchen, game room, lounge, or fitness center—of at least 10 square feet per unit. The cost of the required 240-square-foot community room also acts as an additional regulatory tax for the micro-apartment developer.

Regulations That Impose Design and Performance Standards

Two types of design and performance standards in San Francisco are residential design guidelines and unit-mix requirements. The city's residential design guidelines apply to development in residential and residential mixed zones (City of San Francisco, 2003). These guidelines add process requirements to the development of new housing in these zones, but they do not include any specific provisions or barriers to small apartments. As mentioned previously, the provision of family-sized housing is a considerable policy concern for the city. As such, the city requires that a percentage of new units in certain zones have at least two bedrooms.[1] It would not be possible to build a development consisting entirely of micro-apartments (or even one-bedroom units) in these

[1] Zones with unit-size mix requirements include the Residential Transit-Oriented (RTO), Regional Commercial (RCD), Neighborhood Commercial Transit (NCT), Downtown Residential (DTR), and Eastern Neighborhoods Mixed Use districts.

zones. The existing micro-apartment developments have predominantly comprised small units and been in zones without unit-mix requirements. Dwelling unit-mix requirements may inhibit the micro-apartment prototype, depending on a developer's desired location.

Regulations That Shift Costs From the Locality to the Developer

San Francisco shifts some affordable housing and infrastructure costs from the municipality to the developer through inclusionary zoning requirements and development impact fees. First, the city requires that developers of at least 10 residential units choose from one of three inclusionary zoning options: (1) pay an Affordable Housing Fee, (2) make 12 percent of the units affordable to households earning 55 percent of Area Median Income (AMI), or (3) provide 20 percent of the units affordable to those households off site (City of San Francisco, 2013b). Each option is costly to a developer; I use the two prototype developments to illustrate the options.

The first option allows a developer to make an in-lieu fee payment based on an annually updated fee schedule (City and County of San Francisco, 2013). To calculate the in-lieu fee for the micro-apartment prototype, I multiply the total number of units in the development (24) by 0.20, round up, and then multiply the resulting number by $171,558.[2] Using this formula would result in an $823,000 fee. The conventional apartment developer could opt to pay a $710,000 in-lieu fee, calculated by multiplying 14 total units by 0.20 and then by $236,545. Thus, the additional cost to the micro-apartment prototype developer would be about $113,000.

With the second option, instead of paying the Affordable Housing Fee, a developer could ensure 12 percent of the units are affordable. In the micro-apartment development, 3 of the 24 units would need to be affordable to renters earning no more than 55 percent of San Francisco's AMI. These unit rents (without utilities) would be capped at $939 per month (City of San Francisco, 2013c), a discount of hundreds of dollars per month per unit, given expected micro-apartment market-rate rents that exceed much more than $1,500 per month (Said, 2013). With the third option, each prototype developer would have the option to build affordable units off site. The micro-apartment developer would need to build 5 affordable units off site, whereas the conventional developer would be required to build only 3 units off site.

In addition to requiring affordable housing provision, San Francisco assesses a plethora of other citywide and specific area development impact fees. With few exceptions, these fees are levied based on square footage, meaning that a small unit would not be disproportionately penalized. The only charges that are not assessed on a square-footage basis are a water capacity charge that is assessed based on the water meter size and a wastewater capacity charge that is assessed by unit size range (City of San Francisco, 2013d). Both of these fees are minimal and would probably have a negligible effect on housing affordability.

[2] The multiplier is based on the size of the units in the building. For example, in 2013 the studio unit figure was multiplied by $171,558, the one-bedroom unit figure by $236,545, and the two-bedroom unit figure by $326,086 (City and County of San Francisco, 2013).

Conclusions

This analysis finds that planning requirements in San Francisco—and undoubtedly in cities across the nation—privilege larger units by adding costs to the development of smaller ones. This article suggests that local governments carefully consider land use regulations that make small apartments difficult to develop. In San Francisco, I find the biggest potential barriers to be (1) parking requirements, (2) outdoor open-space requirements and indoor common-space requirements, (3) unit-mix requirements, and (4) inclusionary zoning.

First, San Francisco has been a leader in parking policy. The city has instituted parking maximums (Millard-Ball, 2002) and tested market-based pricing for on-street parking (Pierce and Shoup, 2013). Off-street parking regulations in some zones, however, could make affordable medium- or high-density development prohibitively difficult, which poses a particular challenge in the development of small units.

Second, cities certainly require open space to maintain a high quality of life, but should the open-space requirement be the same for a 325-square-foot unit with one resident as for a three-bedroom unit with four residents in the same zone? Planners should graduate open-space requirements by unit size. Likewise, if planners and policymakers view common rooms as an important amenity for urban San Franciscans, they should apply requirements proportionately to all multifamily developments rather than to only micro-apartments.

Third, if micro-apartments reduce pressure on the supply of two- and three-bedroom units—and empirical research is needed in this area —increasing the supply of smaller units may have a greater effect on family housing than mandating the production of large units.

Fourth, inclusionary zoning requirements could disproportionately affect small studio units compared with larger apartment units.

Some of these regulatory barriers indirectly or directly limit the areas in the city where micro-apartments can be developed. Other barriers clearly raise costs. Geographic restrictions and cost-increasing regulations could make the widespread provision of lower cost small apartments difficult. This research suggests several policy mechanisms through which the city can level the regulatory playing field in terms of unit size. One big change would be to eliminate the remaining minimum parking requirements in medium- and high-density zones. In terms of open space, regulations should be applied to unit square footage rather than on a per-unit basis. In addition, the city should develop common-space requirements that are consistent for different types of buildings. If further research shows that micro-apartments reduce pressure on larger family-sized units, the housing type could be allowed by right in zones that currently require a percentage of bigger units. In terms of inclusionary zoning, adding a lower in-lieu fee multiplier specifically for micro-apartments would be useful.

For future research, one of the biggest general questions that comes out of this article—and the literature in general—is whether regulations are binding. That is, in the absence of regulations, would a developer provide the same amount of parking, number of units, and open space, for example? Beyond the study of specific land use regulations, we do not know how micro-apartments will affect American housing markets. Because few new micro-apartment buildings have been completed, we do not know much about the demographic characteristics of micro-apartment tenants. Will micro-apartments serve single young people earning modest wages or high-income out-of-towners desiring a pied-à-terre? Will renters of micro-apartments be primarily one- or two-person households? Although proponents often make an affordability argument for micro-apartments, we do not know the extent to which these units will reflect a low-cost housing option. Finally, what are the local politics of changing regulations to allow infill micro-apartment development in existing neighborhoods? Will neighborhood groups oppose micro-apartment policy changes or attempt to delay or stop building construction? While we do not have the answers to these questions, the first important step in this research agenda is to view land use regulations through the lens of unit size.

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Author

C.J. Gabbe is a doctoral candidate at the University of California, Los Angeles, Luskin School of Public Affairs.

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Foreclosed Property Investors in a Strong Housing Market City: A Case Study of Boston

Lauren Lambie-Hanson
Federal Reserve Bank of Philadelphia

Christopher E. Herbert
Irene Lew
Rocio Sanchez-Moyano
Joint Center for Housing Studies of Harvard University

Abstract

Falling home sales prices during the recent mortgage crisis were exacerbated by an increased number of properties coming on the housing market through foreclosures and short sales. Real estate investors made up a significant share of buyers of foreclosed residential properties in cities around the country, leading many to ask if, on net, they provide a stabilizing influence on the market or are detrimental. In this case study, we explore the scale and nature of investor activity in acquiring foreclosed properties in the heart of the Boston area. We find that investors purchased about one-half of foreclosed properties. Despite competition from owner-occupants and mission-driven organizations, investors were successful in purchasing such a large share of foreclosed properties because of several characteristics we discuss, particularly their greater access to financing and ability to pay cash. Although opportunities for favorable returns on investment encourage investors to purchase homes in the most distressed neighborhoods and to make property improvements, investors may not pursue the most severely distressed foreclosed properties or perform the degree of rehabilitation desired by nonprofit organizations.

Introduction

When the housing bust accelerated in 2008, concerns mounted about the effect of rising foreclosure levels, especially in low-income and minority communities where nonprime lending had been concentrated in the years leading up to the crash. With demand from owner-occupants in these communities plummeting in tandem with rising unemployment and falling home prices, market analysts expected that foreclosed homes would find few buyers. In fact, although owner-occupant demand remained weak in areas hard hit by foreclosures, many housing markets experienced a surge of home purchases by investors absorbing excess supply.

Although the prominence of investors' presence has received substantial interest, little systematic assessment has occurred regarding the scale of investor activity, which properties investors acquire, and what they do with them. This study aims to investigate these topics in one area as a means of shedding light on how investors are likely to affect local housing markets. This case study focuses specifically on investor activity in the city of Boston and three other jurisdictions in Suffolk County, Massachusetts.

We analyze data on foreclosed properties in Suffolk County from 2007 to 2012 to provide a quantitative assessment of investor activity. We supplement this analysis with information obtained from a small sample of interviews with market participants in Boston, including government officials, staff from nonprofit organizations, real estate brokers, lenders, and investors to paint a portrait of investors and their activities. Although the number of interviews conducted was limited and only a small number of investors participated, the results provide some indication of the characteristics, motivations, and activities of investors to help inform our understanding of how investors have affected local markets.

Since the housing market downturn began in 2007, investors have played a significant role in acquiring foreclosed properties in Suffolk County, accounting for 44 percent of foreclosed properties sold at foreclosure auction or out of real estate owned (REO) inventories from 2007 through 2012. Three-fourths of the investors we identified acquired only three or fewer foreclosed properties in Suffolk County. Meanwhile, only 7 percent of all investors (totaling 33 different entities) acquired 10 or more foreclosed properties between 2007 and 2012 but accounted for one-half of all investor foreclosed property acquisitions. Although these large investors acquired properties in neighborhoods throughout Suffolk County, they were more active in neighborhoods with high foreclosure rates, relatively low median home prices and household incomes, and a large share of households headed by racial and ethnic minorities. Given the significance of their role in these neighborhoods, this study largely focuses on the activities of these large investors.

Toward the end of the period we study, mortgage default rates had begun falling and fewer foreclosed properties came onto the market. Meanwhile, more investors entered the market, driving up competition for acquiring foreclosed properties. Several investors told us that the prices of properties sold out of REO and at auction rose substantially over time, even after taking into account property condition and other characteristics. Despite this increased cost, foreclosed property investors still bought about one-half of the foreclosed properties sold in Suffolk County in 2012.

Part of the scale of investor activity can be explained by heterogeneous preferences between the different types of buyers. Investors were active in areas with high foreclosure rates and often had stronger tastes for distressed housing than most owner-occupants, who are generally assumed to seek out turnkey properties. Despite this trend, we learned from our interviews that investors faced competition from nonprofit organizations for distressed properties, and they also competed to buy move-in-ready properties. We argue that three main characteristics of investors set them apart from other types of buyers: (1) their willingness and ability to purchase at foreclosure auction; (2) their connections to other real estate professionals; and (3) their greater access to financing, including their ability to pay cash.

Although much has been made of the significant role that national investment funds and foreign investors have played in acquiring foreclosed properties in some parts of the country, the large investors active in Suffolk County for the most part have local roots—at least as of 2012. Some of these large investors had a long history of owning rental properties in Boston, while others were new to the market, attracted by the opportunity to acquire properties at lower-than-normal price points through foreclosure sales. The predominant strategy among large investors in Boston has been to hold on to these foreclosed properties as rental units. But the spectrum of large investor strategies has also included those who sold most of their purchases, and others who were roughly divided in the share held versus the share resold. The lack of a consistent tendency to hold or sell properties indicates that, in many respects, investors pursued property-specific strategies.

Given that foreclosed properties have often gone through a period of neglect, and so their presence may exert a blighting influence on the surrounding neighborhood, a key policy concern is whether investors engage in rehabilitation of properties to any significant degree. Although this study does not attempt to systematically measure the degree of rehabilitation investors undertake, we argue that Boston's relatively high housing values and significant rental demand provide incentives for investors to maintain these properties in at least decent condition.

That said, we learned from our interviews that investors did not make property improvements to the extent that nonprofit organizations felt was desirable. This difference likely reflects the fact that nonprofit organizations were pursuing broader goals of neighborhood revitalization with the support of government subsidies, while investors' decisions about the degree of investment to make were driven purely by expectations of higher rents or resale values.

The article proceeds as follows. In the next section, we briefly review the existing literature on the role of private investors in acquiring foreclosed properties in cities around the United States. Then we provide an overview of housing market conditions and demographic traits of Suffolk County, the focus of this study. In the third section we describe the methods used in our analysis and document the scale of investor activity and the characteristics of the neighborhoods in which investors are most active. In the fourth section we describe the ways in which investors successfully compete to purchase foreclosed properties. Then we discuss their decisions to resell or hold properties and whether to make property improvements. We finally summarize our findings and discuss their likely applicability to other cities.

Previous Research About Investors

To address the policymakers' and academic communities' growing interest in foreclosed property investors, this study and three others were commissioned to explore investor behavior in four cities: (1) Boston, Massachusetts; (2) Atlanta, Georgia; (3) Cleveland, Ohio; and (4) Las Vegas, Nevada. Immergluck and Law (2014) compared and contrasted the behavior of foreclosed single-family home investors in Atlanta and the surrounding suburbs in Fulton County, Georgia, tracking their behavior from 2002 to 2011. The investors they interviewed had moderate to high levels of spending on renovations, particularly relative to the low property acquisition costs in the area, and respondents indicated that they were either content with or eager for even stricter code enforcement.

Ford et al. (2013) found more evidence of problematic investor behavior in Cleveland. Although institutional investors tended to avoid investing in central city neighborhoods, out-of-state investors (primarily noninstitutional) who purchased in these neighborhoods were likely to underestimate the costs required to stabilize and renovate the deteriorated properties. Mallach (2014) studied single-family home and condominium foreclosures in four ZIP Codes in Las Vegas and argued that foreclosed property investors provided a stabilizing influence in those neighborhoods, but that, over time, investors increasingly crowded out prospective owner-occupants. After conducting windshield surveys of a sample of properties in his study area, Mallach concluded that investor-owned properties had poorer exterior conditions but were not so inadequate as to be considered blights in the immediate neighborhoods. Similar to Boston, relatively few investors in Las Vegas purchased many properties.[1]

Using a similar approach, Ellen, Madar, and Weselcouch (2014) examined data on sales of foreclosed properties in Atlanta, Miami, and New York City, and found that investors played a large role in purchasing REO properties in these cities. In Atlanta, investors were most active in moderately hit neighborhoods, although, in Miami and New York, they were more commonly active in neighborhoods with the most distressed properties. In all three cities, small-scale investors made up more than two-thirds of the investor REO purchases, and few purchases by investors resulted in "flips."

Treuhaft, Rose, and Black (2011) reviewed research from the 1990s and argued that large, nonlocal investors, particularly those who purchase properties in bulk, were less desirable than homeowners and small, local investors who are committed to property rehabilitation. Fisher and Lambie-Hanson (2012) analyzed data on the purchases and investment behaviors of investor-owners and owner-occupants in Chelsea, one of the cities in Suffolk County, Massachusetts. Basing their analysis on building permits data, they found that local investors purchasing one- to three-family homes before the foreclosure crisis planned to make greater investments than owner-occupants and nonlocal investors. Although local press reports (for example, McKim, 2008) suggested that several large local investors in our sample were slow to make improvements to the foreclosed properties they purchased, evidence from our interviews indicates that numerous local REO investors spent a substantial amount on rehabilitation. We discuss this issue in greater detail in the section Postpurchase Property Management.

Treuhaft, Rose, and Black (2011) stressed that, because investors disproportionately purchased damaged REO properties, the business models they use are crucial to determining their effect on neighborhoods. Numerous scholars have turned to Mallach's (2010a) typology of foreclosed property investors as rehabbers, flippers, milkers, and holders. We discuss these groups in the section Postpurchase Property Management. King (2012) found evidence of all four investor types in Oakland, California, between 2007 and 2011. During that time, investors made up nearly one-half of all foreclosed property purchases, which is similar to the share in Suffolk County, Massachusetts. King expressed some surprise that investors did not capture an even greater share, considering "the competitive advantage that cash investors wield at multiple stages in the post-foreclosure home buying landscape" (King, 2012: 5).

[1] For a comprehensive summary and comparison of the four case studies, see Herbert, Lew, and Sanchez-Moyano (2013).

Although maintaining a strategy to hold may be potentially desirable from a neighborhood perspective, it may be prohibitively expensive from the perspective of profit-motivated investors—particularly those supplying housing at affordable rents. Typical rehabilitation costs for foreclosed properties may be infeasible for many owners, given that profit margins for small rental properties are often slim. Mallach (2007) wrote that, in 1995, less than 40 percent of the owners of one- to four-family rental properties reported that they had made a profit on their property during the preceding year. An analysis of data from the 2001 Residential Finance Survey and the 2007 American Housing Survey by Garboden and Newman (2012) tells a similar story. Their study found that only 5 percent of small (one- to four-unit) affordable rental properties, which are typically owned by individuals or couples, were in economically stable condition. More than one-half (65 percent) of the units could have been salvaged but were at risk of losing affordability, and 30 percent could not be salvaged.

Trends and Conditions in the Boston Housing Market

The specific focus of this study is on foreclosed properties in Suffolk County, the core county of the Boston metropolitan area, consisting of the cities of Boston, Chelsea, Revere, and Winthrop. Although not as dramatic as in some U.S. housing markets, Suffolk County experienced a substantial housing boom and bust during the 2000s. From the start of the decade through the peak in November 2005, home sales prices in Suffolk County increased 86 percent. National prices continued to climb into 2006, however. After the peak, prices in Suffolk County began a steady decline, bottoming out in March 2009 at about 29 percent below peak values. Nationwide, during the same period, prices declined 28 percent. In exhibit 1 we display Suffolk County's house price index, along with the national index and the indices for Cuyahoga County (Cleveland), Clark County (Las Vegas), and Queens County (in New York City). As discussed in the previous section, these three places have also been the subject of foreclosed property investor case studies.[2] Clark County experienced both a dramatic increase and subsequent decline in house prices in the 2000s. In Queens, prices also rose rapidly and then fell, although the decline was far less severe than that of Las Vegas. Cuyahoga County experienced very little growth in prices from 2000 to 2005, and while prices did decline beginning in 2006, the reduction was also comparatively small.

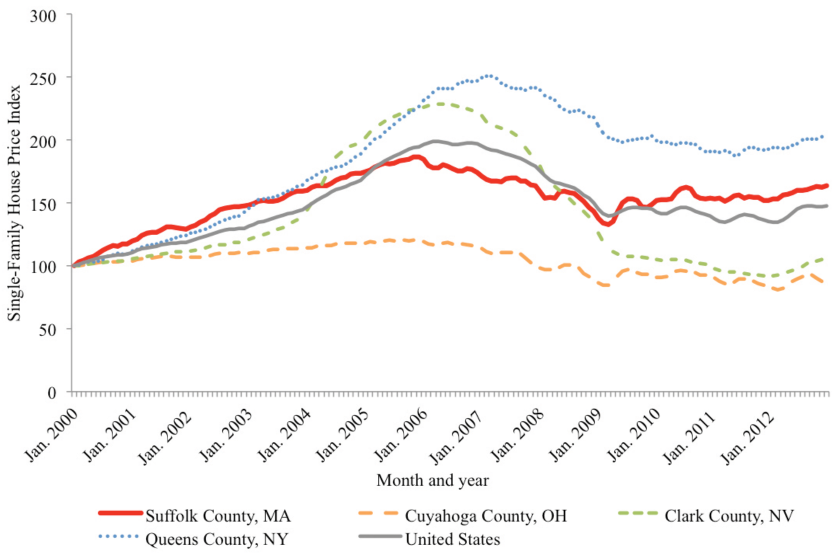
Coinciding with falling house prices, Suffolk County saw a large increase in the number of foreclosed properties.[3] As shown in exhibit 2, during May 2010, the height of its foreclosure crisis, Suffolk County experienced 12.7 foreclosures per 10,000 homes. From 2009 through mid-2012, Suffolk County's rate of foreclosure completions was very similar to the national rate and to the rate for Cuyahoga County. Cleveland's foreclosure crisis began in 2005, however, well before most of the rest of the country. As of the end of 2012, it had also shown less improvement than other areas. But all the places profiled in exhibit 2 had foreclosure rates that paled in comparison with that of Las Vegas, where in May 2011, nearly 59 foreclosures occurred per 10,000 homes. Since then, however, Las Vegas has seen rapid improvement. In December 2012, only 12 foreclosures were completed per 10,000 homes.

[2] Among all the places discussed in the section Previous Research About Investors, these areas were chosen because of the availability of Zillow foreclosure data, displayed in exhibit 2.

[3] Here we define foreclosures as foreclosures completed—that is, foreclosure deeds terminating the mortgage and the owner's rights to the property.

Exhibit 1

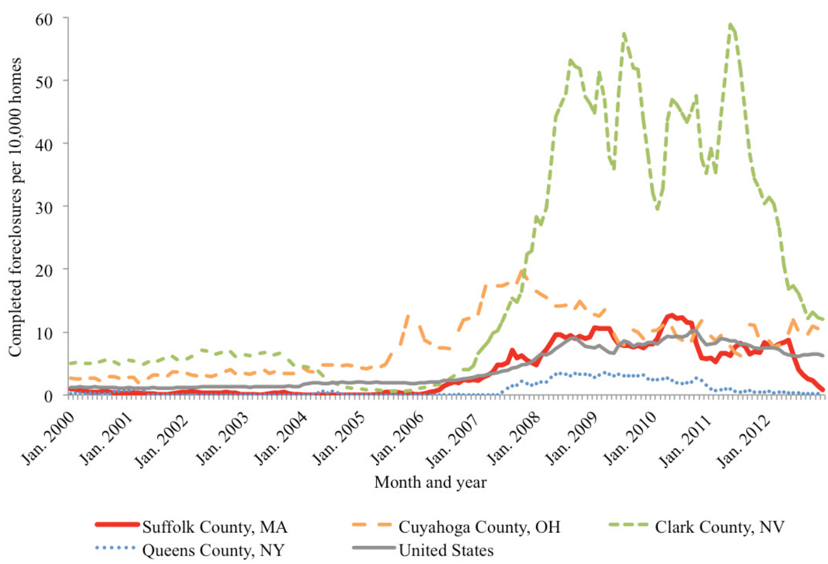
House Sales Price Trends in Suffolk County, Massachusetts, and Other Areas, 2000–2012



Source: Authors' tabulations of data from CoreLogic, Inc. House Price Index

Exhibit 2

Monthly Number of Foreclosures Completed, per 10,000 Homes, in Suffolk County, Massachusetts, and Other Areas, 2000–2012



Note: Foreclosure completions are counts of foreclosure deeds, regardless of whether properties are sold at foreclosure auction to a third-party buyer or become real estate owned (REO).

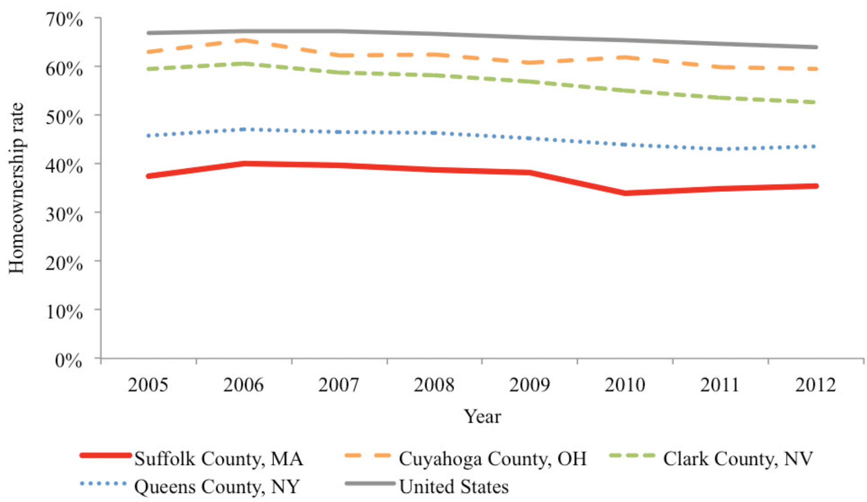
Source: Authors' tabulations of foreclosure data from Zillow

As the urban core of the Boston area, Suffolk County is marked by higher density, older housing stock. According to 2012 American Community Survey data, 55 percent of units in the county were built before 1940, while 18 percent of units were built after 1980. Less than 20 percent of the housing stock is single-family homes. Multifamily structures, split evenly between small multifamily buildings with two to four units and larger buildings, made up most of the stock. In terms of population demographics, 48 percent of the residents were nonminority, 20 percent were African American, and another 21 percent were Hispanic or Latino. The median household income in Suffolk County was about $51,000, and the poverty rate among individuals was 21 percent.

As shown in exhibit 3, following the national trend, homeownership rates in Suffolk County fell from 40 percent in 2006 and 2007 to 35 percent in 2012. Even at the peak of homeownership, renters accounted for a clear majority of households. With such a low homeownership rate and a significant stock of small multifamily buildings, investors have long been active in Boston, but as evidenced by the falling homeownership rate in recent years, they have increased their presence in the market.

Exhibit 3

Homeownership Rates for Suffolk County, Massachusetts, and Other Areas, 2005–2012



Source: Authors' tabulations of data from the U.S. Census Bureau's 2005–2012 American Community Survey 1-year data

Data and Methods

To assess the role that investors have played in acquiring foreclosed properties, we analyze data on individual transactions involving foreclosure deeds in Suffolk County from a private vendor, the Warren Group, for the period from 2007 through 2012. The transactions we study include both properties sold to third parties at the foreclosure auction and those sold by lenders subsequent to taking title at auction. In this way, we focus on one slice of investor activity, ignoring short sales and other ways in which investors may purchase properties that were once owned by borrowers in mortgage distress.[4]

We identified investors in two ways: (1) any purchaser whose name was a corporate or legal entity, rather than an individual's name, was considered an investor; and (2) any named individual was considered an investor if he or she purchased more than one foreclosed property in Suffolk County over the period of study. Linking transactions to the same investor was made difficult by the fact that investors may use different legal entities to acquire properties, and misspellings may exist in the database. To account for these discrepancies, we reviewed the buyers' names in detail and collected additional information on their addresses and the names of their corporate officers.[5] We acknowledge that this method understates the level of investor activity to the extent that individuals acquire only a single foreclosed property in their own name over the period studied.

This article focuses on 4,700 single-family, two-family, three-family, and condominium properties that were sold out of foreclosure between 2007 and 2012.[6] Of these foreclosures, 3,830 (81 percent) were purchased out of REO, while the remaining 870 were purchased directly by third-party buyers at foreclosure auction and thus never became REO. We identified 320 unique individuals or groups of investors who purchased two or more foreclosed properties in Suffolk County (exhibit 4).[7] These buyers purchased a total of 1,947 properties, 41 percent of the sample. Another group of buyers each purchased only one foreclosed property during our study period but appeared to be corporate entities, based on a keyword search of the buyer names, including the terms "LLC" (limited liability company), "Corp." (corporation), "Inc." (incorporated), and so on. These owners together bought

[4] We unfortunately lack information on short sales in our dataset. Unlike the deeds for foreclosed properties, the deeds for short sale transactions appear identical to those of arm's-length transactions (that is, traditional sales in which the price reflects the market value). As a result, it is not possible to distinguish short sales from arm's-length sales in real estate transactions data based on records from local registries of deeds. We also exclude properties surrendered via deeds-in-lieu of foreclosure, but only a handful of these transactions took place in Suffolk County between 2007 and 2012.

[5] Specifically, we used the buyers' addresses (and in the case of LLCs, the officers), from the Massachusetts Corporate Database and the Suffolk Registry of Deeds to distinguish between—and link—buyers. On the rare occasions that address information was missing or ambiguous, we were able to determine if John Doe A and John Doe B were the same person by looking up their mailing address information in the City of Boston Assessor's database and comparing their signatures on documents in the Registry. The owner's address data unfortunately were not available for the entire county during our study period and were of insufficient quality across jurisdictions to use mailing addresses as a primary means of identifying investors.

[6] The sample includes foreclosures completed (that is, foreclosure auctions taking place) between 2007 and 2012. This analysis focuses only on foreclosed properties sold to third-party buyers; in other words, properties still in REO as of the beginning of 2013 are excluded. It also excludes properties with four or more units that were not condominiums.

[7] This total excludes government and nonprofit organizations, which purchased 143 of the properties in the sample (about 3 percent).

Exhibit 4

Investors by Number of Foreclosed Properties Purchased

Foreclosed Properties Purchased (n)	Investors (n)	Share of Investors (%)	Total Foreclosed Properties Purchased (n)	Share of Investor-Owned Properties (%)
1	117	27	117	6
2	147	34	294	14
3	60	14	180	9
4	33	8	132	6
5 to 9	47	11	295	14
10 to 19	15	3	214	10
20 to 49	14	3	418	20
50 or more	4	1	414	20
Total	**437**	**100**	**2,064**	**100**

Note: Percentages may not add to 100 because of rounding.
Source: Authors' calculations of data from the Warren Group

117 properties.[8] In total, from 2007 to 2012, 437 unique investors purchased 2,064 properties in the sample (44 percent). Overall, 60 percent of these investors purchased one or two properties. Only 1 percent, four investors, purchased 50 or more REOs or foreclosure auction properties. These purchases, however, amounted to 20 percent of all investor-owned properties. Including these four largest investors, 33 investors purchased 10 or more properties, totaling one-half of the investor-purchased properties and 22 percent of all properties sold out of foreclosure in Suffolk County during this time. We classify those who purchased 10 or more properties as "large investors."

We have a good deal of information in the Warren Group data about the frequency, timing, and price points of these purchases. To gain additional information, we interviewed a total of 16 housing market participants in late 2012 and early 2013. Participants were not randomly sampled. We contacted city agencies and community development corporations (CDCs) active in neighborhoods with high foreclosure rates to request their participation and their suggestions for potential interview subjects. To a lesser extent, we also used public records information to identify and reach out to investors. Recruiting investors to participate proved difficult. We ultimately conducted informal interviews with two small investors, four large investors, three staff members from a city agency, five staff members employed by local CDCs and other nonprofit organizations, a lender, and a real estate broker. Although this sample is neither large nor representative, the diversity of the participants helped us gather information from a variety of perspectives.

[8] Individual (noncorporate) buyers who purchased only one foreclosed property and resold it within 1 year accounted for an additional 157 foreclosed property acquisitions during the study period. Even after a manual inspection of a sample of these records, it is unclear if the buyers are investors or owner-occupants. In the interest of conservatively measuring investor activity, we do not treat these buyers as investors.

Investors and Their Strategies

Except for the initial years of the housing crisis, 2007 and 2008, investors bought about one-half of the foreclosed properties sold each year at auction or out of REO (see exhibit 5). The scale of large investor activity followed a similar pattern. While large investors purchased 9 percent of the foreclosures in 2007 and 14 percent in 2008, they captured more than one-fourth of 2009 through 2012 sales.

Most foreclosed property investors in Boston are locally based. Focusing on only our sample of 33 large investors, more than one-half (18) were based in Suffolk County, 39 percent (13) were based elsewhere in Massachusetts (typically in the greater Boston area), and 6 percent (2) were located out of state.[9] Several of the investors had a long history of investing in these neighborhoods, in some cases as long as 20 to 30 years, while others were new to property investment. No internationally based large investors were in our sample. The smaller investors we studied were also mostly based in Boston and adjacent communities. The near absence of nonlocal investors in Boston sets it apart from other cities, such as Atlanta and Cleveland, which have been targeted by institutional and foreign investors. We suspect that the higher sales prices of foreclosed properties relative to rents in Boston discouraged outside investment.

Exhibit 5

Share of All Foreclosed Properties Purchased, by Investor Type and Year

Purchase Year	Total Purchases (n)	Bought by Investors (%)	Bought by Large Investors (%)
2007	290	20	9
2008	1,118	34	14
2009	1,184	50	28
2010	915	50	25
2011	624	48	26
2012	569	49	26
Total	**4,700**	**44**	**22**

Notes: Large investors purchased 10 or more foreclosed properties from 2007 to 2012. "All Foreclosed Properties" includes properties sold out of real estate owned (REO) status or at foreclosure auction.

Source: Authors' calculations of data from the Warren Group

Where and What Investors Purchase

Investors bought a greater percentage of foreclosed homes in the neighborhoods (defined here as census tracts) where the foreclosure rates were highest. These neighborhoods also happen to have the highest concentrations of minority households. Exhibit 6 shows that neighborhoods where more than 80 percent of households were minorities experienced foreclosures at a rate of

[9] The geographic location of the investors is the assumed place of business, based on records in the Massachusetts Secretary of State's online corporate database. When addresses appeared to be those of local agents rather than investors themselves, we looked for further information, such as addresses in the purchase deeds filed in the local Registry of Deeds. In some cases, the address appeared to be the investor's place of residence. In the few instances in which multiple addresses for a given individual were identified, the most common location was used.

Exhibit 6

Neighborhood Characteristics, by Minority Household Share and Household Income Level

Tract Characteristics	Minority Share of Households					
	> 80%	60–80%	40–60%	20–40%	< 20%	All
Foreclosure rate (%)	8.7	5.5	3.5	3.4	1.8	4.5
Investors' share of foreclosed properties (%)	58	44	36	32	35	46
Large investors' share of investor purchases (%)	58	49	48	56	23	52
Homeownership rate (%)	34	38	42	43	54	42
Average house value/unit ($)	154,625	202,155	264,187	239,268	343,442	223,011
Average share of single-family homes (%)	24	27	31	26	29	27
Average share of two- to three-family units (%)	56	46	33	33	24	42
Average share of condominiums (%)	20	27	37	41	46	31

Tract Characteristics	Household Income Relative to Suffolk County				
	< 80%	80–100%	100–120%	> 120%	All
Foreclosure rate (%)	7.3	4.9	4.0	1.6	4.5
Investors' share of foreclosed properties (%)	52	44	40	37	46
Large investors' share of investor purchases (%)	54	53	54	35	52
Homeownership rate (%)	30	39	51	56	42
Average house value/unit ($)	159,631	233,287	218,375	355,404	223,011
Average share of single-family homes (%)	24	27	31	26	29
Average share of two- to three-family units (%)	56	46	33	33	24
Average share of condominiums (%)	20	27	37	41	46

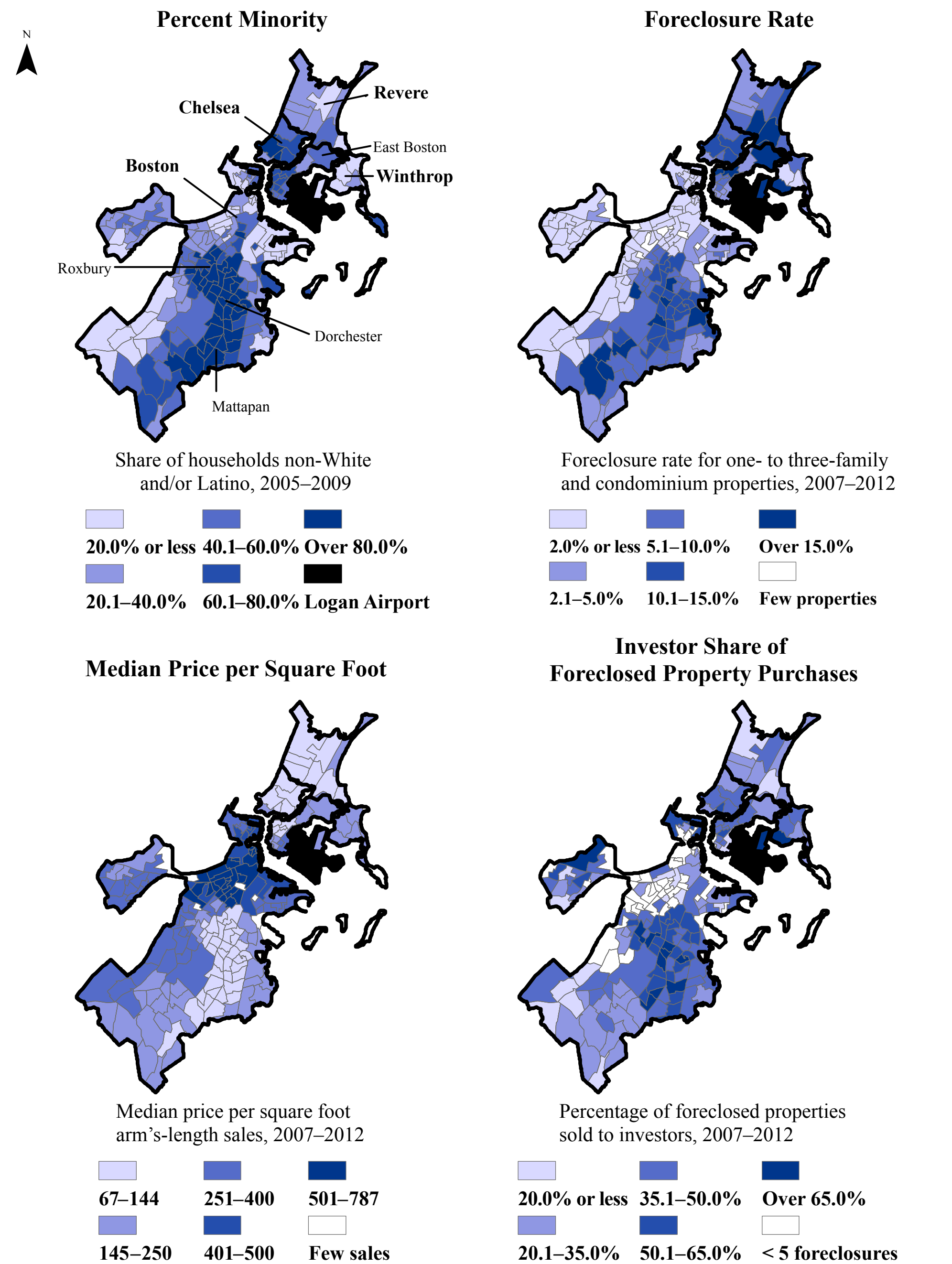
Notes: The reported foreclosure rate includes only properties transferred to a third party and does not include those still held as real estate owned (REO). "Household Income Relative to Suffolk County" reflects the tract median household income as a percentage of the Suffolk County median household income. "Large investors' share of investor purchases" indicates the percentage of all investor-purchased foreclosed properties that were bought by 1 of the 33 investors who purchased 10 or more properties in the dataset. Group averages and rates are weighted by number of transactions, properties, or units, as appropriate.

Sources: Authors' tabulations of data from U.S. Census Bureau's 2005–2009 American Community Survey 5-year estimates; authors' tabulations of data from the Warren Group

8.7 percent, nearly double the countywide rate of 4.5 percent and almost five times the rate in neighborhoods with a minority household share of less than 20 percent. Tract-level data on the share of minority households are displayed side-by-side with foreclosure rates in exhibit 7. Chelsea and the Boston neighborhoods of Roxbury, Dorchester, Mattapan, and East Boston all had high concentrations of minority households, and they also included most of the county's highest foreclosure tracts. These neighborhoods overlap heavily with Suffolk County's lowest income areas. Neighborhoods with median incomes less than 80 percent of the county median had a foreclosure rate of 7.3 percent, compared with 1.6 percent for neighborhoods with incomes above 120 percent of the county median.

Exhibit 7

Suffolk County, Massachusetts, Neighborhood Characteristics and Investor Prevalence



Note: Cities are outlined and labeled in bold.

Sources: Authors' tabulations of data from the U.S. Census Bureau's 2005–2009 American Community Survey 5-year estimates; authors' tabulations of data from the Warren Group

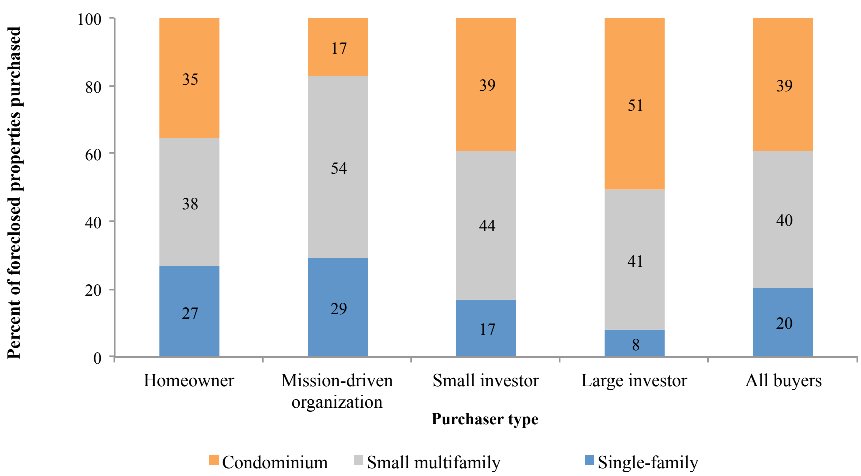
Investors purchased 58 percent of foreclosed properties in neighborhoods that had 80 percent or more minority households and 44 percent in areas with 60- to 80-percent minority households, compared with about a third in other neighborhoods. Likewise, investors purchased a little more than one-half of foreclosed properties in the lowest income neighborhoods but only 37 percent in the highest income areas.[10] Other housing market factors exist in these neighborhoods that may have influenced investor activity. Homeownership rates are low in Suffolk County's low-income and majority-minority neighborhoods. The high share of small multifamily properties, compared with other structure types, provides an attractive rental market in these neighborhoods and may hinder purchases by owner-occupants. Average house values per unit (displayed in exhibit 6) and median sales prices per square foot (displayed in exhibit 7) were also much lower in low-income and high-minority tracts.

Compared with investor activity overall, large investors were notably less active in the highest income and lowest minority tracts, where property values were highest. The investors we interviewed primarily focused on the lower income neighborhoods of Dorchester, Roxbury, Chelsea, and Mattapan. One of the investors reported that he perceived himself as a "value investor" who was not interested in acquiring properties in higher income neighborhoods, arguing that the rents in these areas could not offset the higher purchase prices.

As displayed in exhibit 8, large investors targeted multifamily (two- and three-family) properties and condominiums. Only 8 percent of purchases by large investors were single-family properties, in contrast with 17 percent of purchases by small investors and 27 percent of the foreclosed

Exhibit 8

Types of Properties Purchased by Purchaser Type



Notes: Mission-driven organizations include nonprofit organization and government buyers. Large investors purchased 10 or more foreclosed properties in the sample. Small investors purchased 1 to 9 foreclosed properties.

Source: Authors' calculations of data from the Warren Group

[10] Note that the total rate of investor activity reported in exhibit 6 (46 percent of foreclosed properties) does not precisely match the countywide total reported in exhibit 5 (44 percent). This discrepancy is because a small number of tracts are omitted from the analysis in exhibit 6 because they lacked a sufficient number of transactions to have reliable data on each field included in the exhibit.

properties acquired by owner-occupants. Large investors were particularly likely to purchase condominiums, which were 51 percent of their purchases. Condominiums made up 39 percent of small investors' purchases and 35 percent of the properties bought by owner-occupants. The remaining 41 percent of purchases by large investors were two- and three-family properties. The concentration of investment activity in small multifamily and condominium properties can be explained by the facts that these properties are often better suited for rentals than are single-family properties and are located in neighborhoods where sales prices have been lower.

The condominium properties in these neighborhoods tend to be part of small multifamily buildings, which were formerly wholly owned parcels. Conversions of multifamily properties to condominiums were common in the 1980s and 1990s, with most of the properties having only two or three units (City of Boston, 2000). Small multifamily property conversions to condominiums were also in vogue into the mid 2000s, as housing prices peaked (City of Boston, 2005). Conversion date information is not readily available, which makes it difficult to systematically analyze how recently foreclosed properties had been converted. We manually traced a number of condominium foreclosures in our sample, however, using records on file in the Suffolk Registry of Deeds. We found that many foreclosed condominium properties had been converted from small multifamily rental properties in the early 2000s. Assuming that the properties were brought up to code and perhaps renovated at the time of conversion, it is likely that many of the foreclosed condominiums purchased by investors may have required few or no improvements to make them habitable. Further, unless an investor acquired all the condominium units in a building, he would not bear the full cost of any exterior improvements. Thus, we would expect condominium units in particular to be attractive to both prospective owner-occupants and investors. Small multifamily dwellings were the primary focus of nonprofit organizations, making up more than one-half of their property acquisitions. These properties offer more opportunities for housing development as they have more units and, according to our interviews, often required significant improvements to make them marketable for resale or rentals.

Methods of Identifying and Acquiring Foreclosed Properties

During the period we study, the volume of completed foreclosures rose dramatically and then began to gradually decline as mortgage default rates fell. The investors we interviewed in 2012 and 2013 observed that fewer properties had been coming on the market. One investor attributed this decline to legislation that took effect in Massachusetts in the preceding few years, which created a backlog in the number of properties that went through the foreclosure process and affected the number of foreclosed properties for sale in Suffolk County.[11] At the same time, more investors entered the market, increasing competition for properties. With fewer foreclosed properties on the market and increased competition to purchase them, "the foreclosure market is on life support," one investor noted. The result, investors told us, was that the price of distressed properties sold

[11] Massachusetts extended the foreclosure process in 2008 and 2010 by instituting "right-to-cure" laws that stalled the foreclosure process by 90 and 150 days, respectively, to provide a "cooling off" period for borrowers and lenders to work together to achieve mortgage modifications and avoid foreclosure (Gerardi, Lambie-Hanson, and Willen, 2013). Landmark court cases also influenced the number and timing of foreclosures. *U.S. Bank* v. *Ibañez* ruled that lenders must prove that they hold the mortgages in question before they are able to foreclose. In this sense, the title must be clear at the time of auction or the sale would be voided. *Eaton* v. *Federal National Mortgage Association* ruled that lenders must provide documentation that they hold both the promissory note and mortgage. These decisions forced some foreclosures to be repeated and others to be stalled while lenders and servicers worked through the new rules.

out of REO in Boston increased significantly during the later years of the foreclosure crisis, making them less attractive to investors as potential profit margins shrunk. For example, one investor noted that early in the crisis he bought multifamily properties for $275,000, but by 2012 the same kind of properties had sales prices that were $100,000 higher.

In our dataset, we see clear evidence of falling sales volumes over time, and some evidence indicates that REO sales prices increased over time. The data tell an incomplete story, because we cannot account for property conditions or features beyond neighborhood location and basic property attributes reported in assessors' data, namely property size, age, and numbers of bedrooms and bathrooms.[12] In exhibit 9 we display the simple median REO sales prices and volumes by year and property type for all of Suffolk County and the two ZIP Codes that experienced the greatest number of foreclosures. County median sales prices for all property types were at their lowest points in 2009—the year that the overall house price index bottomed out in Suffolk County (see exhibit 1). The median price for condominiums sold out of REO, for example, was $79,900 that year. In 2012, REO condominiums sold at a median price of $149,900, an increase of nearly 88 percent. The volume of sales fell by more than one-half between 2009 and 2012.

More appropriate is to examine changes in sales prices within particular neighborhoods. Here we use ZIP Codes a proxy for neighborhoods. In ZIP Code 02124, which falls in part of the Dorchester neighborhood of Boston, 519 one- to three-family properties and condominiums were purchased out of REO between 2007 and 2012. Most of these purchases (60 percent) occurred in 2008 and 2009 alone. For all property types except single-family homes—which as we reported, investors target less frequently—median prices were at or near their lowest points in 2009. REO prices held mostly stable in the following years, although medians were higher for small multifamily properties and condominiums sold in 2012, increasing 10 to 60 percent.

The second greatest number of foreclosed properties bought out of REO (497) was in ZIP Code 02151, covering the city of Revere. In 02151, as in 02124, the median sales price of single-family REO properties was somewhat lower in 2012 than in 2009, although the median price of REO condominiums increased 37 percent. Two-family REO property median prices held steady, and there were relatively few three-family REO properties sold.

Despite the fact that median sales prices were somewhat higher in 2012, particularly for the property types investors most heavily targeted, investors still purchased about one-half of the foreclosed properties sold in 2012. The 33 largest investors alone purchased 26 percent of foreclosed properties. Given the competition for foreclosed properties from nonprofit organizations, government, and prospective owner-occupants, how did investors capture such a large share? From our interviews and data analysis, we learned of three main advantages that many investors possess—particularly large investors. First, investors are often able to purchase properties at foreclosure auction, before they ever become REO. In contrast, owner-occupants and mission-driven organizations rarely buy properties at auction. Second, investors appeared well connected and savvy, having timely knowledge of properties coming on the market as REO. Third, and perhaps most important, investors have had better access to financing for purchase and rehabilitation.

[12] We used a hedonic model to estimate the purchase price for REO properties, controlling for these traits, but the results simply reaffirmed the patterns in median sales prices discussed in this section. Results are available upon request.

Exhibit 9

REO Median Sales Prices and Transaction Volumes, by Year

Year of Sale	Median Sales Price ($)				Sales Volume (n)			
	Single-Family	Two-Family	Three-Family	Condominium	Single-Family	Two-Family	Three-Family	Condominium
Suffolk County, Massachusetts								
2007	270,511	308,475	362,625	210,750	82	48	30	62
2008	212,160	235,000	240,000	101,000	200	246	228	353
2009	165,000	195,000	200,000	79,900	179	232	178	403
2010	181,750	200,000	210,000	95,000	142	128	111	285
2011	184,900	203,000	225,000	111,300	101	82	64	227
2012	176,000	208,125	263,000	149,900	105	88	63	179
Percent change 2009–2012	7%	7%	32%	88%	– 41%	– 62%	– 65%	– 56%
Dorchester: ZIP Code 02124								
2007	310,000	350,000	378,500	122,500	13	9	6	4
2008	207,500	250,000	247,000	65,000	22	29	45	62
2009	150,000	175,900	214,000	70,000	21	31	33	69
2010	153,000	197,625	210,000	75,000	13	11	19	37
2011	150,000	177,500	221,000	86,000	7	12	11	19
2012	145,100	281,000	235,300	105,000	8	8	14	16
Percent change 2009–2012	– 3%	60%	10%	50%	– 62%	– 74%	– 58%	– 77%
Revere: ZIP Code 02151								
2007	251,250	295,950	527,000	208,000	22	14	1	6
2008	215,000	234,250	225,000	200,000	45	44	21	31
2009	177,500	215,000	200,000	116,000	38	43	7	23
2010	145,450	215,000	231,450	140,000	28	22	6	17
2011	166,000	221,556	240,500	105,500	23	19	2	16
2012	153,000	215,000	251,600	159,000	24	17	4	24
Percent change 2009–2012	– 14%	0%	26%	37%	– 37%	– 60%	– 43%	4%

REO = real estate owned.

Source: Authors' calculations of data from the Warren Group

Purchases at Foreclosure Auction

Properties sold at foreclosure auction are either bought by third-party buyers (investors or intended owner-occupants) or become bank owned (REO). During our study period, foreclosure auctions were well attended in Suffolk County, but they commonly resulted in bank buybacks of properties: the vast majority (81 percent) of foreclosed properties did not sell to a third party at the foreclosure auction and thus became REO. These buybacks occur when lenders set their reservation prices higher than the perceived market value of the properties, so no third-party participants at the auction are willing to outbid the bank. A greater share of foreclosure auctions resulted in successful sales, however, as the foreclosure crisis unfolded—only about 1 in 10 properties put up for auction at the beginning of the crisis were sold to third-party buyers, as compared with about 1 in 4 properties in recent years.[13]

Buyers at auctions were disproportionately likely to be investors; they bought 75 percent of the properties sold at auction but only 37 percent of the properties sold out of REO. Investors are often better equipped to purchase properties at auction, because of the cash deposits required (usually $5,000 to $10,000) and the risk involved in purchasing foreclosed properties without conducting inspections. King (2012) makes a similar observation about investors' advantages buying properties at foreclosure auctions in Oakland, attributing their success to their ability to pay cash for properties. Buyers at foreclosure auctions also assume any existing liens on the properties that take precedence over the mortgage. Large investors were the most likely to purchase properties at foreclosure auction: 39 percent of all foreclosure purchases by large investors were completed at auction (rather than out of REO), as opposed to 13 percent of purchases by small investors and only 8 percent of purchases by other parties, including owner-occupants, government entities, and nonprofit organizations.

The investors we interviewed told us that they continued to track and attend auctions, but that over time this strategy had become less effective for identifying and acquiring foreclosed properties. One investor estimated that after accounting for postponed and cancelled auctions, his chances of making the highest bid at an auction were only 1 percent. Another reported that as auctions become scarcer, at almost every auction he would observe five or six of the same bidders who drove up the sales prices of foreclosed properties by bidding against each other. He added that the decline in foreclosure auctions and the higher acquisition prices for foreclosed properties represented a reversal from the height of the foreclosure crisis, when foreclosed properties had lower sales prices and it was not uncommon for investors attending auctions to buy properties at steep discounts, particularly in Dorchester: "You had multifamily properties with $700,000 in loans in Dorchester selling for less than $250,000 at auction." Other participants told us that although such deals would sometimes be available, lenders typically set reservation prices close to the unpaid principal, interest, and fees, making it prohibitively expensive to purchase properties at auction. Given that only the lender knows its reservation price before the auction, attending auctions can be fruitless endeavors for investors.

Connections With Real Estate Brokers and Lenders

Large investors tended to be very well connected and were able to leverage their extensive local networks to find properties to purchase. Our interviews revealed that investors often had relationships with certain brokers who had listed foreclosed properties on behalf of banks and trustees, and that these relationships enabled them to acquire bank-owned properties quickly, with one investor noting that "a trusted broker is usually the best way to identify the right properties." One nonprofit organization staff member noted that his organization used their connections with specific investors to help them acquire REO properties, as these investors had ties to real estate

[13] As discussed in the following section, the investors we interviewed believed that sales prices at auction, accounting for property quality, had increased over time. They also reported more competition from other investors at auction. Considering this information, we presume that the increase in successful auction sales was driven more by investor demand than a willingness of lenders and trustees to cut their reservation prices.

brokers representing foreclosed properties and possessed extensive knowledge of the local housing market. At least six investors who bought foreclosed properties in Suffolk County were licensed real estate agents who themselves had sold REO properties on behalf of banks.

Although nonprofit organizations reported benefits from working with some investors, this type of cooperation appears rare in Boston. City officials and local nonprofit community groups were familiar with many of the largest investors by name, but only a small handful of these investors had worked with CDCs and nonprofit organizations to purchase and manage distressed and foreclosed properties. More often these groups competed to buy properties. Government and nonprofit organization interviewees noted that they were facing stiff competition from private investors in acquiring properties, with one interviewee noting that investors seemed to know ahead of time what properties were coming on the market and were able to act before mission-driven groups even knew the properties were available.

The First Look Program, rolled out in late 2009 by large mortgage servicers and the government-sponsored enterprises, was meant to give prospective owner-occupants and mission-driven buyers priority in REO property acquisitions. One nonprofit organization staff member and one government employee we interviewed indicated that the process was cumbersome, and that they had few successes using it. At least one person remarked that the periods involved—24 to 48 hours for prospective owner-occupants and mission-driven entities to initially express interest, and about 15 days to make offers—were sometimes too short to have a meaningful effect on their ability to move forward with a property. One staffer expressed frustration about not having easy access to information about which properties had become available during the First Look period. Experiences appeared to vary based on the seller, with some, like Fannie Mae, having a more transparent process and providing more timely information about properties than others.

It was sometimes difficult for nonprofit organizations to compete in the market, especially under the restrictions of the Neighborhood Stabilization Program (NSP). According to a survey of more than 90 direct and indirect NSP grantees during the initial years of program implementation, only a little more than one-half of NSP grantees had purchased one or more properties within the first 5 to 7 months of starting their property acquisition and rehabilitation efforts (Newburger, 2010). NSP grantees were typically constrained by the types of properties that they could consider and the amount that they could pay. As the real estate broker we interviewed observed, REO holders did not appear to be looking to work with many community organizations or nonprofit organizations, adding that "they are just trying to sell to the highest bidder—there is not much preferential treatment." In an effort to offload properties quickly, REO holders may have been more willing to work with investors. Nonprofit organizations and owner-occupant buyers tended to need mortgage financing or use programs like the NSP to purchase properties, which added obstacles and delayed closings (Newburger, 2010). In contrast, investors often paid cash.

Financing

In the wake of the housing bust, lenders became more conservative and wary of providing mortgage financing, including to investors. Despite this tightening of lending standards, investors had access to a variety of funding sources, including their own equity and loans from financial entities other than banks. Some also had established relationships with small community banks. Several of our interview participants reported that, with fewer financing choices at their disposal, potential owner-occupants were being outbid by investors who were not as constrained.

We analyze data on the purchases by large investors and break the types of financing down into four groups: (1) cash (no purchase mortgages associated with a property); (2) hard-money loans from a firm partially or wholly controlled by one of the foreclosed property investors in our sample; (3) loans from small commercial banks or thrift banks headquartered in the greater Boston area; and (4) loans from other types of lenders, including hard-money lenders not associated with known foreclosed property investors, large commercial banks, mortgage companies, or other institutions.[14]

We find that 43 percent of the purchases by large investors were financed without the use of a recorded mortgage, which we treated as a cash purchases. Six of the large investors in our sample of 33 never used mortgage financing to purchase properties. Instead, as we learned through interviews, they tapped a variety of sources of equity, including their own savings and capital from institutional investors. In contrast, only 27 percent of properties bought by owner-occupants were paid for without a mortgage. Smaller scale investors (those purchasing nine or fewer foreclosed properties) were the most likely to purchase without using a mortgage—nearly 64 percent of their property acquisitions were cash sales. These smaller investors may have found it more difficult to access hard-money loans and other sources of capital.

Traditional loans are ill-suited for acquiring foreclosed properties, as the lending process can take months to complete, undermining deals that need to be completed quickly. Buyers who were able to purchase a property with cash were reported to have had an advantage over buyers who are reliant on mortgages, because they were able to speed up the sale and require fewer contingencies (McKim, 2011). As one interviewee noted, “A lot of [traditional] finance buyers can’t compete with cash buyers who are willing to pay 10–20 percent above list price; it’s very competitive right now for a three-family home.” The same person added that the appraisal process could also be problematic in accessing traditional financing, so the easiest option for purchasing foreclosed properties was cash financing. As shown in exhibit 10, cash purchases were common even when property sales prices were high. The use of cash financing declined only when sales prices began to exceed $250,000. For properties priced above this threshold, cash was still used in 32 percent of purchases.

A little more than one-half of the 33 large investors used some type of mortgage financing in more than 50 percent of their property acquisitions, and three large investors financed all of their purchases using mortgages. Financing came from a range of sources, commonly “hard-money” loans to fund property acquisition and rehabilitation. These loans are from nonbank private financial institutions that specialize in providing real estate backed loans, with mortgage terms ranging from 2 to 24 months. The loans bear relatively high interest rates, averaging 12 to 15 percent, and they require substantial equity investments, as lenders largely rely on the value of the collateral and not on the borrower’s ability to pay.

[14] For cases in which two or more purchase-money mortgage transactions occurred, we selected the one that appeared to be the primary lien (represented by a larger balance or, in the case of tied balances, an earlier book and page in the Suffolk Registry of Deeds) and included it in our analysis.

Exhibit 10

Large Investors' Use of Financing by Property Purchase Price

Notes: Includes purchases by large investors. Percentages may not add to 100 because of rounding.
Source: Authors' calculations of data from the Warren Group

Many investors in Boston turn to each other for hard-money loans. Basing our analysis on an in depth review of the purchase mortgages in our dataset, we find that seven investors operated their own hard-money lending firms that finance acquisitions for themselves and other investors.[15] One investor noted that it became common practice in 2008 and 2009, at the peak of the crisis, for investors to lend to each other because banks were restricting the flow of credit, and investors were forced to find another source of money. As shown in exhibit 10, hard-money lending was most common for lower cost properties, particularly those priced at less than $125,000. Only 12 percent of acquisitions of high-cost properties (priced at more than $250,000) involved hard-money loans from affiliated investors.

The third most common type of financing in our sample of purchases by large investors, making up 16 percent of transactions, was loans by small community banks and thrift banks. These transactions dwarfed the five loans in our sample made by large commercial banks that operate nationally. The large investors we interviewed reported having established relationships with small community banks that enabled them to secure a purchase-money mortgage or refinance after rehabilitating and renting out a property, with one investor noting that "[community] banks tend to have the best prices and are actively lending. Larger commercial banks have no interest in lending to investors and they don't have the local knowledge of the housing market that community banks do." As the same investor explained, it is in the interest of a foreclosed property investor to obtain a bank loan because of the low interest rates; "even for guys who have a lot of their own equity, I don't know a single person who doesn't take a loan [from a traditional lender]. Borrowing is so cheap that I can still make money and achieve a 10 percent cap rate. I make 5 percent on every

[15] We classified lenders based on information we gained from their websites and other online sources about product offerings, length of loan terms, and underwriting practices.

nickel I borrow, so leverage is working in my favor." Community banks appeared to be particularly active in financing the purchase of higher cost properties. Loans from community banks financed the purchase of 44 percent of the properties bought by large investors for more than $250,000.

The type of financing used at purchase does not tell the whole story, though. Through our interviews, we identified a common two-step financing model: taking out a short-term, high-cost loan or using their own equity to finance the initial purchase and rehabilitation of a property, and then after the property is rented and producing a stable income stream, refinancing through a traditional lender. We confirmed this behavior in our dataset. After using a mortgage from a hard-money lender to purchase a foreclosed property, 56 percent of investors took out a subsequent mortgage on the same property, presumably a refinance loan, at a later date.[16] In contrast, 39 percent of buyers purchasing with cash later took out a mortgage, and 42 percent of those initially using loans from small local banks appeared to refinance. Only 29 percent of investors using other types of financing were observed to take out another mortgage after the purchase date. These investors initially borrowed from large banks, mortgage companies, and hard-money lenders not affiliated with known Suffolk County foreclosed property investors.

One investor explained that his strategy of initially using hard-money loans and later refinancing through a bank proved effective because banks were more likely to assist with financing a foreclosed property if they saw that the property had been rehabilitated and leased for a certain period of time with positive cash flow. In his words, "once you fix it up and rent it out, the property is worth more than what you bought it, in the bank's eyes, because it's generating income. The bank will run the cap rate and see that after the rehab, the property is now worth $450,000 instead of $250,000, bringing in $3,000 per month in positive cash flow. Then the bank will allow you to refinance 75 percent of the value." Another investor added that his ability to refinance with a traditional lender after purchasing a foreclosed property affected his decision to resell or hold the property; if he was able to secure refinancing, he would certainly continue to hold it.

From our interviews we learned that owner-occupants and small-scale investor landlords struggled to compete with large investors in Boston because large investors had greater access to cash, hard-money loans, and alternative lending streams. Financing was a particularly salient issue for those wanting to buy properties that would require substantial spending on rehabilitation. One nonprofit organization staff member who worked with small property owners observed that "the big issue is that usually you can't get more money in your loan for making improvements." According to the same person, although small property owners previously had the ability to take out a bank loan for improvements, limited credit availability for this purpose had made it more difficult to borrow for rehabilitation expenses. Another nonprofit organization staff member observed that "small investor-owners tend to operate from check to check to make repairs." He had seen cases of small investor-owners who were foreclosed on because they wound up overpaying for a property in poor condition, initially intending to accumulate rental income but ultimately finding themselves unable to keep up with the necessary repairs and maintenance.

[16] Our data do not enable us to distinguish between refinance mortgages and subordinate-lien mortgages taken out after the time of purchase.

Postpurchase Property Management

As we have established, investors accounted for a large share of foreclosed property acquisitions in Suffolk County. We now turn to the question of what these investors did with the properties they bought. We find that investors in Boston and neighboring communities tended to hold properties, although some resold or even flipped them. Holding properties in Boston appears to have been desirable because of the strong rental market in the area, especially renting units to voucher holders. Positive expectations about rents and future house prices led some investors to spend substantial sums rehabilitating properties.

Strategies With Respect to Holding or Selling Properties and the Challenges of Rental Management

Mallach (2010a) presents a typology of distressed property investors that distinguishes between several common types of business strategies. His typology includes four categories: rehabbers, flippers, milkers, and holders. Although rehabbers and flippers purchase distressed properties with the goal of reselling them to buyers, the main difference between the two categories is that rehabbers are more focused on investing in necessary capital improvements and renovations for the property, while flippers typically put minimal investment into the property before selling quickly to other buyers. Meanwhile, milkers and holders purchase properties with the intention of renting them out. Unlike holders, however, milkers do not invest in property maintenance and tenant selection practices because they are focused on the cash flow that can be generated from the spread between rents and the low property acquisition and maintenance costs. Holders are generally more cognizant of property appreciation and dedicate more financial resources to property maintenance and tenant screening.

In practice, almost all of the large foreclosed property investors in Boston had both held and resold properties, rather than pursuing a single strategy. The predominant strategy was to hold, however, at least until the housing market improved. Overall, 68 percent of properties were held for at least 2 years, and 53 percent were still owned by the same large investor as of January 2015. Looking at the 33 large investors individually, 21 (64 percent) held at least two-thirds of their properties for 2 years or longer. Of these 21 investors, 12 still held two-thirds of their properties by January 2015.

Despite the prevalence of a holding strategy among investors, 8 large investors resold at least one-half of their properties within 2 years of purchase. These investors could be classified as flippers or rehabbers, according to Mallach's typology. For the most part, though, flipping in Boston seems to have been rare; for the properties resold, the median time to resale was about 9 months, which suggests that at least some improvements could be made to the properties before they were resold. Only one large investor had a median holding time of less than 30 days, while another two had median times until resale of less than 90 days. Only 117 properties resold by large investors (7 percent) were resold in less than 90 days.

Based solely on purchase and resale prices (ignoring other factors, like costs of building improvements or financing), 97 percent of resold properties by large investors resulted in gross gains (that is, sales price exceeding purchase price). The median dollar gain was $96,000; the median percentage gain was 63 percent. As a point of comparison, the median gross return on a nonforeclosed property purchased and sold in Suffolk County during this period was 12 percent.[17] Foreclosed property investors earned these high returns despite the fact that most of their portfolios were concentrated in low-income areas with high foreclosure rates.

Most sales by large investors conducted through 2012 were to owner-occupants, with only 39 percent of properties sold to other investors. The prevalence of sales to owner-occupants or other parties varied greatly, however, based on the investor's primary business strategy. Most of the investors who had resold the bulk of their properties primarily targeted owner-occupants, and even when they sold to other investors, they typically did not sell to another large investor. On the other hand, among investors who primarily held their properties, it was less common to sell to owner-occupants; they instead generally sold to other investors, often to large investors.[18]

The dominant strategy of holding properties in Suffolk County appears to have been driven by high rental demand, although house price recovery served as an incentive to resell. One investor explained that he preferred to resell multifamily properties after acquiring and renovating them, rather than holding properties for rental income. "Multifamily market values are such that it makes sense to flip the properties," he said. "We usually extensively renovate our properties so the condition they are in when we purchase them is irrelevant. They will sell for a premium given our renovations." To estimate the feasibility of a resale versus a holding strategy for each individual small multifamily property, he would determine whether he and his partner were able to achieve a per-property profit of $50,000. If not, he would hold onto these properties for the rental income; he estimated that he wound up holding around 25 percent of the inventory that he purchased at auction. Over time, Boston and other cities may see a larger share of investors reselling their properties. Two investors commented that they and their partners initially held and rented out nearly all their purchases, but as sales prices were increasing in the area, they planned to divest.

Similar to Immergluck and Law's (2014) findings on Atlanta, we learned that many investors in Boston who rented out their properties had a preference for tenants with Housing Choice Vouchers. Voucher holders were attractive as tenants because they represented a reliable stream of rental income in neighborhoods where lower income households may be stretched to afford market-rate rents. As one investor put it, voucher tenants represented "guaranteed money," as the federal government pays the difference between the tenant contribution and the fair-market rent. Voucher holders were also more likely to seek housing in distressed neighborhoods because of the lack of affordable housing throughout Boston. Several investors noted that within these neighborhoods, fierce competition among landlords over leasing to voucher holders provided incentives for investors to rehabilitate distressed properties and to use more expensive finishes, because nicer units tend to rent out faster.

Not all investors were competing for voucher tenants, however. Interview participants noted that very few "mom and pop" investors were adept at handling vouchers, because of strict requirements and high housing standards mandated by the program. Larger, "professional" landlords had more

[17] As an anonymous referee pointed out, investors who are renting out their properties may delay sales until they receive a higher asking price. By contrast, traditional sellers may feel a greater urgency to sell, which could lead them to accept lower offers.

[18] For a more detailed description of these patterns, see Herbert et al. (2013).

capacity to manage the requirements for the voucher program, particularly those with property management companies. The volatility of the market and recent policy changes also presented broader challenges in rental and property management, particularly for less sophisticated, smaller investors. For example, increased legal protections provided to tenants living in foreclosed homes have affected purchase and property management strategies. In 2010, Massachusetts enacted a law that prohibited banks from evicting tenants living in foreclosed properties.[19] Managing rents and existing tenants in previously foreclosed buildings that are still occupied can present challenges for landlords and can deter investors from purchasing these properties. One investor noted that, although he had purchased several occupied buildings, they were "special cases" in which he got a "really good deal." Another investor noted that, in some cases, he was able to negotiate a "cash for keys" deal with existing tenants in foreclosed properties, requiring them to leave within 30 days if he gave them $2,500.

Property Improvements

We unfortunately lack reliable building permit or housing condition data for most of the properties in our sample, so we must rely on anecdotal information from our interviews about the extent to which investors made property improvements. In these interviews, we were told that private investors were more likely than nonprofit organizations to target less physically distressed foreclosed properties. One nonprofit organization staff member noted that his organization tended to be outbid by investors for properties that required lower levels of rehabilitation. Meanwhile, the "seriously deteriorated and abandoned" properties that comprised one-half of his organization's portfolio received little competition from private investors. The same person explained that his organization mostly targeted highly distressed foreclosed properties, however, because "they were the cancers on the street. Properties that are feasible on a market basis [are attractive to a] different set of investors." Recall that as we discussed in the section Where and What Investors Purchase, one-half of the properties that large investors acquired were condominium units, which may have required less rehabilitation than small multifamily and single-family properties.

As the same nonprofit organization staffer explained, unlike a mission-based nonprofit organization, an investor acquiring foreclosed properties without subsidy would not necessarily ensure that properties were energy efficient and that all systems had been "brought up to date, making them durable and sustainable" to potential owner-occupants. The cost of these upgrades might not be fully recaptured in the sales price of the property, particularly in lower income neighborhoods. The availability of subsidies through federal programs such as the NSP enabled nonprofit organizations to upgrade properties to a greater extent than the purchasing power of these lower income households alone could support.

The level of rehabilitation required by foreclosed properties can deter owner-occupants and small investor landlords from purchasing them. Compared with properties with similar physical or

[19] The law is considered one of the most comprehensive in the United States for protecting residents of foreclosed properties. It includes a "just cause" section that bars banks from evicting tenants from foreclosed properties unless the tenant fails to pay rent, damages the property, or otherwise gives "just cause" for eviction. It also imposes a longer preforeclosure period on banks that do not make a concerted effort to restructure loans with homeowners, criminalizes mortgage fraud, and provides property tax exemptions for charitable organizations that purchase foreclosed properties (Commonwealth of Massachusetts, 2010).

locational characteristics in the traditional housing market, REO properties are typically in worse condition (Mallach, 2010b). A real estate agent who had also invested in foreclosed properties told us that the REO properties he saw would often have “leaking on multiple floors and [be in] total disrepair.” In fact, Mallach (2007) documented that it was not uncommon for the combined costs of property acquisition and a comprehensive, code-compliant rehabilitation of a severely deteriorating property in a distressed neighborhood to easily surpass both the market value of the renovated property and the cash flow generated from the rental income.

Information provided by investor respondents indicated that a number of investors were spending a significant amount on rehabilitation, particularly of small multifamily properties. One investor who bought two- and three-family houses noted that although he is “prepared to spend up to $100,000 on some properties,” he would spend “as little as $25,000 or less on others,” and another investor estimated that he spent a minimum of $50,000 to $60,000 per property on rehabilitation, but that rehabilitation costs can be higher. For example, he estimated that he would spend $80,000 to $100,000 on a property he was planning to resell to other investors. For projects supported by NSP funds, investors reported undertaking a greater amount of renovation. An investor who participated in NSP projects estimated that he spent between $100,000 and $125,000 per property on rehabilitation, with most of the properties requiring gut rehabilitations. Another investor respondent who was involved in the NSP cited similar figures, spending about $100,000 on rehabilitation per unit using NSP subsidy money. If not using NSP subsidy money, the same investor reported spending about $50,000 to $75,000 on rehabilitating a market-rate property. What is not clear is whether these properties renovated with NSP funds were in substantially worse condition to begin with, or if the subsidy actually provided incentives to bring properties to higher standards than the market would achieve on its own.

Interview participants had heterogeneous opinions on whether investors, by and large, performed a sufficient level of maintenance and improvements to their properties. Multiple interview participants, however, including nonprofit organization workers, government staff, and investors, argued that REO properties (that is, those owned by banks) tended to be in worse condition than investor-owned properties, largely because of the fact that banks were using nonlocal property management companies to oversee their portfolios. So, investors, though perhaps not perfect actors, seemed to be a lesser evil in the eyes of some of the government and nonprofit organization staff members we interviewed.

One person who oversees property inspection services for a Boston-based nonprofit organization, managing several REO properties in its portfolio, noted that although a property might be acceptable at the time of the foreclosure auction, conditions could deteriorate the longer the home remained under bank ownership, with structural, plumbing, and heating issues cropping up. Trustees holding foreclosed properties may be reluctant to make necessary repairs, let alone improvements. La Jeunesse (2013) found in her national study that around 65 percent of REO properties were sold with no work or minimal work done, increasing the need for repairs and improvements after sale, and Lambie-Hanson (2013) found that bank-owned properties in Boston were the subject of many constituent complaints to city government about property conditions.

Summary and Conclusions

Investors have played a significant role in acquiring foreclosed properties in Boston and nearby communities, with large investors having been particularly active in neighborhoods with lower incomes and higher proportions of minority residents. With a higher percentage of these purchases paid for using cash or hard-money loans, investors channeled a substantial amount of capital into these neighborhoods through nontraditional channels. In that way, investor activity has appeared to play a stabilizing influence in helping absorb the high volume of distressed properties that have come on the market.

All told, investors purchased 44 percent of foreclosed properties sold at foreclosure auction or out of REO from 2007 through 2012. Of these properties, one-half were purchased by 33 large investors who acquired 10 or more properties. Among the properties that large investors purchased, 41 percent were small multifamily dwellings, which, in many cases, required substantial investment. In addition, 51 percent of the properties purchased were condominiums, which were typically located in small multifamily buildings, many of which had been converted in recent years. Because of the recent conversions, these units may not have required substantial investment. Also, the cost of exterior renovations, if made, would be shared across units.

Although investors played a large role in purchasing distressed properties, it is not clear how the market would have absorbed these properties in their absence. Nonprofit organization and government staff using NSP funds to purchase properties reported that they and prospective owner-occupants experienced competition from investors to purchase small multifamily properties, particularly those properties that needed less improvement. Investors and prospective owner-occupants also competed to purchase condominium properties, because the properties were smaller (one unit instead of several), had lower price points (making them attractive to owner-occupants), and appeared to require less substantial renovation. The investors we interviewed reported experiencing competition not only from mission-driven organizations and owner-occupants but, increasingly, over time, from other investors. We explained how large investors often purchased properties at foreclosure auction, giving them "first pick" of the foreclosed properties. We also discussed how their market knowledge and connections with real estate agents helped them identify REO properties quickly and seize opportunities. Most important to our discussion, however, large investors had access to a variety of financing sources, which made them more agile in the market. During a period in which traditional mortgage credit became scarce (see, for example, Goodman, Zhu, and George, 2014), this advantage was likely to be important not only in strong housing market cities like Boston but also in weaker market areas.

One concern about a high level of investor activity is whether investors have displaced potential owner-occupants who otherwise would have acquired these properties. Our investigation did find that most of the properties acquired by investors were held as rental units. This outcome, however, appears to mostly reflect the greater financial returns available from renting versus selling and, therefore, the somewhat limited demand from owner-occupants. At the same time, based on a subsample of large investors, a small majority of the properties that investors resold were bought by owner-occupants, so investors were, to some extent, serving as a conduit for returning these properties to the owner-occupied stock.

The homeownership rate in lower income and minority neighborhoods in Suffolk County has been 40 percent or less, and so there has always been a sizeable fraction of rented housing in these areas. To the extent that investors bought and rented out properties previously held by owner-occupants, they have further increased the rental stock and may have had a positive effect on rental affordability. That said, one nonprofit organization staff member we interviewed told us that foreclosed property investors commonly raised rents on existing tenants in the low-income neighborhood where she worked, even in cases in which property renovations were not made.

Another key issue is whether these investors have performed a sufficient degree of maintenance and improvements to reduce the potential that these formerly distressed properties act as blights on their neighborhoods. Although it was difficult to measure the extent of property improvements from the information available, the interviews we conducted for this study indicated that it was common for investors to pursue at least modest improvements after acquiring these properties to better position them for rent or sale. Problematic activities such as predatory flipping and milking of properties did not appear common in this market. The nonprofit organization and government staff members we interviewed confirmed that Suffolk County has largely been spared these problems.

We note that Mallach (2014) had a similar finding for Las Vegas, although as Herbert, Lew, and Sanchez-Moyano (2013) discussed in their comparative analysis, foreclosed property flipping in Las Vegas was more common at the beginning of the crisis. Immergluck and Law (2014) found considerably more flipping and milking in Atlanta. They argued that milkers may simply have been owners who had not been able to sell and who abandoned their properties rather than maintained them. Ford et al. (2013) reported that flipping and milking in Cleveland was common, with milking particularly prevalent among out-of-state investors who had misjudged the scale of deterioration of the REO properties they were buying and were unwilling or unable to resell these properties.

In the Boston area, optimism about rents and home prices seems to have been better founded, which may have spared the area problems of milking and abandonment—although, as we learned from the investors we interviewed, even those in Boston sometimes purchased properties without clear intentions of whether to hold or resell, waiting to decide on their strategies until they determined if, and under what conditions, they could refinance. This is another example of how market factors influence investors' profits and business strategies.

The typical improvements the Boston-area investors made to properties may not have been as extensive as those pursued with the support of public subsidies, but the area's relatively high housing values and significant rental demand provided an incentive for investors to maintain properties in at least decent condition, in contrast with investors' maintenance efforts in cities like Cleveland. Given the importance of this issue, an area for further research is to undertake a more systematic assessment of the types of properties investors target and whether they are more or less likely to make investments in property improvements. We expect that the results for strong housing market cities like Boston will differ from weaker market areas, where investors stand to gain less in expected rents and resale values and are less likely to be locally based, making it more difficult for them to oversee rehabilitation projects.

While we caution that the results presented in this case study are confined to the Boston area, we think our findings are likely to be applicable to other cities with relatively strong housing markets. In these cities, investors have stronger incentives to maintain and rehabilitate properties, which may result in fewer burdens on municipalities' code enforcement units. Likewise, the need for mission-driven organizations to acquire distressed properties to stabilize markets may not be as pressing, aside from pursuing broader objectives, such as providing affordable housing, performing greater degrees of property rehabilitation, and engaging in historic preservation.

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Authors

Lauren Lambie-Hanson is a senior specialist in the Risk Assessment, Data Analysis and Research Group of the Supervision, Regulation and Credit Department at the Federal Reserve Bank of Philadelphia.

Christopher E. Herbert is the Managing Director of the Joint Center for Housing Studies of Harvard University.

Irene Lew is a research assistant at the Joint Center for Housing Studies of Harvard University.

Rocio Sanchez-Moyano is a research analyst at the Joint Center for Housing Studies of Harvard University.

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A Research Note: Long-Term Cost Effectiveness of Placing Homeless Seniors in Permanent Supportive Housing

Joshua D. Bamberger
University of California, San Francisco; Mercy Housing

Sarah K. Dobbins
San Francisco Department of Public Health

Abstract

A recently developed body of evidence shows that housing chronically homeless adults improves health outcomes and prevents unnecessary, high-cost, institutional-based medical care. In this study, we report changes in the healthcare costs of homeless seniors who were placed in housing from a skilled nursing facility (SNF) and the costs for those placed in housing from the general community. Cost and utilization data from 1 year before move-in were compared with data from the 7 years subsequent to moving into a new permanent, supportive housing facility. During the 7 years after placement, the total hospital-based costs for the 51 seniors who moved into the facility was $1.46 million less than the costs incurred in the year before moving in. Permanent supportive housing may be a cost-effective placement option for homeless seniors exiting SNFs, particularly as they approach the end of life.

Introduction

Past research has found that housing chronically homeless adults can not only reduce homelessness but also may improve health outcomes and reduce healthcare costs (Holtgrave et al., 2013; Larimer et al., 2009; Sadowski et al., 2009). The New York State Medicaid program has proposed to budget more than $100 million in fiscal year 2014/2015 to pay for supportive housing that targets chronically homeless adults with the goal of reducing the overall state healthcare expenditures (Doran, Misa, and Shah, 2013).

Some past studies indicate that supportive housing may reduce costs for homeless adults who are frequent users of the healthcare system, but little attention has been given to how supportive housing might serve homeless adults as they approach the end of life. Gulcur et al. (2003) report that public health expenditures on homeless people before and after placement in permanent housing have fallen significantly (Gulcur et al., 2003). Few studies reported on the long-term effect on health and healthcare use following placement, however (Stefancic and Tsemberis, 2007). In addition, most studies assessed resource use after housing homeless people from the streets or shelters, whereas permanent supportive housing can also serve as a high-quality and cost-effective option for placing homeless people who have had extended stays in skilled nursing facilities (SNFs).

In 1999, the San Francisco Department of Public Health—through its Direct Access to Housing (DAH) program—began offering locally funded Housing First permanent supportive housing to homeless adults The Housing First strategy was adopted as an alternative to the Continuum of Care model that prevented people who continue to use illicit substances and/or alcohol or people with poorly controlled mental illness from qualifying for housing. A core belief underlying the Housing First strategy is that many people who live on the street, in shelters, or in institutions are unlikely to make progress in their substance abuse or mental health condition until they achieve stable housing. In May 2006, Mercy Housing opened Mission Creek Apartments a new affordable housing development. The residential component of the development provides housing and onsite services for 139 seniors (age 61 or older), with 51 units reserved to serve homeless seniors through the DAH program. The facility provides studio and one-bedroom apartments that overlook San Francisco Bay and are adjacent to the city's professional baseball stadium (AT&T Park). Preliminary reports indicate a significant reduction in healthcare use for the DAH tenants in the first year of placement at Mission Creek.

In this article, we present data on the healthcare use of these 51 seniors during the past 7 years since the building opened. In addition, we report on the housing outcomes and healthcare use and costs for the subset of seniors placed directly from the city-operated skilled nursing facility (SNF)—many of whom were approaching the end of life. We then compare these outcomes with those for homeless seniors placed in the facility from the general community. In this relatively small, initial study, we describe a new model of enriched supportive housing that not only improves the quality of life of seniors but also can provide a return on investment that reduces healthcare expenditures.

Program Description

As with other Housing First programs, tenants do not need to prove sobriety or compliance with treatment to qualify for access to permanent supportive housing. To be eligible for the DAH program, applicants must be homeless at the time of referral to the program or must have been homeless before entering an institution. A precondition to signing the lease includes that the tenant agree to pay rent through a third-party rent payee. The rent amount is fixed at $377 per month. Tenants who have an income of less than $754 (double the rent) are ineligible for this facility (although they are eligible for other DAH buildings). The Supplemental Security Income, or SSI, benefit level for a single, disabled individual in California was $889.40 per month in 2015. Tenants are selected from a pool of referrals to the DAH Access and Referral Team; the referrals are designed to collect information to assess the clinical condition of each applicant and guide prioritization of clients who have the most severe medical, psychiatric, and substance use conditions, but who are able to safely live independently.

Two case managers work on site at the building, and most DAH tenants have outside case management from programs targeting seniors or frequent users of the healthcare system. Most tenants also have in-home support service providers to assist with housekeeping, food preparation, activities of daily living, and medication schedule reminders.

The Mission Creek Adult Day Health Center is colocated in the facility and offers functional activities, nursing services, food, physical therapy, occupational therapy, and socialization to qualifying tenants and community members. Entry to the day health program is based on a tenant's request to enroll; the tenant must meet medical eligibility for the program. The cost of the day health program is covered by Medi-Cal, California's Medicaid program. Attendance ranges from 2 to 5 days per week based on clinical assessment and tenant choice.

Tenants sign a lease directly with the owner of the facility and have all the rights and responsibilities of a leaseholder.

Methods

Medical records maintained by the San Francisco Department of Public Health (Lifetime Clinical Record) were used to determine utilization of inpatient and emergency department services at San Francisco General Hospital (SFGH)—the city's only public hospital—which is both the primary hospital for the city's uninsured and the major source of care for most homeless patients (San Francisco Planning and Urban Research Association, 2014). Records from the Mission Creek Adult Day Health program provided information on attendance in the day health program. Records of stay at Laguna Honda Hospital (LHH), San Francisco's public SNF, were used to calculate SNF days. In San Francisco, homeless adults with an acute hospitalization are placed at LHH if they need skilled nursing services after hospitalization. Community referrals came from agencies targeting chronically homeless adults on the streets, in shelters, or in residential substance use or mental health treatment programs. This cohort was identified as a comparison group to assess the cost savings associated with moving homeless seniors from SNFs to independent living and to compare this savings with that associated with housing those from the community. The DAH program database provided data on tenant demographics and dates of housing entrance and exit (as applicable). DAH residents sign a release of information at the time of referral and again at the time of housing application, which releases DAH to collect and review all information contained in the electronic medical record.

Estimation of medical care costs were based on 2012 median Medi-Cal reimbursement rates for SFGH: (1) $502 per emergency room encounter, (2) $1,440 per night spent in an inpatient hospital ward, and (3) $560 per night spent in an SNF (Valerie Inouye, SFGH Chief Financial Officer, personal communication). The primary variables we assessed were public hospital use before and after placement, in addition to housing outcome and day health use after placement. Tenants exited housing because of death, placement in an SNF, voluntary exit, or eviction.

Results

In May 2006, 51 homeless seniors moved into Mission Creek Apartments. The average age of the tenants upon entry was 67 years; 67 percent were male, 47 percent were White, 29 percent were African-American, 12 percent were Latino, and 14 percent were Asian/Pacific Islander (exhibit 1). Of the 12 seniors (24 percent) referred from the SNF, all had an extensive history of homelessness before an extended stay in the SNF. For the 51 seniors who initially moved into Mission Creek, the estimated cost to the public healthcare system to provide hospital (medical and psychiatric inpatient or emergency department) and SNF care the year before moving into Mission Creek was an average of $33,537 per person for a total of $1,710,430 for the cohort (exhibit 2). In the 7 1/2 years between the opening date and January 1, 2014, the tenants residing in Mission Creek used a total of $249,460 in public hospital and SNF care costs.

Nearly one-half (47 percent) of all the tenants of Mission Creek enrolled in the onsite Mission Creek Adult Day Health program. A higher percentage of tenants referred from the general community (51 percent) attended day health compared with the tenants referred from the SNF (33 percent). Attendance at the day health program ranged from 2 days to 5 days per week, with an average of 4 days per week. Tenants referred from the SNF and tenants referred from the general community cost the public sector $409,396 and $1,636,918, respectively, for day health services during the study period during the time they resided at Mission Creek.

Exhibit 1

Tenant Demographics

	Tenants (Percent of Total)	Placement From SNF (Percent of Total)	Community Placement (Percent of Total)	*p* Value
Total	51	12 (24%)	39 (76%)	
Sex				
Male[a]	34 (67%)	8	26	Ref
Female	17 (33%)	4	13	0.773[b]
Average age (years)	67	67	68	0.890[c]
Race/ethnicity				
White[a]	24 (47%)	4	20	Ref
African-American	15 (29%)	5	10	0.2657
Latino	6 (12%)	1	5	1.000
Asian/Pacific Islander	7 (14%)	3	4	0.3023

SNF = skilled nursing facility.

[a] Signifies referent category.

[b] Fisher's exact test, two tailed.

[c] Mann–Whitney U-test.

Exhibit 2

Estimated Costs

	Total (N = 51)	Placement From SNF (N = 12)	Community Placement (N = 39)	*p* Value
Total hospital-based healthcare costs year before placement (average per tenant)	$1,717,430 ($33,537)	$1,617,430 ($134,202)	$100,000 ($2,564)	0.0001[b]
Inpatient days	152	63	89	
Emergency room episodes	5	2	3	
Skilled nursing days	2,852	2,852	0	
Total hospital-based healthcare cost while placed (average per tenant)	$249,460 ($4,891)	$4,400 ($367)	$245,060 ($6,284)	0.0019[b]
Inpatient days	181	4	177	
Emergency room episodes	37	0	37	
Skilled nursing days	37	0	57	
Number who participated in day health program (percent of total)	24 (47%)	4 (33%)	20 (51%)	0.0253[b]
Cost of day health while tenant resided in housing	$ 2,046,314	$ 409,396	$ 1,636,918	
Total housing costs while housed	$4,345,837	$683,511	$3,662,236	
Total hospital-based care plus housing after placement (annual average)	$6,641,611 ($1,186,002)	$1,097,307 ($296,569)	$5,554,304 ($908,902)	
Number exiting housing (percent of total)	27 (52%)	10 (83%)	17 (43%)	0.012[b]
Number exiting to SNF[a]	11 (22%)	5 (41%)	6 (15%)	
Deaths	11 (22%)	4 (33%)	7 (17%)	
Evictions	5 (10%)	1 (8%)	4 (10%)	
Years per tenant in housing after placement	5.6	3.7	6.1	0.0008[c]

SNF = skilled nursing facility.

[a] *Signifies referent category.*

[b] *Fisher's exact test, two tailed.*

[c] *Mann–Whitney U-test.*

The 2013 public expenditure for rent and support services for the 51 DAH tenants (including operations, janitorial services, property management, and case management) was $785,114 ($462,280 in a local operating subsidy and $322,834 in a contract for support services). Tenants contributed $230,724 per year toward rent.

In summary, the government spent approximately $1.7 million dollars to provide hospital-based healthcare services for these 51 seniors the year before entering housing and an average of $1.2 million per year to provide housing, day health services, and hospital-based services annually after placement (exhibit 2).

As of January 2014, 23 (45 percent) of all the original tenants continue to reside at Mission Creek. Of the 12 tenants placed from the SNF and the 39 (43 percent) tenants placed from the community, 10 (83 percent) and 17 (43 percent), respectively, have exited since the building opened. Of the tenants placed from the SNF who have exited, 4 died in their apartments and the others left Mission Creek to return to LHH and subsequently died while residing there (1 tenant was evicted but was subsequently admitted to the SNF). Tenants placed from the SNF resided in the facility for an average of 3.7 years, which was significantly less time compared with 6.1 years for seniors placed from the general community. Assuming that the tenants placed at Mission Creek from the SNF would have had no other placement options to exit the SNF and would have remained in the nursing facility instead of being placed at the supportive housing facility, we estimate that 16,433 days at the SNF were avoided by having access to this residential community setting.[1] This figure corresponds with a cost savings of $9.2 million to Medi-Cal for the past 7.0 years. The total cost (including rent, day health services, and hospital-based care) for all 51 tenants of Mission Creek while residing in the building between May 2006 and January 2014 was approximately $8.5 million.

Discussion

This study is consistent with other studies that demonstrate a significant reduction in healthcare costs when chronically homeless adults are placed in permanent supportive housing. The low level of hospital utilization after the first year in housing is sustained during the 6 subsequent years under review, particularly in the tenants placed from the SNF. For the 12 people who were at the SNF and then housed at Mission Creek, the costs that would have been incurred if they had remained at LHH are far more than the public cost needed to operate Mission Creek for all 51 DAH tenants during the 7 years the building has been operational. Most government-supported costs reported in the article come from rent with onsite services and adult day health services with modest expenses for in-hospital costs after placement in housing.

In many communities, the paucity of service-enriched permanent supportive housing targeting frail seniors exiting nursing homes markedly delays or eliminates the option to place seniors in the general community. These individuals used limited hospital-based resources while living in the general community and were able to remain autonomous in the general community with onsite services and outpatient medical care. In addition, placement in independent housing with a lease adheres to the intent of the Olmstead decision, which requires the public sector to place adults with disabilities in the least restrictive environment possible.

This study has limitations. One major limitation is that data on healthcare use were drawn only from the public healthcare system. Other tertiary care private and university hospitals in San Francisco and the surrounding area could have served the residents of Mission Creek. Nonetheless, in previous studies, we have found that fewer than 10 percent of homeless adults sought emergency room care or had inpatient days in hospitals outside the public sector (Bamberger and Dobbins, 2013). In addition, no other publically supported SNF exists in San Francisco, so it is unlikely that tenants of Mission Creek were able to access SNF services that were not assessed in this analysis. Next, although this analysis may not have captured all healthcare use, we found no systematic reason to hypothesize that the visits to the private sector would have been considerably different before or after placement in Mission Creek. Another limitation is the small sample size, especially because only 12 tenants came from the SNF. Another limitation is the lack of a control group that remained homeless or in an SNF to compare with the individuals who moved into Mission Creek.

[1] We recognize this statement is a strong assumption; please see Discussion section.

Having a comparison group could have helped to determine if the reduction in healthcare costs observed in the cohort was only a "regression to the mean" effect rather than a true reduction in healthcare costs because of the intervention. Although having an appropriate control group would have been particularly useful when comparing the healthcare use of the tenants referred from community sites, we think that using estimates of cost avoided for the tenants placed from the SNF provides an accurate model of the cost had these individuals been unable to be placed outside the institution.

With the implementation of the Affordable Care Act, many states are expecting managed care organizations (MCOs) to accept financial risk for providing health care to homeless adults. Although a small minority of homeless adults will require placement in a SNF based on medical needs, the probability that they will have extended stays in a SNF is a major threat to the financial bottom line for MCOs serving the Medicaid population. Whereas rental costs in an affordable housing setting could be covered by a portion of the public benefits provided to an individual in most communities, the remaining cost of supportive housing could be provided by an MCO in lieu of an extended stay in a SNF. This resource would provide not only a cost-effective option for MCOs but also a community-based alternative to an institutional setting as is required by the Americans with Disabilities Act.

Conclusion

The observed cost savings during the first year after placement of homeless seniors in supportive housing continues for many years. These data support that, hypothetically, by prioritizing access to supportive housing exclusively to seniors exiting nursing homes above other subsets of the homeless population, savings to the healthcare system could be even greater than reported here. Although we believe that all people with chronic medical conditions and homelessness would benefit from placement in high-quality supportive housing, prioritizing seniors exiting nursing homes will result in the greatest healthcare utilization reductions compared with other groups. For healthcare payment systems that are reluctant to use healthcare dollars to fund placement alternatives to nursing homes, starting with seniors who are stuck in nursing homes because of a lack of community alternatives would be a good initial entry to reducing systemic barriers between housing and healthcare providers. Systems that are built on a wait-list model rather than on clinical prioritization may create a more equitable strategy to access housing but will be unlikely to maximize the economic benefits of using housing as a healthcare intervention. Targeting seniors who are exiting a SNF for placement in supportive housing is a strategy that could markedly reduce the cost of serving homeless people, many of whom have recently enrolled in Medicaid as part of the Affordable Care Act. Frail seniors with a history of homelessness have a high mortality rate. Service-enriched, independent supportive housing such as Mission Creek can play an important role in caring for this highly vulnerable population so that their final years of life can be of the highest quality and with the greatest levels autonomy, and they can be less expensive than prolonged stays in nursing homes. As the homeless population ages, expanding this type of housing should be a focus of the healthcare system to create more alternatives to institutional end-of-life care for homeless seniors (Hahn et al., 2006). In addition, MCOs would significantly mitigate the financial risk that comes with the increased responsibility to provide health insurance to homeless seniors by supporting part of the cost of providing supportive housing and controlling access to this housing for their members.

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Authors

Joshua D. Bamberger is an associate clinical professor for Family and Community Medicine at the University of California, San Francisco, and is Chief Medical Consultant for Mercy Housing. During the time of the study, he was Medical Director of Housing and Urban Health at the San Francisco Department of Public Health.

Sarah K. Dobbins was an administrator of Direct Access to Housing and is presently a nurse practitioner student at the University of California, San Francisco.

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Investing in Distressed Communities: Outcomes From the Neighborhood Stabilization Program

Jenny Schuetz
Board of Governors of the Federal Reserve System

Jonathan Spader
Jennifer Lewis Buell
Kimberly Burnett
Larry Buron
Alvaro Cortes
Michael DiDomenico
Anna Jefferson
Abt Associates Inc.

Christian Redfearn
University of Southern California

Stephen Whitlow
Abt Associates Inc.

Abstract

The Neighborhood Stabilization Program (NSP) is the largest public-policy effort to assist communities that were severely impacted by the housing crisis of 2007 through 2009. NSP's objective was to mitigate the impact of foreclosures on surrounding neighborhoods by reducing the stock of distressed properties and demonstrating positive investment. This article presents evidence on housing production outcomes and expenditures from the second round of NSP funding (NSP2) across 18 counties and Washington, D.C., in diverse housing markets. As intended, public and nonprofit grantees used NSP2 to invest in neighborhoods with initially weak housing markets. Local grantees undertook different approaches to NSP2 that resulted in varied outcomes—as measured by activity type, expenditures per property, scale, and spatial concentration of NSP2 investments. Basing our analysis on these findings, we outline research topics and suggested approaches for future research.

Introduction

The housing crisis that began in 2007 affected virtually every community in the United States. Nationwide, home sale prices declined about 30 percent, reflecting the incidence of mortgage default and foreclosure at levels not seen since the Great Depression (1929 to 1939), as well as rising unemployment (Been et al., 2011; Brown et al., 2012). Behind the aggregate statistics, many cities and neighborhoods struggled to contain the damage imposed by foreclosed and vacant properties on local physical, economic, and social conditions. Foreclosures can create negative spillover effects on surrounding neighborhoods through four hypothesized mechanisms: (1) the visual blight caused by poorly maintained properties may reduce the value of neighboring homes in the eyes of potential buyers, (2) completed foreclosures increase the supply of for-sale properties in the neighborhood, (3) the presence of foreclosed properties may be a negative signal to both sellers and buyers about the future stability of the neighborhood and the risk associated with a home purchase, and (4) the lower sales prices of foreclosures and short sales may affect the assessed value of neighboring homes if foreclosed homes are used as comparable properties for appraisals and list prices. A large empirical literature has documented significant negative relationships between foreclosures and neighborhood conditions (Anenberg and Kung, 2014; Campbell, Giglio, and Pathak, 2011; Fisher, Lambie-Hanson, and Willen, 2013; Gerardi et al., 2012; Harding, Rosenblatt, and Yao, 2009; Hartley, 2010; Ihlanfeldt and Mayock, 2013; Immergluck and Smith, 2006; Leonard and Murdoch, 2009; Lin, Rosenblatt, and Yao, 2009; Mian, Sufi, and Trebbi, 2011; Rogers and Winter, 2009; Schuetz, Been, and Ellen, 2008; Whitaker and Fitzpatrick, 2013). Several of these papers found that concentrated foreclosures are "contagious," creating a downward spiral of falling home sales prices and inducing future defaults.

To help restore housing market stability and encourage broader economic recovery, the federal government adopted a slate of new programs.[1] One of these programs, the Neighborhood Stabilization Program (NSP), was specifically aimed at mitigating the impact of foreclosures on hard-hit neighborhoods and communities. Structured similarly to the Community Development Block Grant (CDBG) program, under NSP, the U.S. Department of Housing and Urban Development (HUD) awarded grants to state and local governments and qualified nonprofit organizations for five activities: (1) acquisition and rehabilitation of foreclosed properties, (2) redevelopment, (3) demolition of blighted structures, (4) land banking, and (5) purchase or development of affordable housing.[2] NSP was intended to address four mechanisms by which foreclosures create negative externalities: (1) reducing the stock of distressed properties, (2) removing sources of blight and crime, (3) placing new homebuyers in rehabilitated properties, and (4) creating a positive signal to residents about the neighborhood's future. Neighborhoods—defined by the program and in this article as census

[1] Gerardi et al. (2011), Been et al. (2011), and Immergluck (2013) reviewed several housing recovery programs, including the Neighborhood Stabilization Program.

[2] Only public agencies and nonprofit organizations were eligible to receive NSP grants from HUD. Throughout the article, we use the term grantees to refer to these public and nonprofit grant recipients. The activities undertaken by NSP grantees are referred to throughout the article as investments, because the grantees viewed their work as investing in neighborhoods' well-being, even when the activity did not yield a physical structure (that is, demolition). We use the term "investor" to refer to private individuals and for-profit corporations that purchased, rehabilitated, rented, and/or sold foreclosed properties in NSP neighborhoods. These private investors were not direct or indirect recipients of NSP funds.

tracts—were deemed eligible to receive NSP funds based on initial foreclosure and vacancy rates. With total funds of $6.9 billion across three allocations, NSP was the largest federal effort to address the impact of foreclosures on neighborhoods and was a substantial influx of resources for many local communities.[3]

In this article, we present the first multicity quantitative evidence on housing investments funded by the second round of NSP (hereafter, NSP2). We describe the context of neighborhoods that received these investments and document housing outcomes produced by the program, using administrative data from 28 grantees across 18 counties and Washington, D.C. (hereafter, counties). We specifically analyze the types of activities pursued, the quantity of housing properties affected, the scale of the activities, spatial concentration, and timing of investments. We examine variation in all these outcomes across geographic areas and housing market types.

Several key findings emerge from the analysis. As intended, census tracts targeted for NSP2 investment had poor economic and housing market conditions before NSP2, although the specific circumstances of local housing markets varied across geographic regions. The grantees in this study collectively spent slightly more than $1 billion of NSP2 funds to acquire, rehabilitate, demolish, finance, or otherwise affect approximately 6,400 housing units. Local grantees implemented a number of different approaches to NSP2, often varying by market type. Grantees in counties in the Declining market type (in Arkansas, Michigan, and Ohio) mostly used NSP2 to demolish blighted structures and achieved the largest neighborhood scale and spatial concentration of investments.[4] Grantees in counties in the Sand States market type (in Arizona, California, Florida, and Nevada) used NSP2 primarily for rehabilitation or redevelopment, at relatively low scale and concentration. Grantees among counties in the East Coast market type (in Illinois, New York, and Washington, D.C.) and counties in the Moderate market type (in Colorado, Minnesota, Pennsylvania, and Tennessee) used NSP2 for a mixture of rehabilitation, demolition, financing, and redevelopment. Acquisition and rehabilitation expenditures per property vary widely across counties but are not obviously correlated with geographic region.

The remainder of this article is organized as follows. The next three sections (1) review previous research on NSP, (2) provide additional context for the program and NSP2 neighborhoods, and (3) discuss the empirical methods used and present analytical results. The final section outlines a future research agenda for local and regional evaluators and concludes the discussion of this study.

Previous Studies of NSP

Very little academic research on NSP has been published to date, likely because most property investments have only recently been completed. We review several papers that focus on the planning and operational challenges faced by HUD and local NSP grantees, and a smaller set of papers conducting early analysis of production outcomes and impacts.

[3] The first round of NSP funding, $3.9 billion, was provided by the 2008 Housing and Economic Recovery Act. The second round, $2 billion, was part of the 2009 American Recovery and Reinvestment Act. The third round, $1 billion, was included in the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act.

[4] Market type groupings were developed based on home sales price levels and trends before NSP. The section NSP Context describes the groupings in more detail. Exhibit 1 shows all counties in the study, indicating groupings by market type.

Planning and Operational Challenges

Several academic papers and policy reports written concurrently with NSP's adoption and rollout discussed implementation challenges of the program that local grantees faced (Fraser and Oakley, 2015; Immergluck, 2013; Newburger, 2010; Nickerson, 2010; Reid, 2011). From the program's beginning, observers have noted that the amount of NSP funding across all three rounds was small relative to the scope of the foreclosure problem and other economic recovery programs.[5] Even with optimal implementation, it was unclear whether the size of the program would be sufficient to create measurable impacts in severely affected markets. Both HUD and local grantees had difficulty identifying and targeting geographic areas with the greatest need because limited real-time data were available on the location of foreclosed properties. The lack of data on foreclosures also initially hindered grantees' ability to contact lenders and servicers to acquire real estate owned (REO) properties. Tight deadlines to obligate and spend their NSP funds sometimes limited grantees' ability to strategically target their investments in locations with the highest potential for positive impact.

Local grantees used NSP funds not only for foreclosure mitigation but also to pursue policy goals that predated the crisis, often working in areas already targeted for redevelopment or revitalization. Reid (2011) noted that grantees in Los Angeles used NSP for long-standing priorities such as the preservation of existing affordable rental housing, transit-oriented development, and achieving green building standards. Grantees in Cleveland targeted NSP funds to reinforce previous investments made through HOME, CDBG, and the Low-Income Housing Tax Credit (LIHTC) Program (Reid, 2011). Grantees in Nashville selected one neighborhood, Chestnut Hill, which city leaders had already designated as a priority location for redevelopment (Fraser and Oakley, 2015).

These studies also documented several common operational challenges around acquiring, rehabilitating, and reoccupying REO properties through NSP. Many local grantees, particularly in the first round of NSP, were not familiar with the REO acquisition process, which is less transparent and predictable than standard property acquisition. Grantees often did not have previous experience with property development or asset management skills, especially for monitoring portfolios of scattered-site homes. Moreover, grantees in many markets faced competition for REOs from private investors with deeper pockets and more streamlined acquisition processes. Lack of cooperation from lenders and servicers holding REO properties complicated grantees' ability to gain control of distressed properties (Newburger, 2010; Nickerson, 2010). A variety of bureaucratic rules—both from HUD and imposed by state and local agencies—slowed down grantees' property acquisition. Specific rules for grantees mentioned were the requirement to purchase REO properties at a discount from market value, mandatory environmental impact reviews, and compliance with tenant protection laws (Immergluck, 2013; Newburger, 2010; Nickerson, 2010; Reid, 2011). Grantees' inability to compete with investors often left them with properties in substantially poorer physical condition than expected; therefore, they incurred higher rehabilitation costs. As lenders tightened credit standards, grantees had difficulty finding borrowers who met NSP's income guidelines and were able to qualify for mortgages (Reid, 2011).

[5] For instance, $45.6 billion was allocated for mortgage modifications under the Home Affordable Modification Program, or HAMP, and about $475 billion was allocated under the Troubled Asset Relief Program (Fleming, 2012).

The planning and operational challenges of NSP identified in these studies provide some context for the production outcomes we analyze in this article, especially the per-property expenditures, neighborhood scale, and spatial concentration of NSP2 investments.

NSP Outcomes and Impacts

Only a few studies have documented changes in neighborhood housing markets for areas that received NSP investments. Ergungor and Nelson (2012) examined the impact of NSP (mostly the first round) on vacancy rates in Cuyahoga County, Ohio, from 2006 to the end of 2010. They compared vacancy rates of former REO properties purchased with NSP funds with vacancy rates of comparable former REOs not acquired through NSP. They found that NSP properties tend to be older, smaller, of less value, and in more heavily minority neighborhoods. Investors were the most common purchasers of former REO properties in Cuyahoga County during this time period. The authors concluded that in NSP targeted areas, "vacancy rates decline if the property was purchased out of REO by an individual" (presumably an owner-occupant), compared with REO properties purchased by investors or nonprofit organizations (Ergungor and Nelson, 2012: 12).

Graves and Shuey (2013) conducted a small-scale, mostly qualitative analysis of changes in social conditions around properties that were rehabilitated using NSP funding. The study area includes 16 city blocks in Boston, one-half with NSP properties (one per block) and one-half with non-NSP REO properties. The authors conducted visual inspections and surveyed nearby residents. It is notable that they found that only one-half of the NSP properties were renovated or undergoing renovation, while seven of the eight control properties had been rehabilitated. The authors found no significant difference in residents' perceived sense of community between NSP blocks and control blocks. It is striking that most residents on both treatment and control blocks did not realize that the vacant homes had undergone foreclosure and did not list the presence of vacant homes as a substantial source of concern. Boston had unusually low foreclosure and vacancy rates relative to other NSP grantees, so it is unclear whether these results can be extrapolated to other cities, including the ones in this analysis.

The Reinvestment Fund (TRF) has investigated the spatial concentration of NSP properties and changes in sales prices and vacancy rates in NSP neighborhoods (TRF, 2013). The report identifies clusters of NSP investment and compares changes in home sales prices and vacancy rates between each NSP cluster and three matched block groups (referred to in the report as "comps"). The study concludes that one-half of NSP clusters performed better on home sales prices than two or three "comps," while one-half performed better than zero or one "comps." No tests of statistical significance for the comparisons are presented. Essentially these results are consistent with expectations of a random draw: if home sales prices in NSP clusters do not really differ from other neighborhoods, the probability that home sales prices in an NSP cluster fall in the upper one-half of the distribution would be 0.5. Thus the TRF study provides no evidence that NSP clusters performed better or worse than non-NSP block groups.

NSP Context

NSP was adopted during highly unusual conditions in the U.S. housing market, which had implications for the grantees' ability to implement the program. Although NSP shares some goals and structural elements with previous housing and community development programs, particularly the Community Development Block Grant program, it also has several unusual features, discussed in more detail in the following section.

Program Administration and Goals

NSP2 funds were awarded to 56 grantee organizations operating in 133 counties across 26 states and the District of Columbia. More than one-half of the grantees were local public agencies, such as city and county housing and redevelopment agencies, which used NSP2 funding within their primary political jurisdictions. Four state governments (Massachusetts, Michigan, Ohio, and Oregon) were responsible for administering NSP2 across multiple localities within the state. The remaining grantees were nonprofit organizations; most of these organizations also implemented NSP2 in a single location, but four large nonprofit organizations (Center for Community Self-Help, Chicanos Por La Causa, Habitat for Humanity® International, and The Community Builders, Inc.) created national consortia that worked in multiple cities and states.

The overall NSP was designed around three distinctive features (Immergluck, 2013; Joice, 2011). First, the range of allowable activities gave grantees flexibility to tailor their strategies to local housing market conditions. Second, to ensure that NSP funds were spent quickly—as required of other stimulus programs during the Great Recession—grantees were required to expend funds within a fairly short time from the initial allocation. Third, grantees were encouraged to concentrate their investments in a few targeted neighborhoods, at sufficient scale to improve housing market outcomes (Reid, 2011). The program's relatively decentralized nature enabled grantees to pursue fundamentally different strategies.

NSP2 was intended to correct several limitations of the first round of NSP (hereafter, NSP1), particularly targeting funds to organizations with demonstrated capacity to carry out the work under short deadlines, and achieving greater spatial concentration of investment (Joice, 2011). Local and state government agencies and qualified nonprofit organizations applied to HUD for funds, which were allocated through competitive bidding. Applications had to indicate the census tracts in which grantees intended to work, the type of activities they intended to carry out, and provide evidence of organizational capacity (previous experience carrying out similar work). HUD allocated grant funds in January 2010; grantees were required to obligate 50 percent of funds by February 2012 and 100 percent of funds by February 2013.

Relative to previous housing and community development policies, NSP2 is difficult to categorize neatly. Like traditional public housing or many urban renewal programs, funds were targeted directly at places, rather than "people-based" programs that target individual households, such as Section 8 voucher holders. The broad goals and flexible set of activities permitted under NSP2 overlap with several different types of previous policies, including blight removal, development, and rehabilitation of affordable housing, and homebuyer assistance. Yet, NSP2 also differs from these previous policies in important ways. Most properties targeted by NSP2 (either for rehabilitation or demolition) were scattered site, single-family houses. Previous policies such as CDBG, LIHTC, and HOPE VI have frequently been used for larger multifamily structures. Compared with previous blight removal policies, most demolitions conducted under NSP2 resulted in vacant land, rather than new structures.

Study Overview and Data Collection

This study uses administrative data collected from a national sample of 28 grantees across 18 counties and Washington, D.C. The analysis focuses on the program's production outcomes: the number of properties treated, type of activities, neighborhood scale, spatial concentration, and timing of investments. The sample counties were selected to offer diversity in underlying housing markets (for example, sales price levels and trends, composition of the housing stock), and to include large grant recipients who represented the bulk of NSP2 funds. Exhibit 1 lists the counties studied, the total NSP2 allocations and number of completed investments. Almost all the sample counties had received investments through the first round of NSP funding as well, although in some cases

Exhibit 1

Summary of NSP Counties (Including Washington, D.C.) Studied

County	Market Type	NSP Spent ($ millions)	Properties	$/Property
Cook, IL	East Coast	132.0	262	503,817
Cuyahoga, OH	Declining	25.9	758	34,169
Davidson, TN	Moderate	31.0	116	267,241
Denver, CO	Moderate	35.5	119	298,319
Ingham, MI	Declining	18.6	215	86,512
Kings, NY	East Coast	35.5	46	771,739
Los Angeles, CA	Sand States	220.0	558	394,265
Maricopa, AZ	Sand States	115.0	494	232,794
Miami-Dade, FL	Sand States	90.0	296	304,054
Palm Beach, FL	Sand States	66.5	235	282,979
Philadelphia, PA	Moderate	58.6	494	118,623
Pulaski, AR	Declining	16.2	236	68,644
Ramsey, MN	Moderate	17.7	149	118,792
Riverside, CA	Sand States	8.9	54	164,284
Sarasota, FL	Sand States	21.5	71	302,817
Stanislaus, CA	Sand States	23.3	94	247,872
Washington, D.C.	East Coast	21.7	66	328,788
Washoe, NV	Sand States	22.4	146	153,425
Wayne, MI	Declining	75.6	1,947	38,829
Total		**1,035.9**	**6,356**	
Average		**54.5**	**335**	**162,975**

NSP = Neighborhood Stabilization Program.

the grantee organizations changed (for instance, NSP1 funds were administered through the state government, while NSP2 funds were allocated to the city and county). Each grantee organization provided data on the location and timing of NSP2 investments, types of activities carried out at each property and expenditures. Data were collected in the summer of 2013, shortly after the deadline for obligating 100 percent of funds.[6] Many grantees reported that construction had only been completed shortly before data collection, or in some cases was still ongoing.

For purposes of sampling and analysis, we grouped counties into the four housing market types identified previously, based on sales price levels and changes during the boom and bust periods that preceded NSP. Counties in the Sand States market type (Los Angeles, Riverside, and Stanislaus, California; Maricopa, Arizona; Miami-Dade, Palm Beach, and Sarasota, Florida; and Washoe, Nevada) experienced high home sales-price appreciation and high volumes of new construction during the boom period and dramatic sales price declines during the bust. Counties in the East Coast market type (Cook County, Illinois; Kings County, New York; and Washington, D.C.) also saw large sales price appreciation during the boom period, but with more modest rates of new housing construction.[7] Counties in the Declining market type (Cuyahoga County, Ohio; Ingham and Wayne Counties, Michigan; and Pulaski County, Arkansas) experienced declining population and housing values for many years before the onset of the housing crisis. The final group of counties (Davidson, Tennessee; Denver, Colorado; and Philadelphia, Pennsylvania) is referred to as Moderate because these counties (although quite geographically and economically diverse) saw fairly moderate rates of housing appreciation and depreciation during the period, although, in general, without construction booms. Results of analysis are presented for individual counties with indications of the market types to illustrate similarities and variation across counties within each market type.

Targeted Areas of NSP2 Investment

We begin by presenting some context on the baseline conditions of NSP2 neighborhoods before implementation of the program (exhibit 2). NSP2 was intended to help census tracts with high concentrations of foreclosed and vacant properties; therefore, NSP2-targeted areas might be expected to differ from non-NSP2 census tracts along other economic and demographic characteristics.[8]

In accordance with the program's design, grantees targeted their NSP2 investments to census tracts with highly distressed housing markets and weak economic fundamentals—notably low income and educational attainment—before intervention. Because NSP2 funds were limited, however, and grantees were encouraged to concentrate their investments, not all initially distressed census tracts

[6] Abt Associates Inc. (2014) provides more details on the sampling strategy, data collection, and methodology. The obligation deadline applied to NSP2 funds initially allocated to grantees from HUD. Grantees that rehabilitated or redeveloped properties received additional income when those properties were sold, and they could use this additional program income for further work. There is no deadline for obligation or expenditure of ongoing program income.

[7] Cook County is grouped with counties in the East Coast market type because of similarities in pre-NSP2 housing market trends rather than geographic proximity.

[8] Data on housing market conditions—sales prices, financially distressed property inventory, and investor purchases—come from CoreLogic, Inc. Vacancy data were obtained from the U.S. Postal Service. Population characteristics used in this analysis were obtained from the 2005–2009 American Community Survey, or ACS. The full list of variable definitions and data sources appears in appendix exhibit A-1. The section NSP2 Production Outcomes provides more detail about variable construction.

Exhibit 2

Comparison of NSP2 and Non-NSP2 Tracts, 2008

	NSP2 Tracts	Non-NSP2 Tracts	NSP2 – non-NSP2
Housing markets			
Price ($)	150,048	310,869	– 160,821*
Percent change in price, 2000–2006	76.14	72.78	3.36
Distressed properties per 1,000 housing units	57.88	31.56	26.32*
Vacancies/1,000 housing units	118.83	75.90	42.93*
Investor purchases (%)	57.44	40.57	16.87*
Population characteristics			
Income ($)	43,690	64,050	– 20,360*
Population with less than 12 years education (%)	30.56	19.63	10.92*
Hispanic (%)	34.96	25.59	9.37*
Black (%)	39.63	20.99	18.64*
Central city	0.80	0.62	0.18*
Population density	11,347	13,221	– 1,874*
n	862	7,443	

NSP2 = Neighborhood Stabilization Program (second round).
** p < .01.*

received NSP2 investments. In 2008, home sales prices in NSP2 tracts were less than one-half of those in non-NSP2 tracts (about $150,000 per housing unit compared with $310,000), although sales price appreciation during the housing boom was similar in NSP2 and non-NSP2 tracts.[9] NSP2 tracts had greater prevalence of properties in any stage of financial distress (the inventory of properties in a census tract that had received foreclosure notice, had completed a foreclosure sale, or had moved into REO status). About 58 properties per 1,000 housing units were in financial distress in NSP2 tracts, compared with 32 properties per 1,000 in non-NSP2 tracts. The vacancy rate in NSP2 tracts was substantially higher, as was the prevalence of investor purchases. Some of the differences in housing outcomes can be explained by differences in population characteristics. On average, NSP2 tracts had lower median household incomes and lower educational attainment (higher share of residents with no formal education beyond high school degrees). They had larger shares of Black and Hispanic residents and slightly lower population density. Although the housing crisis hit neighborhoods in central cities and in suburban or exurban locations, within the 18 sample counties and Washington, D.C., census tracts that received NSP2 investments were more likely to be in central cities. These descriptive statistics suggest that grantees did indeed focus their NSP2 investments in low-income census tracts with distressed housing markets, which the program was intended to serve.

[9] All dollar values are adjusted to constant 2012 values, using the Consumer Price Index, or CPI, for all urban consumers, by census region.

Housing Markets During Boom, Bust, and Recovery

Exhibit 2 offers a single-period snapshot of NSP2 tracts before the program. To provide a longer context of housing market changes in NSP2 tracts, exhibits 3 through 6 show the trajectory of four census tract-level housing metrics: (1) median sales prices, (2) the inventory of distressed properties, (3) number of vacant properties, (4) and number of investor purchases. Three of these metrics (excluding vacant properties) are aggregated from property-level data on housing transactions obtained from CoreLogic, Inc. These data include all residential properties with a recorded transaction between January 2000 and February 2013. Median sales prices are calculated using arms-length transactions of two types of properties: one- to four-family buildings and condominium units. Properties are considered in financial distress any time after a foreclosure filing (also referred to as notice of default or lis pendens) and before sold to a new third-party owner (that is, leaving REO). A property purchased by an investor (nonowner-occupant) is identified by the purchaser's name.[10] The fourth housing metric, vacant properties, is assembled from U.S. Postal Service data. To normalize for the size of housing stock, the vacant property counts and distressed property counts per census tract are divided by 1,000 housing units in each tract, using data from the 2005–2009 American Community Survey, or ACS.

For descriptive purposes, we divide non-NSP2 census tracts in the sample counties into two groups based on the median home sales price in 2008 (during the recession but before NSP2 implementation). Most NSP2 tracts had sales prices below median value in their counties, so we would anticipate that the trajectory of housing markets in NSP2 tracts would more closely follow that of other lower value census tracts. Exhibits 3 through 6 show the trajectories of all four housing metrics for NSP2 tracts and other low- and high-value census tracts. The tracts are grouped together by market type rather than shown separately for each county because of the small number of census tracts in most sample counties.

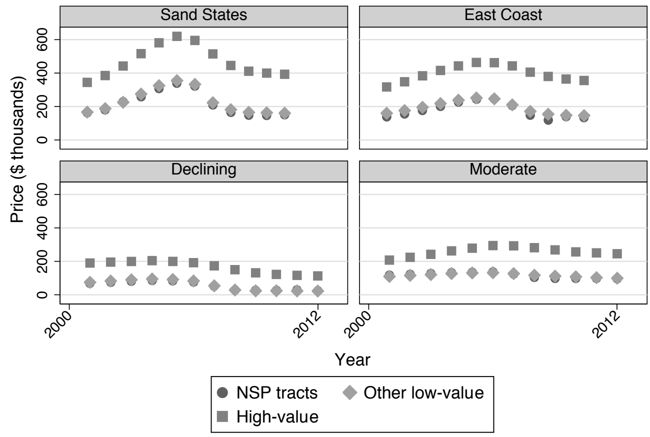
Consistent with national trends, home sales prices in the sample counties increased rapidly during the boom years (2000 to 2006), collapsed during the bust (2007 to 2009), and stabilized somewhat during the recovery (2010 to 2013), as shown in exhibit 3. The biggest swings in sales prices in both directions occurred in Sand States. Census tracts in East Coast and Moderate market types show similar time trends to tracts in the Sand States type, but with much smaller variation. Tracts in the Declining market type showed little growth during the boom and weaker recovery. In all four market types, median sales price levels in NSP2 tracts were similar to other low-value tracts and well below high-value tracts. Over time, sales price trends, in general, were similar across all three groups of tracts within each market type.

The prevalence of financially distressed properties rose steadily throughout the bust years, peaking around 2009 for most market types, and then declined substantially during the recovery period (exhibit 4). As with sales prices, the most variation over time occurred in Sand States, with all three tract types experiencing large increases in distressed properties from 2006 to 2009, before recovering nearly to precrisis levels in 2013. In counties in the Sand States market type, NSP2 tracts showed higher distress rates during the bust years than either low- or high-value tracts.

[10] Consistent with the previous literature, investor purchases are defined by corporate entities in the purchaser's name, the purchaser's mailing address, and multiple purchases by the same entity. For further discussion, see Ellen, Madar, and Weselcouch (2014); Fisher and Lambie-Hanson (2012); and Immergluck (2013).

Exhibit 3

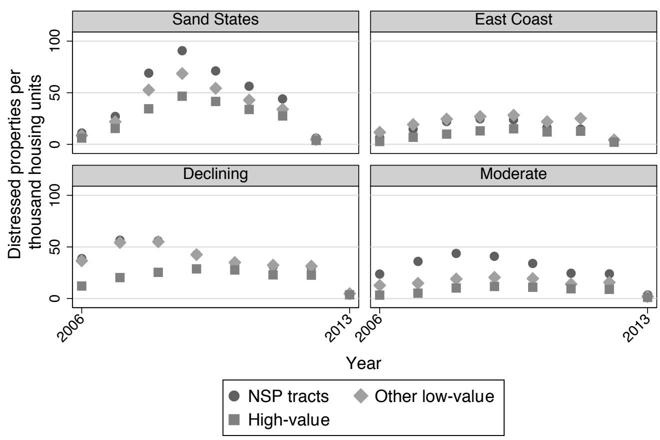
Median Housing Sales Prices, by Market Type (2000–2012)



NSP = Neighborhood Stabilization Program.
Note: Market types group counties with similar housing market characteristics.
Source: mkttype

Exhibit 4

Financially Distressed Properties, by Market Type (2006–2013)



NSP = Neighborhood Stabilization Program.
Note: Market types group counties with similar housing market characteristics.
Source: mkttype

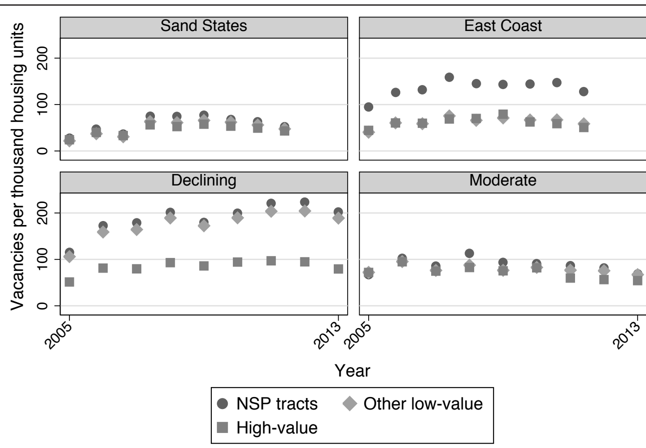
NSP2 tracts in counties in the Moderate market type also had larger distressed property inventories during the bust and recovery than either low- or high-value tracts. For counties in the East Coast and Declining market types, NSP2 tracts had similar distress rates to non-NSP low-value tracts. Distressed property inventories in Declining and Moderate market types hit their peak slightly earlier than inventories in the Sand States and East Coast market types.

Vacancy rates (in levels and changes over time) differ noticeably across market types (exhibit 5). Vacancy rates are highest throughout all years in the Declining market type, with vacancy rates continuing to rise even during the recovery. In the Declining market type, vacancy levels in NSP2 tracts were similar to those in low-value census tracts and much higher than those in high-value tracts. NSP2 tracts in counties in the East Coast market type (mostly in Cook County) had higher vacancy rates than either low- or high-value tracts. For counties in the Sand States and Moderate market types, vacancy rates in NSP2 tracts were slightly higher than in low-value census tracts and well above vacancy rates in high-value tracts, but they were relatively stable over time.

Investor purchase shares followed similar trajectories over time in all four market types, although the levels varied across markets (Exhibit 6). In all market types, NSP2 tracts and other low-value census tracts saw large growth in investor purchase shares, implying a decline in owner occupancy over time. Counties in the Sand States market type experienced relatively low rates of investor purchases during the boom, with rates increasing sharply after 2009. Investor purchases in NSP2 tracts were slightly higher than in low-value census tracts and, during the bust and recovery, substantially higher than in high-value tracts. Investor activity in counties in the East Coast market type was notably higher among NSP2 tracts than among low- or high-value census tracts during all years, with investor shares in all tracts rising rapidly after 2006. For counties in the Declining market type, investors accounted for 60 to 80 percent of all purchases among NSP2 tracts during the entire period examined, much higher than investor purchases in high-value tracts. Investor purchases were lower and less volatile over time in counties in the Moderate market type for all tract types. NSP2 and low-value tracts had similar rates of investor activity, both noticeably higher than in high-value tracts.

Exhibit 5

Vacancy Rates, by Market Type (2005–2013)



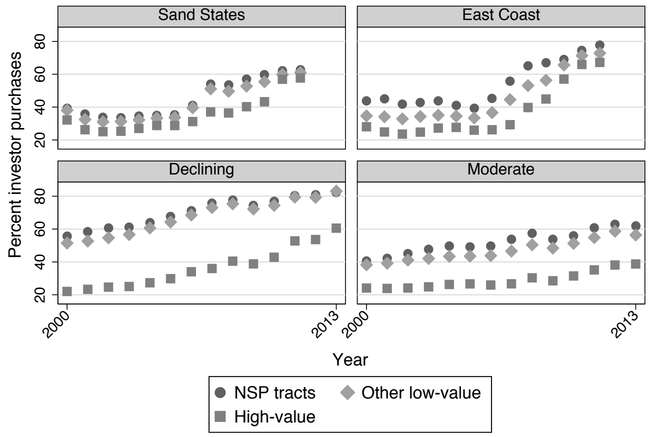
NSP = Neighborhood Stabilization Program.

Note: Market types group counties with similar housing market characteristics.

Source: mkttype

Exhibit 6

Purchases by Nonowner-Occupants, by Market Type (2000–2013)



NSP = Neighborhood Stabilization Program.

Note: Market types group counties with similar housing market characteristics.

Source: mkttype

Overall, the data in these exhibits confirm the general trends in housing markets during three time periods. Home sales prices increased during the boom, decreased from 2007 through the collapse, and stabilized during the recovery. Indicators of financial distress increased from 2006 to 2008; they then declined somewhat from 2008 to 2012, although, in general, not to prebust levels.[11] The exhibits provide additional evidence that NSP2 investment went into census tracts with lower home values, more distressed properties, and more investor activity (implying lower homeownership rates) compared with average census tracts in the same market types.

NSP2 Production Outcomes

NSP2 was intentionally designed to be flexible, so that grantees could tailor their approaches to local housing market conditions and organizational expertise. It is not surprising, therefore, to find that approaches to and outcomes from NSP2 vary considerably across local grantees. We analyze the housing investments funded by NSP2 along several dimensions: types of activities undertaken by grantees, the number of housing units affected, NSP2 dollars spent, the neighborhood scale, spatial concentration, and timing of investments. For some of the investment metrics, similar outcomes are apparent across housing market types.

Overview of County-Level Production

Through July 2013, NSP2 grantees working in the 18 sample counties and Washington, D.C., had obligated a total of $1.04 billion in NSP2 funds to treat 6,356 properties (exhibit 1). This

[11] CoreLogic, Inc., did not consistently track foreclosure starts, sales, or entry into and exit from REO status before 2006; therefore, measures of mortgage distress are not available for during the boom period.

translates into an average of $54.5 million and 335 properties per county, but the size of NSP2 investments varied considerably. Los Angeles County received the largest allocation of NSP2 funds at $220 million, spread across six local grantees. Wayne County, Michigan (home to Detroit), treated by far the largest number of properties (nearly 2,000), however, with a much smaller NSP2 allocation of $75.6 million. The rank order of counties differs when investment size is measured by expenditures rather than properties because of grantees' different approaches. In Wayne County, the State of Michigan concentrated mostly on demolitions, while Los Angeles County's grantees primarily invested in acquisition and rehabilitation. This variation is also evident in the average NSP2 funds per property (last column). The four counties with the lowest NSP2 dollars per property—Cuyahoga, Ohio; Ingham, Michigan; Pulaski, Arkansas; and Wayne, Michigan—are all in the Declining market type and focused on demolition. Grantees in Kings County, New York (Brooklyn) had the highest per-property expenditures and financed redevelopment of multifamily properties.

Distribution of Activity Types

The distribution of investments by activity—measured both by property counts and expenditures—are shown in exhibit 7. Acquisition and rehabilitation accounted for 36 percent of all NSP2 properties treated, but 64 percent of NSP2 expenditures. Demolition accounts for 44 percent of properties but only 3 percent of funds. Most grantees doing demolition did not purchase the property before demolition, which reduced the costs relative to acquisition and rehabilitation, and the labor and materials costs required for demolition, in general, are less expensive than those required for rehabilitation or redevelopment. Together, rehabilitation and demolition account for four-fifths of NSP2 properties and two-thirds of expenditures. Land banking was the least frequently used activity, and stand-alone financing was also relatively scarce. The final column in exhibit 7 shows the average per-property cost by activity type. It is not surprising to find that redevelopment—which sometimes involved removing an existing structure and developing a new structure—had the highest cost per property, at $375,000, followed by acquisition and rehabilitation ($290,000), and multiple activities (often a combination of demolition and redevelopment, at $228,000 per property).

Exhibit 7

NSP2 Investments by Activity Type

Activity	Properties (%)	Expenditures (%)	$/Property
Acquisition/rehabilitation	35.9	64.2	291.3
Demolition	44.1	2.9	10.6
Financing	4.1	5.1	203.1
Land bank	1.8	0.5	42.7
Multiple	5.9	8.3	228.9
Redevelopment	8.3	19.1	375.1
Total n	**6,356**	**1,034.9**	**162.8**

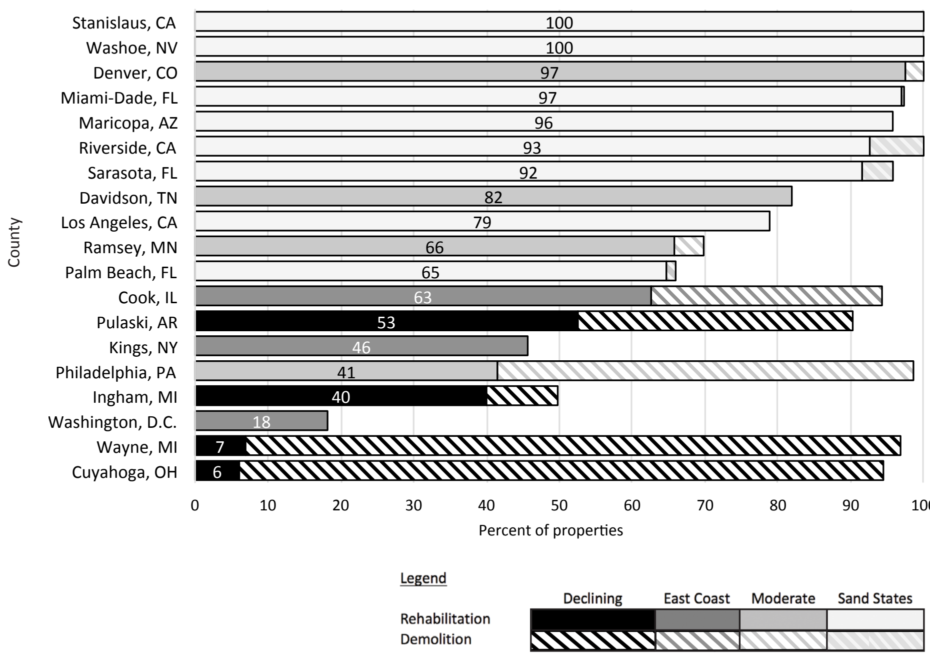
NSP2 = Neighborhood Stabilization Program (second round).

Notes: $/Property shown in thousands. All data provided by grantees.

The most fundamental part of grantees' strategy—what activities to undertake—varied considerably across counties, with some discernable geographic patterns (exhibit 8). All counties in the Sand States market type and three of the four counties in the Moderate market type pursued acquisition and rehabilitation as the dominant strategy; for most of these counties, more than 90 percent of NSP2 properties were rehabilitated. At the other end of the spectrum, Cuyahoga and Wayne Counties used demolition and land banking for more than 90 percent of NSP2 properties, with small numbers of rehabilitated properties. Cook, Philadelphia, and Pulaski Counties had the most even split between rehabilitation and demolition, with 40 to 60 percent of properties rehabilitated and 30 to 60 percent demolished. Only three counties—Ingham County, Kings County, and Washington, D.C.—did not treat most of their NSP2 properties with either rehabilitation or demolition. For these three counties, stand-alone financing was the largest single activity.[12]

Exhibit 8

NSP2 Activity Choice: Rehabilitation Versus Demolition, by County



NSP2 = Neighborhood Stabilization Program (second round).
Notes: Rehabilitation includes redevelopment. Demolition includes land banking. Finance and multiple activities are not shown. Data provided by NSP2 grantees.

[12] The percentage of properties for all five activities, along with all numbers used in the graphs, are shown in appendix exhibit A-2.

Among the sampled 18 counties and Washington, D.C., rehabilitation and redevelopment activities focused mostly on one- to four-family structures (exhibit 9).[13] This focus is particularly pronounced in the Sand States market type, where 88 percent of NSP2 properties were one- to four-family buildings. Grantees in the East Coast market type used NSP2 funds to rehabilitate and redevelop a more diverse building stock, with about one-third of NSP2 properties composed of one- to four-family buildings, 28 percent multifamily structures, and 19 percent condominiums. Structure type was not provided for large numbers of rehabilitated properties in counties in the Declining and Moderate market types; most of the properties reporting structure type were one- to four-family buildings.

Exhibit 9

Distribution of NSP2 Property Types for Rehabilitated and Redeveloped Properties

	All	Sand States	Declining	East Coast	Moderate
One- to four-family (%)	75.1	87.5	48.6	34.0	69.6
Condo/coop (%)	2.9	1.5	3.6	18.8	1.0
MF (five or more families) (%)	5.8	4.6	0.5	27.9	5.4
Other (%)	5.0	5.9	5.4	4.1	2.3
Unknown (%)	11.2	0.6	41.9	15.2	21.6
n	**2,809**	**1,707**	**391**	**197**	**514**

condo = condominium. coop = cooperative. MF = multifamily. NSP2 = Neighborhood Stabilization Program (second round).
Notes: One- to four-family properties include single-family detached, townhouse, duplex, triplex, and quadriplex buildings. Totals include only properties that were purchased and rehabilitated or redeveloped. Structure type corresponds to post-NSP2 investment status.

Expenditures

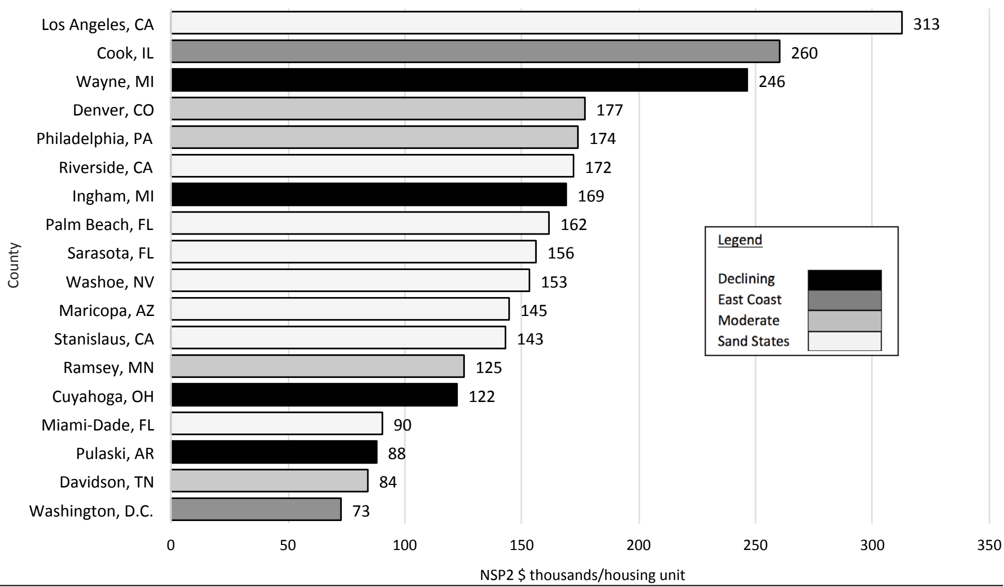
A comparison of per-property expenditures across all NSP2 properties—as shown in the last column of exhibit 1—is difficult to interpret because of the variation in activity type and property size. For a more useful comparison, therefore, we calculate the expenditures per housing unit (not per property) only for rehabilitated properties.[14] Exhibit 10 shows the per-unit NSP2 expenditures with counties ranked in descending order. Unlike for the distribution of activity, no obvious correlations were observed between housing market type and expenditures. Most counties in the Sand States market type cluster in the middle, with expenditures on acquisition and rehabilitation between $140,000 and $170,000 per housing unit. But Los Angeles spent nearly double that (more than $300,000 per unit), while Miami-Dade County had one of the lowest average expenditures (around $90,000). Nor do these differences obviously match overall differences in home sales prices; the county-level correlation between rehabilitation expenditures per unit and median home sales prices is 0.14. Los Angeles County (which has a median sales price of $388,000) had the highest rehabilitation expenditures per unit, while Washington, D.C. (median sales price

[13] Demolished or land-banked properties had no observable structure type after treatment, and information on structure type or unit count was missing for many of the financed properties. Housing unit counts are missing or inconsistent for most properties, thus no analysis can be done based on size of multifamily properties.

[14] Property type and housing unit counts are missing for many of the demolished or land-banked properties, and redevelopment and financing are more heterogeneous activities.

Exhibit 10

NSP2 Acquisition and Rehabilitation Costs, by County



NSP2 = Neighborhood Stabilization Program (second round).
Notes: Graph shows average per census tract. NSP2 expenditures and housing unit counts provided by grantees.

of $374,000) had the lowest. Wayne County, which had a median home sales price slightly less than $40,000, spent on average $246,000 for each rehabilitated property. Developing a better understanding of what drove the difference in expenditures across counties and across grantee organizations is an important area for future research.

Concentration and Scale of Investment

An important difference in program design between NSP1 and NSP2 is NSP2's emphasis on concentrated investment. Whereas NSP1 was allocated across grantees by formula and resulted in small amounts of funding being spread over spatially dispersed areas, NSP2 encouraged grantees to spend sufficient funds in targeted areas to achieve a scale of intervention that could halt the downward spiral of foreclosures and decreased property values. We create three metrics to analyze the neighborhood scale and concentration of NSP2 investments. First, the number of NSP2 properties in each census tract is divided by the total number of housing units per tract to account for differences in the size of the housing stock. Second, the value of NSP2 expenditures for each census tract is divided by the median home sales price in the tract.[15] The scale of spending might differ from the scale of properties for several reasons. For instance, if grantees tended to work on larger properties, acquired properties in worse condition that needed more extensive rehabilitation, or used more costly materials, then the scale of spending might exceed the scale of properties.

[15] Housing unit counts are taken from the 2005–2009 American Community Survey, or ACS, median sales prices as of 2009 from CoreLogic, Inc. The numbers vary slightly when using housing units in one- to four-family properties, or a different year of home sales prices, but the general range and differences across market types are similar.

Third, we calculate a nearest neighbor index for each NSP2 property (Clark and Evans, 1954; Fischer and Harrington, 1996). The index measures the average distance from each property to its five spatially closest NSP2 properties, with increasing index values indicating greater diffusion or lower concentration. The nearest neighbor index is calculated for all NSP2 properties within each county/area and is a property-level concentration measure. Equation 1 shows the calculation; d_{ij} is the pairwise distance between each NSP2 property (*i*) and all other NSP2 properties (*j*).

$$\overline{D_{min}} = \frac{\sum_{j=1}^{5} Min(d_{ij})}{5} \tag{1}$$

Whereas the first two metrics capture the relative scale of NSP2 investment within each census tract, the distance index is an absolute measure of spatial concentration that is interpreted the same way regardless of census tract size. Tract geographic and population sizes vary across sample counties; in general, tracts in counties in Western states have larger land areas and lower housing densities than counties on the East Coast of the nation. It is unclear in theory whether the relative or absolute concentration of NSP2 investments matters more for the program's goal of mitigating negative spillover effects from foreclosures; therefore, we present results for all three metrics. In practice, at the county/area level, all three metrics are highly correlated.[16]

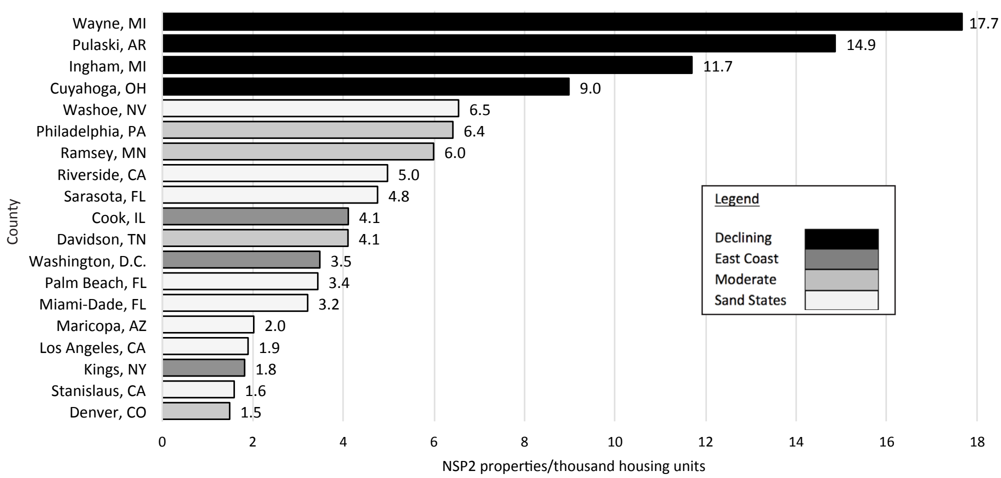
The four counties in the Declining market type had the largest tract-level scale of NSP2 investments, using the property concentration metric (exhibit 11). The values range from 9 NSP2 properties per 1,000 housing units in Cuyahoga County to nearly 18 NSP2 properties in Wayne County—a considerable dispersion within the Declining market type—but all four counties have substantially larger scale investments than any county in the other three market types. In five counties—Denver, Kings, Los Angeles, Maricopa, and Stanislaus—the scale of NSP2 investment was 2 or fewer properties per thousand housing units. The remaining counties invested in 3 to 6 NSP2 properties per 1,000 housing units, or less than 1 percent of the housing stock in NSP2 tracts. Because this metric does not take into account property size, it could underestimate the visible scale of NSP2 activity in counties that treated mostly multifamily structures, such as those in the East Coast market type—Cook County, Kings County, and Washington, D.C.

Somewhat similar patterns emerge using the expenditure scale metric (exhibit 12). Wayne County had the largest scale of expenditures, spending approximately 55 times the median house sales price, followed by two counties in the Declining market type: Ingham (33) and Pulaski (28). Four of the five counties that ranked lowest in the property scale metric also had relatively low expenditures: Kings, Los Angeles, Maricopa, and Stanislaus. In these counties, NSP2 expenditures were between 4 and 9 times the median home sales price. The relatively small scale of NSP2 investments in these counties, measured by both properties and expenditures, raises questions about whether the program could generate measurable changes to census tract-level housing markets.

[16] The correlation between properties per housing unit and spending divided by sales price is 0.9, the correlation between properties per housing unit and average distance is -0.7, and the correlation between spending and sales price and average distance is -0.6.

Exhibit 11

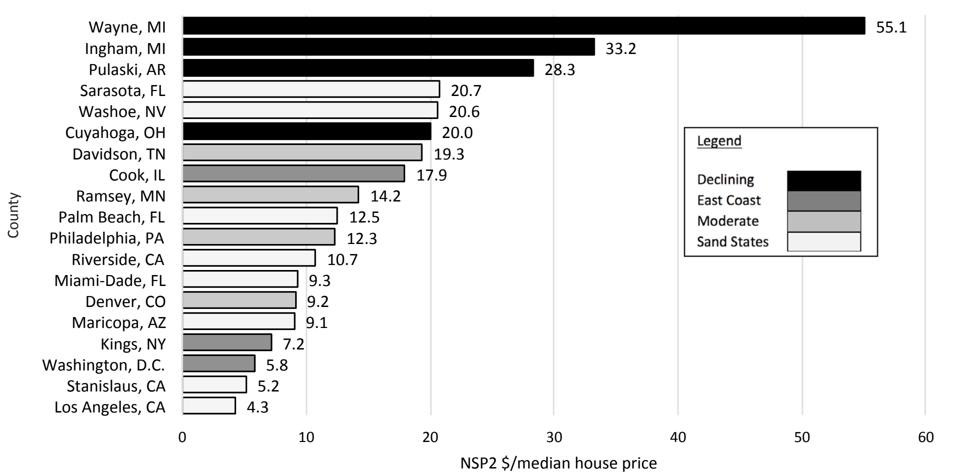
Scale of Tract Investment: NSP2 Properties, by County



NSP2 = Neighborhood Stabilization Program (second round).
Notes: Graph shows average per census tract. NSP2 property counts provided by grantees. Housing unit counts for census tract come from 2005–2009 American Community Survey, or ACS.

Exhibit 12

Scale of Tract Investment: NSP2 Expenditures, by County

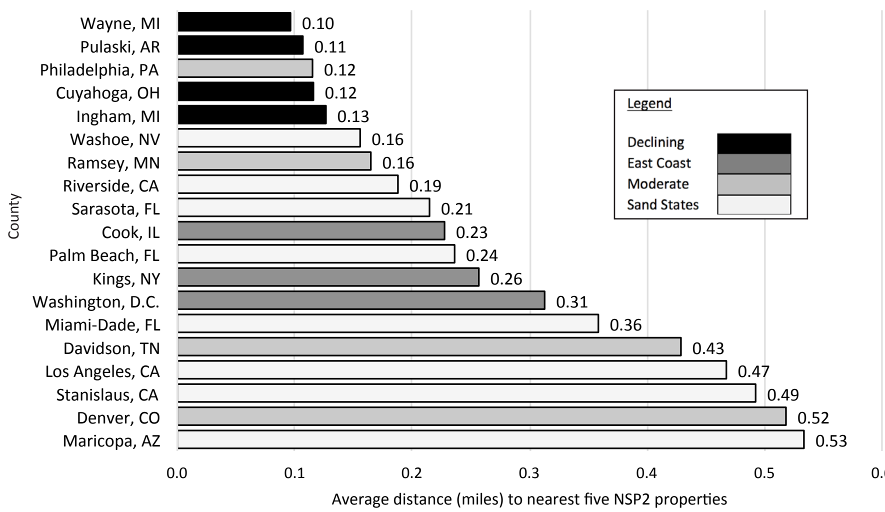


NSP2 = Neighborhood Stabilization Program (second round).
Notes: Graph shows average per census tract. NSP2 expenditures provided by grantees. Median home sales price per tract calculated from CoreLogic, Inc., using 2008 data.

The third measure of NSP2 investment concentration, the average distance between NSP2 properties, shows similar patterns to both tract-level scale metrics (exhibit 13). NSP2 investments were most spatially concentrated in counties in the Declining market type; NSP2 properties were within about one-tenth of a mile from five other NSP2 properties in the four counties of the Declining market type and in Philadelphia County in the Moderate market type. In the three counties in the East Coast market type, the average distance between NSP2 properties was between about one-fourth and one-third of a mile. The remaining three counties in the Moderate market type and all eight counties in the Sand States market type have a greater dispersion of distances. As might be expected, several counties in the Western states (Denver, Los Angeles, Maricopa, and Stanislaus), which tend to have lower housing densities, had spatially diffuse NSP2 investments: in those counties, the average distance between NSP2 properties was nearly one-half of a mile.[17]

Exhibit 13

Spatial Diffusion of NSP2 Properties, by County



NSP2 = Neighborhood Stabilization Program (second round).
Note: Distance measure is the average distance from each NSP2 property to the five nearest other NSP2 properties.

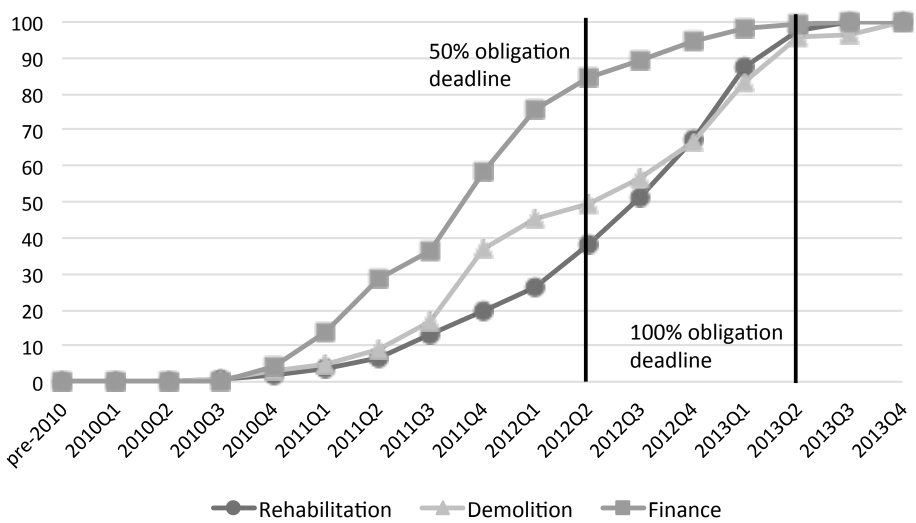
Timing

Because NSP2 was part of the overall economic stimulus, and because a goal of the program was to provide immediate support to hard-hit neighborhoods, grantees had a fairly short window during which to obligate the funds. As noted in the section Previous Studies of NSP, this challenge was compounded by the difficulty of acquiring properties in various stages of financial distress. Exhibit 14 shows the timing of completed NSP2 interventions by activity type. HUD awarded NSP2 grants in January 2010; grantees had to obligate 50 percent of funds by February 2012 and 100 percent of funds by February 2013. Some grantees layered NSP2 onto projects started with NSP1 or used the

[17] Nearest neighbor indices that measure the distance from NSP2 properties to both NSP1 and NSP2 properties have very similar distributions, because NSP1 investments were considerably more dispersed across space. Results are available upon request from the authors.

Exhibit 14

Timing of Completed NSP2 Investments



NSP2 = Neighborhood Stabilization Program (second round).
Notes: Rehabilitation category includes redevelopment. Demolition category includes land banking. Data collection from grantees ended in August 2013, so completions through the fourth quarter of 2013 are estimated. Properties that were missing the year of completion or had projected completion after the fourth quarter of 2014 are excluded.

third round of NSP (NSP3) funds to complete NSP2 projects, complicating the question of when projects appeared complete to external observers. All grantees met the two obligation deadlines, but the timing of completed investments varied by activity type. At all points in time, more of the financing projects were completed than either rehabilitations or demolitions: more than 80 percent of finance projects were obligated by the second quarter of 2012, compared with 50 percent of demolition projects and about 40 percent of rehabilitation or redevelopment projects.[18] Funds for demolition projects were obligated faster than funds for rehabilitation or redevelopment projects through the end of 2012. Across all activities, by the fourth quarter of 2012, about two-thirds of NSP2 projects were complete. The relatively recent completion date of most NSP2 investments projects gives only a short window to observe the performance of housing markets after the program's implementation.

[18] Very little difference in timing exists between demolition and land banking or between rehabilitation and redevelopment, so the activities are shown collapsed into three categories. Holding constant activity type, not much difference exists in timing across market types.

Discussion and Future Research Agenda

During the housing crisis from 2007 to 2009, unprecedented levels of foreclosures threatened not only individual homeowners but also entire neighborhoods and communities and the stability of major financial institutions. The Neighborhood Stabilization Program was the primary federal effort to assist cities and neighborhoods heavily impacted by concentrated foreclosures. This article presents evidence collected during a 3-year evaluation of NSP2 on housing investments achieved by the program.

Census tracts that received NSP2 investments had weaker initial housing markets than typical tracts in the same counties, with lower household income and housing values and with higher rates of foreclosed and vacant properties. Across a nationwide sample of 18 counties and Washington, D.C., grantees used NSP2 funds to invest in more than 6,300 properties. About one-half of these properties represent newly developed or renovated properties that will become available to low-income households. Grantee approaches and outcomes differed substantially across housing market types. Grantees in counties in the Declining market type used NSP2 funds mostly to demolish blighted properties; they achieved the highest scale and spatial concentration of investment. Grantees in the counties in the Sand States market type focused mostly on rehabilitation and redevelopment; they produced relatively low-scale, spatially diffuse investments. Grantees in the counties in the East Coast and Moderate market types undertook more mixed approaches, combining rehabilitation, demolition, and financing. Expenditures per property and spatial concentration varied across counties and across the four market types.

This article presents the earliest evidence on NSP2, but we anticipate that, as more data become available, additional research will investigate the implementation, outcomes, and impacts of the program. The complexity of NSP—especially the variation in strategies and outcomes across localities—creates both challenges and opportunities for such research. Based on our initial findings, we outline several topics of interest for further study and suggest some useful empirical approaches and caveats of which to be aware.

The diverse approaches and outcomes suggest several lines of inquiry focused on analyzing program implementation. Specific research questions of interest include: how did grantees develop initial strategies? How and why did strategies change over time? What were challenges to implementation, and how did grantees meet those challenges? What factors explain variations in outcomes and expenditures? In particular, it would be valuable to understand how much of the variation in strategies, outcomes, and expenditures can be explained by economic factors, such as differences in home sales prices or competition from investors, and how much is because of institutional or organizational factors, such as the grantees' expertise, staff capacity, or organizational structure. These questions lend themselves both to qualitative approaches, such as indepth interviews with staff at grantee organizations, and statistical analysis of the relationship between local housing markets and quantifiable production outcomes. Comparing strategies and outcomes across multiple markets for the large nonprofit organizations that worked in several counties would be one useful approach for distinguishing between locally varying and invariant factors.

Another set of questions could focus on the impacts of NSP on local economic and social conditions. Outcomes of interest include home sales prices, property distress, vacancy rates, housing tenure, crime rates, and population characteristics. The main challenge to conducting large-scale statistical analyses of NSP impacts is that there is no "average" NSP treatment; therefore, it will be difficult to find an average treatment effect. Because of the variation in NSP implementation, analyses of smaller local areas are more likely to yield informative results than pooling large numbers of counties together in regressions. Moreover, the analysis should attempt to measure the type and quantity of NSP investments completed in a local area. Two particular challenges arise: establishing the appropriate geographic scale of the analysis and the timeframe during which impacts might become apparent. Although NSP was conceived of as an intervention that could alter census tract-level housing markets, the scale of investment in the average NSP tract raises questions about whether tracts will be too large to observe any mitigating impact from aggregate NSP properties. One approach would be to focus on the subset of NSP2 tracts that received large-scale investments, either large volumes of single-family properties or those tracts in which NSP2 was used to rehabilitate and redevelop larger multifamily buildings. Researchers alternatively could examine NSP2 impacts at smaller levels of geography, using event-history methods for individual property transactions near NSP2 properties. The latter approach is also complicated by thin volumes of arms-length property sales during much of the implementation period, so it may be feasible for only a few NSP2 counties.

In a similar way, future research should attempt to measure both short-term and long-term impacts of NSP2. It is not obvious a priori when positive spillover effects from NSP2 are likely to begin. If the negative spillover effects of foreclosure are mitigated only after the vacant property has been completely rehabilitated (redeveloped) and reoccupied, then an impact analysis will need to occur after a sufficient window of time has passed beyond the completion of NSP2 properties. On the other hand, if NSP2 begins to improve neighborhood perceptions at early stages, for instance with the acquisition of a foreclosed property or the beginning of rehabilitation, observations of spillover effects to nearby property markets concurrent to program implementation will be more likely. The timeframe of the current analysis may be too early to detect the effects of NSP2: the most recent outcomes described in the study were measured when nearly 27 percent of the property investments were not complete or had only been completed. Moreover, many grantees viewed NSP2 as a complement to their longer term neighborhood revitalization strategies. Approximately one-half of the study grantees reported purposely targeting areas with long-standing distress, and almost all grantees reported that they chose areas to coordinate with other community development activities (including NSP1 and NSP3 and CDBG). When we view NSP2 investments through the lens of long-term community development, it is likely too early to draw conclusions about the impact of NSP2 on neighborhood revitalization outcomes. Indeed, the literature on neighborhood revitalization suggests that altering the outcomes of distressed neighborhoods requires concentrated investment over a multiyear timeframe (Galster et al., 2006; Galster et al., 2004; Pooley, 2014). Examining neighborhoods that received not only NSP2 funding but also other investments such as CDBG, either before or after NSP2, would enable researchers to test for longer term impacts of neighborhood revitalization.

Appendix

Exhibit A-1

Variable Definitions and Sources

Variable	Definition	Source
NSP activity/treatment status		
NSP treat	= 1 if at least one NSP2 property in tract, = 0 otherwise	Grantee data
NSP props	Total # NSP properties in tract	Grantee data
NSP spent	Total $ value of NSP spent in tract (not average/property)	Grantee data
Housing market outcomes		
Price	Median sales price of arms' length housing sales (3-year average)	CoreLogic, Inc.
Distress	Properties in any stage of mortgage distress per 1,000 housing units	CoreLogic, Inc.; ACS
Vacancy	Vacancies per 1,000 housing units	USPS, ACS
Investor	Investor purchases/total purchases	CoreLogic, Inc.
Population and housing market characteristics		
Central city	= 1 if tract belongs to designated central city, = 0 otherwise	OMB
Pop density	Population density (per square mile)	ACS 2005–2009
Hispanic	% Hispanic	ACS 2005–2009
Black	% African-American	ACS 2005–2009
Income	Median household income	ACS 2005–2009
No HS grad	% population age 24+ with high school degree or less	ACS 2005–2009
Housing 1–4 fam	% housing units in 1–4 family properties	ACS 2005–2009
∆Price, 00–06	% change in median housing price, 2000–2006	CoreLogic, Inc.

ACS = American Community Survey. NSP = Neighborhood Stabilization Program. OMB = Office of Management and Budget. USPS = U.S. Postal Service.

Exhibit A-2

County NSP2 Outcomes

County	Grantees	Tracts	Activities (%)			Rehab Cost ($ 000s)	Scale/Concentration			
			Rehab	Demo	Finance		Prop/ Tract	Prop/ Housing	NSP2 $/Price	Distance (miles)
Cook, IL	5	44	66	33	1	253.4	6.0	4.1	17.9	0.23
Cuyahoga, OH	1	89	6	92	2	122.3	8.5	9.0	20.0	0.12
Davidson, TN	1	18	82	0	18	84.2	6.4	4.1	19.3	0.43
Denver, CO	2	29	97	3	0	177.0	4.1	1.5	9.2	0.52
Ingham, MI	1	17	80	20	0	169.0	12.6	11.7	33.2	0.13
Kings, NY	2	20	46	0	54	NA	2.3	1.8	7.2	0.26
Los Angeles, CA	6	205	83	0	17	293.1	2.7	1.9	4.3	0.47
Maricopa, AZ	2	113	100	0	0	127.8	4.4	2.0	9.1	0.53
Miami-Dade, FL	2	56	100	0	0	89.0	5.3	3.2	9.3	0.36
Palm Beach, FL	2	33	73	1	26	163.9	7.1	3.4	12.5	0.24
Philadelphia, PA	2	49	42	58	0	173.9	10.0	6.4	12.3	0.12
Pulaski, AR	2	11	58	42	0	87.4	21.5	14.9	28.3	0.11
Ramsey, MN	1	22	94	6	0	125.3	6.8	6.0	14.2	0.16
Riverside, CA	1	5	93	7	0	146.5	10.8	5.0	10.7	0.19
Sarasota, FL	1	7	96	4	0	156.1	10.1	4.8	20.7	0.21
Stanislaus, CA	1	29	100	0	0	143.9	3.2	1.6	5.2	0.49
Washington, D.C.	3	17	18	0	82	78.6	3.9	3.5	5.8	0.31
Washoe, NV	1	6	100	0	0	145.5	24.3	6.5	20.6	0.16
Wayne, MI	1	92	7	93	0	299.5	21.2	17.7	55.1	0.10

Demo = demolition. NSP2 = Neighborhood Stabilization Program (second round). Prop = properties. Rehab = rehabilitation.
Notes: In Activities, Rehab includes redevelopment and Demo includes land-banking. Rehab Cost is per housing unit in completed NSP2 properties. Kings County, New York, had no rehabilitated properties. Prop/Housing is NSP2 properties per tract divided by 1,000 housing units. NSP2 $/price is NSP2 expenditures per tract divided by median housing sales price. Distance is average distance to five nearest NSP2 properties.

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Authors

Jenny Schuetz is an economist at the Board of Governors of the Federal Reserve System.

Jonathan Spader is a senior associate at Abt Associates Inc.

Jennifer Lewis Buell is a senior analyst at Abt Associates Inc.

Kimberly Burnett is a senior associate at Abt Associates Inc.

Larry Buron is a principal associate at Abt Associates Inc.

Alvaro Cortes is a principal associate at Abt Associates Inc.

Michael DiDomenico is a senior analyst at Abt Associates Inc.

Anna Jefferson is an associate at Abt Associates Inc.

Christian Redfearn is an associate professor at the University of Southern California.

Stephen Whitlow is an associate at Abt Associates Inc.

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Departments

In this issue—

- *Data Shop*
- *Industrial Revolution*
- *Impact*
- *Evaluation Tradecraft*
- *Referees 2014–15*

Data Shop

Data Shop, a department of Cityscape*, presents short articles or notes on the uses of data in housing and urban research. Through this department, the Office of Policy Development and Research introduces readers to new and overlooked data sources and to improved techniques in using well-known data. The emphasis is on sources and methods that analysts can use in their own work. Researchers often run into knotty data problems involving data interpretation or manipulation that must be solved before a project can proceed, but they seldom get to focus in detail on the solutions to such problems. If you have an idea for an applied, data-centric note of no more than 3,000 words, please send a one-paragraph abstract to david.a.vandenbroucke@hud.gov for consideration.*

Gauging Confidence in the U.S. Housing Market

Terry Loebs
Pulsenomics LLC

Abstract

Confidence in U.S. housing markets is a prerequisite for stable real estate asset values and a healthy economy. Bold policy actions in recent years by the Obama Administration and the Federal Reserve Board have underscored the profound impact that housing market health can have on consumer sentiment and the macroeconomy, and these actions imply that traditional, lagging indicators of housing market conditions (for example, home price indices, real estate transaction volumes) are incomplete gauges of market risk. Like those of other asset classes, future levels of transaction volume and prices in residential real estate markets depend on the prevailing sentiments and expectations of market stakeholders.

After several years of development, The U.S. Housing Confidence Survey (HCS), inspired by honorary advisers Karl Case and Robert Shiller and sponsored by Zillow Group, was launched by Pulsenomics LLC in January 2014 as the foundation for The Zillow Housing Confidence Index (ZHCI).[1] Pulsenomics now collects more than 10,000

[1] Zillow Group, sponsors The U.S. Housing Confidence Survey™ and The U.S. Housing Confidence Index™. Terry Loebs is the author and manager of the survey and the developer of the index. Pulsenomics LLC is the index calculation agent and the owner of all intellectual property related to HCS and (Z)HCI. ZHCI data are freely available via Zillow.com or https://www.pulsenomics.com/Housing_Confidence_Index.html. Zillow® is a registered trademark of Zillow Group. Pulsenomics®, Housing Confidence Index™, and Housing Confidence Survey™ are trademarks of Pulsenomics LLC.

Abstract (continued)

completed HCS questionnaires from households across 20 of the largest U.S. metropolitan areas every 6 months and synthesizes the more than 350,000 HCS response data points compiled during each field period into freely available, comprehensible housing confidence metrics.[2]

ZHCIs reflect assessments by individual households of prevailing market conditions, their home value expectations, and homeownership aspirations. Via these indices, housing confidence in the United States is quantified; variations in housing confidence and its key indicators can be monitored over time by geography, tenure, and key demographic variables. These data can ultimately contribute to better informed public policy, improvements in real estate market forecasts, and enhanced understanding of changes in macroeconomic activity.

Introduction

The U.S. housing experience of the past decade and its evolved demographics, rapidly changing consumer attitudes, and unpredictable government policies all indicate that, going forward, new and more proactive forms of real estate market information will be necessary to complement traditional, lagging indicators of housing market conditions (for example, home price indices and real estate transaction volumes) so that emergent housing risks can be detected and monitored more effectively.

Housing confidence—a measurement of attitudes among heads of household that can signal future supply and demand changes within residential real estate markets—is one such form of market intelligence that complements legacy indicators of U.S. housing market health.[3] Housing confidence is a prerequisite for stable real estate asset values and a healthy economy, as it can influence home prices, individual behavior and economic consumption.[4] The velocity and volatility of consumer attitude changes in the digital age suggest that housing confidence should be measured and monitored in a systematic fashion. The U.S. Housing Confidence Survey (HCS) and The Zillow Housing Confidence Index (ZHCI) represent the first concerted effort to do exactly that, at the national level and within major metropolitan markets across the United States.[5]

[2] One of the most durable of all housing-focused, consumer-attitudinal surveys to date is a research effort led by Karl Case and Robert Shiller. The Case-Shiller homebuyer survey project began in 1988 and has focused on the attitudes and expectations of recent homebuyers in four cities. The survey is administered annually using a questionnaire that is sent to several hundred recipients via U.S. mail. See Case, Shiller, and Thompson (2012).

[3] Contrary to common belief, none of today's headline indices of U.S. consumer sentiment and economic confidence reflect any direct assessment of prevailing conditions in the real estate market, expectations for home values, or other attitudes concerning the housing market.

[4] Residential real estate has powerful, two-way consumer wealth effects and a "confidence multiplier." The confidence multiplier in real estate manifests itself through price-to-price and price-to-GDP-to-price feedback cycles and can be magnified by cultural and institutional forces (Akerlof and Shiller, 2009).

[5] The HCS was developed for the specific purpose of quantifying and monitoring housing confidence over time. The inaugural edition of the survey was conducted in January 2014.

The ZHCI metrics quantify the degrees and dimensions of housing confidence among renters and homeowners within specific metropolitan markets. ZHCI represents the current attitudes of all market stakeholders—not only those of householders who happen to have been involved in a recent real estate transaction.[6]

ZHCI is a weighted combination of three underlying housing sentiment indicators: The Housing Market Conditions Index, The Housing Expectations Index, and The Homeownership Aspirations Index.[7] When the historical database of these index values becomes sufficiently large, the market signals reflected in these data will facilitate progress in related research endeavors (for example, they may prove helpful in analyses of turning points in real estate markets, studies of household economic behavior, forecasts of housing supply, demand, and prices).

Taking the Pulse of Households: The U.S. Housing Confidence Survey

The HCS is the foundation for ZHCI. More than 10,000 HCS questionnaires are completed by heads of household who reside in metropolitan areas across the United States, and more than 350,000 individual responses are electronically recorded each time this survey is fielded. The survey response data enable Pulsenomics to produce an extensive set of indices that quantify housing confidence and track how it changes over time.

Overview

The HCS is developed to facilitate systematic measurement and reporting of consumer confidence in the U.S. housing market. The HCS is unique among all consumer housing and economic confidence surveys because it is the only one that—

- Focuses specifically on the measurement of nationwide housing confidence among the U.S. heads of household.
- Gauges attitudes among homeowners and renters concerning homeownership and prevailing market conditions at the metropolitan area level.
- Measures affordability expectations and home value expectations (for short- and long-term horizons) among homeowners and renters.
- Enables consistent and concise reporting of survey results, via ZHCI, for easy public consumption and comprehension.

The HCS deploys a survey instrument developed to gather repeated measures of consumer attitudes that enable production of ZHCI.[8] The project team designed the content and questions that comprise the HCS instrument to be engaging with, relevant to, and comprehensible to respondents

[6] For example, less than 1 percent of all U.S. households are involved in a home purchase or sale contract in a typical month.

[7] Housing Market Conditions Index™, Housing Expectations Index™, and Homeownership Aspirations Index™ are trademarks of Pulsenomics LLC.

[8] The HCS questionnaire is available at https://www.pulsenomics.com.

to encourage accurate responses. The HCS questionnaire was written by subject matter experts and tested in the field before production. The instrument is administered to adult respondents who are the sole or joint decisionmakers concerning their household financial matters.[9]

In addition to gathering response data concerning housing market conditions, expectations, and homeownership aspirations, the questionnaire collects key demographic information from each respondent during the HCS interview to enable post-stratification weighting. The sample balancing weights are calculated and applied at the metropolitan area level so that HCS response data and ZHCI reflect the population attributes of each geographic market.[10]

Sample Size and Data Points; Margin of Error

Within each of the 20 metropolitan areas where Pulsenomics conducts this survey research, interviewers complete a minimum of 500 questionnaires.[11] For each edition of HCS, Pulsenomics compiles a total of more than 350,000 response data points from the completed questionnaires.

At a 95-percent confidence interval—

- The theoretical margin of sampling error for an aggregated, household-weighted sample of 10,000 (composed of 20 metropolitan-level probability samples of 500 each) is +/-1.2 percent and is larger for subgroups (for example, +/-1.5 percent for all homeowner households and +/-2.0 percent for all renter households).
- The theoretical margin of sampling error for a probability sample of 500 drawn from a single U.S. metropolitan area population is +/-4.4 percent (larger for subgroups).

A translation: For a probability sample design using a random digit dial (RDD) landline sample frame, one can say with 95-percent confidence that survey results do not vary from the true population values by more than the stated margin of sampling error in one direction or the other if the entire universe of respondents with home telephones answers the phone when called and provides accurate responses to all questions in a uniformly administered survey instrument.

Alas, gauging the reliability of survey research in the 21st century is not so simple. For example—

- The number of households that have abandoned their landlines in favor of cell phones and Internet communication in recent years has grown rapidly. For example, in the first 6 months of 2011, fewer than one in every three households (32 percent) did not have a landline telephone but did have at least one wireless telephone; 3 years later, this figure grew to more than two in

[9] The HCS instrument includes approximately 40 questions, although the actual number of questions comprising each HCS interview is dependent on the respondent's tenure profile and answer pattern. For example, certain survey questions are specific to owner- or renter-occupants; the respondent's answer pattern can trigger question-branching logic within HCS that determines whether a followup question is necessary and, if so, what version of a followup question is appropriate to administer.

[10] Post-stratification weights for each metropolitan area are derived from the U.S. Census data and applied for key demographic characteristics (that is, age, gender, and race/ethnicity) and household tenure profile (that is, owner- or renter-occupied homes).

[11] Oversampling is employed to ensure that hard-to-reach population segments are not underrepresented. The actual number of completed interviews conducted within each metropolitan area typically exceeds 500 by 10 percent or more.

every five households (44 percent; Blumberg and Luke, 2014). Moreover, the adoption rate of landline alternatives has been nonuniform across key segments of the population (for example, in general, households headed by younger adults are more likely to use a landline alternative).

The universe of landline phone numbers conforms to a fixed structure that is known and finite. Thus, one can sample from this universe with confidence. Cell phones and Internet addresses allow for no such bounded universe; one can sample, but not with confidence, because margin of (sampling) error calculations assume a probability sample design—one in which every member of the population has an equal, known, and nonzero chance of inclusion in a sample. Because databases composed of the universe of cell phone users do not exist, margin of error estimates that are reported with most survey research today (including HCS) might best be described as theoretical.[12]

- Nonsampling errors—such as the accuracy and consistency of the survey questions as read by the interviewer, the inability to contact some members of the population, the difficulty of translating each questionnaire into all possible languages and dialects, the way and extent to which response data are weighted–are also very important, but cannot be so easily quantified.

Although sample size and selection methodology will always be key considerations when evaluating the merit of survey research data, margin of (sampling) error metrics calculated for nonprobability samples warrant scrutiny. The variety and potential impact of nonsampling errors render margin of sampling error an incomplete measure of the overall quality of survey research. The overarching goal of scientific survey research should be minimization of total survey error (TSE). Although no singular or proven approach exists to achieve this goal, HCS strives to minimize TSE via a combination of diligent instrument design, iterative field testing, blended sampling, multimode technology, and methodical weighting.

Mixed-Mode, Blended-Sample

By contrast to traditional survey approaches, HCS is multimodal, with a cell phone user sample augmenting a landline sample frame for each metropolitan area to better reflect communication preferences and tendencies among today's adult population.

The HCS landline sample frame is selected proportionate to each metropolitan area's population through the RDD method, giving all landline telephone numbers, listed and unlisted, an equal chance of being included.[13] An adult age 18 or older who is the sole decisionmaker or a joint

[12] Every landline telephone number in the United States is structured according to the 1940s-era North American Numbering Plan (NANP), using a standard combination of a three-digit, territory-specific area code, a three-digit central office code (sometimes referred to as an "exchange"), and a four-digit station code. With a fixed number of preknown area codes, a fixed number of known exchanges per area code, and a finite number of possible station codes available to each valid area code-exchange pairing (a station code must be a four-digit number between 0000 and 9999), the number of landline phone numbers is knowable and finite. Thus, it was possible, historically, to sample from that known, bounded universe of landline numbers with confidence.

[13] The landline samples for the HCS are sourced from Survey Sampling International (SSI), a leading provider of telephone survey sampling solutions for scientific survey research. Pulsenomics' strategic partner, SurveyUSA, uses a real-time connection to the SSI mainframe that permits HCS samples to be drawn quickly from irregularly shaped geographies (for example, metropolitan statistical areas), in volume and with precision.

decisionmaker concerning household financial matters is selected by a systematic procedure to provide a balance of survey respondents by gender, age, race/ethnicity, and household tenure. During the survey field period, the telephone numbers of those landline respondents who are not reachable on a first attempt because of a busy signal, "no-answer," or connection to an answering machine may be redialed at a later time.

HCS landline interviews are conducted using a proprietary interactive voice response technology that uses the recorded voice of a professional announcer. Among other benefits, this technology ensures that every HCS question is articulated to each respondent in precisely the same fashion.[14]

An electronic version of the HCS instrument is administered to a separate frame within each metropolitan area. This frame includes adult respondents who generally do not communicate via a household landline (that is, adults who use their cell phone instead of a landline phone for all or most of their voice communications). Within the HCS questionnaire, "cell phone only" and "cell phone mostly" survey respondents confirm that they use a cell phone as their exclusive or primary telephonic communications device. These cell phone respondents, who comprise approximately 40 percent of each metropolitan area sample, complete the questionnaire via the Internet on their smart phone, tablet or other electronic device.[15]

For each metropolitan area, the respondent universe from the landline and Internet samples are combined and weighted using the most recent U.S. Census estimates for age, gender, ethnic origin, and household tenure to align the sample to the metropolitan area population.

This "mixed-mode, blended-sample" approach attempts to achieve the best possible balance between key survey goals: maximizing geographic coverage and execution efficiency, and mitigating TSE.

Geographic Scope

HCS research currently is conducted in 20 major metropolitan areas throughout the United States.

Atlanta	Detroit	New York City	San Francisco
Boston	Las Vegas	Philadelphia	San Jose
Chicago	Los Angeles	Phoenix	Seattle
Dallas	Miami	St. Louis	Tampa
Denver	Minneapolis	San Diego	Washington, D.C.

[14] In certain counties, live telephone operators conduct HCS landline interviews.

[15] The cell phone-landline respondent mix for each metropolitan area is reported by Pulsenomics with each edition of HCS.

Quantifying and Monitoring Real Estate Sentiment: The Zillow Housing Confidence Index

The U.S. Housing Confidence Survey was designed to gather assessments by individual households of prevailing market conditions, their home value expectations, and homeownership aspirations. Via The Zillow Housing Confidence Index, these key components of housing market sentiment are, for the first time, quantified and summarized so that housing confidence in the United States can be effectively monitored over time by geography, tenure, and key demographic variables. These data can ultimately contribute to better informed public policy, improvements in real estate market forecasts, and enhanced understanding of changes in macroeconomic activity.

Definition and Purpose

As forward-looking gauges of housing market health with low data latency, the ZHCI may prove to be timely leading indicators of future home value changes and macroeconomic activity nationally and at individual metropolitan area levels. The indices were designed to summarize and effectively communicate response data collected from HCS (see previous section).

ZHCI reflect a timely and systematic assessment of prevailing sentiment among homeowners and renters concerning the metropolitan area housing market where they reside. These metrics cogently summarize—

- Assessments of current housing market conditions in the locales where respondents live.
- Short- and long-term expectations for future home value changes and home affordability.
- Aspirations for future homeownership (among renters) and for continued homeownership (among existing owners).

For each metropolitan area studied, a variety of indices are published from each wave of HCS—

- Housing confidence indicator indices (that is, The Housing Market Conditions Index, The Housing Expectations Index, and The Homeownership Aspirations Index for each of 20 major metropolitan areas).
- Headline housing confidence indices (that is, The Housing Confidence Index—a summary metric derived from the three housing confidence indicator indices—for each of 20 major metropolitan areas).
- Tenure-specific housing confidence indices (that is, separate housing confidence indices for homeowners and renters).
- U.S. composite housing confidence indices (weighted averages of the 20 metropolitan-level constituent housing confidence indices).

Index Methodology and Scale

ZHCI is computed using a weighted diffusion index methodology.[16] Diffusion indices measure the degree that data are diffused (dispersed) within a sample.[17]

ZHCI is based on a 0-to-100 scale. For any index reporting period—

- An index value exceeding 50 designates a *positive* indicator or degree of confidence.
- An index value equal to 50 indicates a *neutral* indicator or degree of confidence.
- An index value of less than 50 indicates a *negative* indicator or degree of confidence.

The **maximum index value of 100** would indicate maximum confidence (that is, respondents provided uniformly positive answers to relevant questions within HCS); the **minimum index value of 0** would indicate no confidence (that is, respondents provided uniformly negative answers to relevant questions within HCS).

Index Structure

Each ZHCI is a weighted composite measure of the three underlying indicator indices, each of which quantify a unique dimension of confidence in the housing market.

1.	The Housing Market Conditions Index (HMCI)	25 percent weight in the headline index
2.	The Housing Expectations Index (HEI)	50 percent weight in the headline index
3.	The Homeownership Aspirations Index (HAI)	25 percent weight in the headline index

The three indicator indices are calculated from responses to combinations of individual HCS questions formulated to address specific topics relevant to each indicator. For example, current buying conditions and current market direction are two of the topics that are pertinent to HMCI. Thus, response data associated with the following questions from the HCS instrument are used in the calculation of HMCI—

- Where you live, would you say now is a good time to buy a home? Or a bad time to buy a home?
- Right now, would you say the values of homes where you live are… Going up? Going down? Or staying the same?

A complete list of question topics that relate to each housing confidence indicator appears in exhibit 1, preceded by a bullet point.[18]

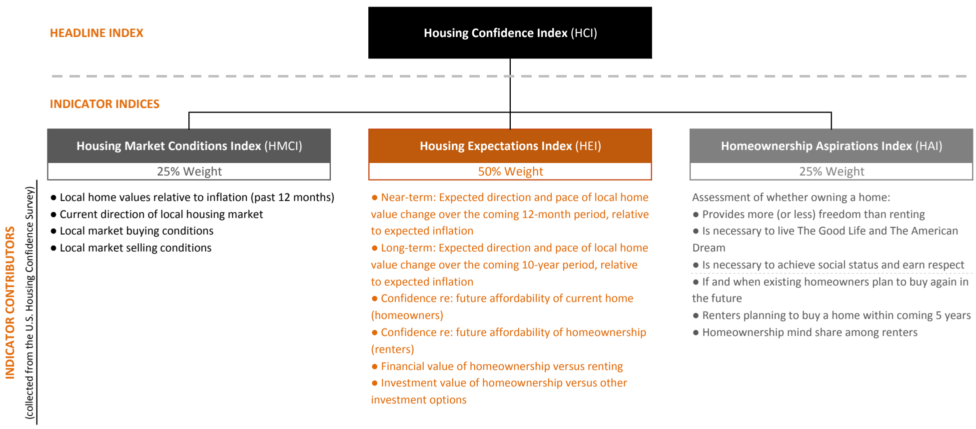
[16] A detailed index methodology document is available online. See https://www.pulsenomics.com/uploads/HCI_Methodology_v1.11.pdf.

[17] Other indices that use this approach include the Wells Fargo Homebuilder Confidence Index; The Institute of Supply Management's (ISM) Purchasing Managers' Index; The Conference Board's Consumer Confidence Index, Present Situations Index, and Expectations Index; and The University of Michigan's Index of Consumer Sentiment, Index of Current Economic Conditions and Index of Consumer Expectations.

[18] The HCS Instrument is available on the Pulsenomics website at https://www.pulsenomics.com/uploads/HCS_Instrument_v1.11.pdf. An illustration of how the levels of a housing confidence indicator are related to household responses to particular questions within the HCS instrument is provided in exhibits 4 and 5.

Exhibit 1

Index Structure, Indicators, and Contributors



In addition to the four housing confidence indices produced for the total of all surveyed households in each metropolitan market, the data products include tenure-specific subindices for each city, that is, headline and indicator indices for (1) the subset of respondents who are homeowners and (2) the subset of respondents who are renters. Thus, each edition of the ZHCI includes a total of 252 ZHCI values—

Number of markets:	21	(20 metropolitan areas + 1 U.S. composite)
ZHCI types	x 4	(1 headline ZHCI + 3 indicator indices: HMCI, HEI, HAI)
Tenure categories:	x 3	(Homeowners, renters, homeowners + renters)
	252	

Samples of Published Research Data

Publications include biannual reports and research briefs that complement and contextualize raw ZHCI values. The following summary analyses are excerpted from a recent research report.[19]

Indices

ZHCI has already shown that, overall, housing confidence has improved since early 2014 across the United States, and in every city surveyed homeowners have a greater level of confidence in their local housing market than renters do. As the data in exhibit 2 shows, however, significant differences and shifts in housing confidence are common across the metropolitan areas and tenure categories.

- Since January 2014, Chicago's housing confidence has improved the least among homeowners (+1.1), but, among renters, it has increased significantly more (+5.4); in St. Louis, renter confidence surged (+8.3) above near-negative territory but homeowner confidence rose more modestly (+4.0).

[19] Pulsenomics LLC (2015).

Exhibit 2

January 2015 Headline ZHCI by Tenure

Sorted by 1-Year Index Point Change

Homeowner Confidence Index	Level	6-month change	1-year change	Renter Confidence Index	Level	6-month change	1-year change
U.S. Composite	70.6	2.9	3.7	U.S. Composite	62.4	3.6	4.4
New York	71.0	4.1	6.2	St. Louis	59.0	2.7	8.3
Detroit	67.9	0.7	5.6	Philadelphia	59.1	5.1	8.1
Dallas	71.1	3.9	5.4	Los Angeles	64.3	4.8	7.8
Seattle	72.9	0.5	5.4	Minneapolis	62.0	0.4	7.1
Denver	71.3	2.2	5.0	Dallas	67.4	8.2	6.8
Boston	70.1	0.5	4.3	Denver	65.2	1.8	5.7
Tampa	68.2	2.4	4.3	Chicago	58.3	3.5	5.4
St. Louis	65.8	3.2	4.0	San Francisco	65.4	3.6	5.4
Atlanta	69.4	3.6	4.0	Miami	68.3	8.5	5.3
Washington, D.C.	72.8	2.7	4.0	Detroit	55.6	– 0.8	4.9
San Francisco	74.7	1.1	3.6	Atlanta	60.9	– 3.1	4.6
Philadelphia	67.6	5.3	2.7	Las Vegas	62.2	4.0	3.3
Los Angeles	74.1	0.7	2.6	Washington, D.C.	62.7	1.6	3.2
San Jose	75.7	3.1	2.5	San Jose	65.5	5.3	2.8
Las Vegas	69.4	2.0	2.5	San Diego	62.2	4.3	2.7
Minneapolis	67.9	1.4	2.4	Phoenix	63.9	4.3	2.7
Miami	72.0	1.6	2.4	Seattle	59.8	0.5	2.0
San Diego	75.1	3.8	2.3	New York	62.2	4.1	1.8
Phoenix	70.8	4.2	1.6	Boston	60.0	1.1	1.0
Chicago	68.1	5.4	1.1	Tampa	59.5	1.4	0.0

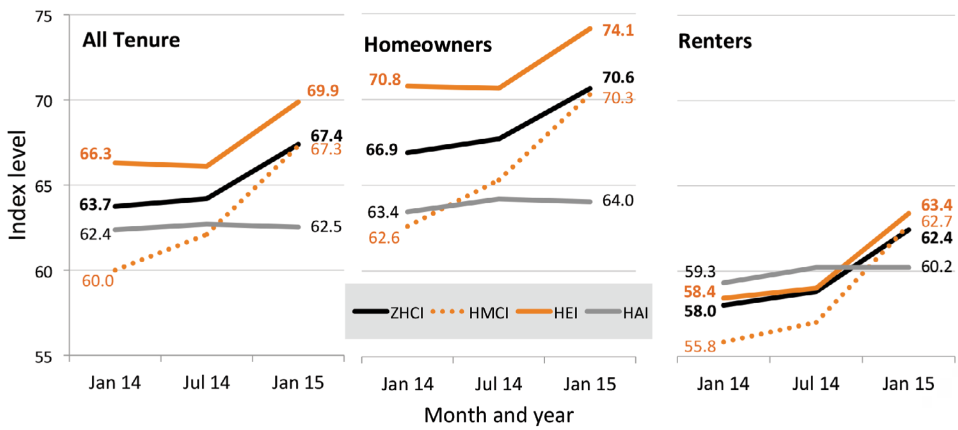
ZHCI = Zillow Housing Confidence Index.

- The U.S. Composite ZHCI for renters increased at a faster rate than that for homeowners during 2014, but, across all surveyed metropolitan areas, housing market sentiment among renters still trails that of homeowners by an average of 8.2 points. This "confidence gap" currently is widest in Seattle (13.1 points) and narrowest in Dallas (3.7 points).
- The January 2015 ZHCI data also revealed a persistent confidence gap between homeowners and renters (see exhibit 3). This gap was consistent across all geographies and index indicators, with only two exceptions: aspirations for homeownership among renters in Atlanta and St. Louis were higher than those of existing homeowners in both cities.[20]

[20] At the present time, HCS is conducted biannually, in January and July. At the time of this writing, the January 2015 edition of HCS was the most recent available.

Exhibit 3

Headline and Indicator Index History by Tenure (U.S. composites)



HAI = Homeownership Aspirations Index. HEI = Housing Expectations Index. HMCI = Housing Market Conditions Index. ZHCI = Zillow Housing Confidence Index.

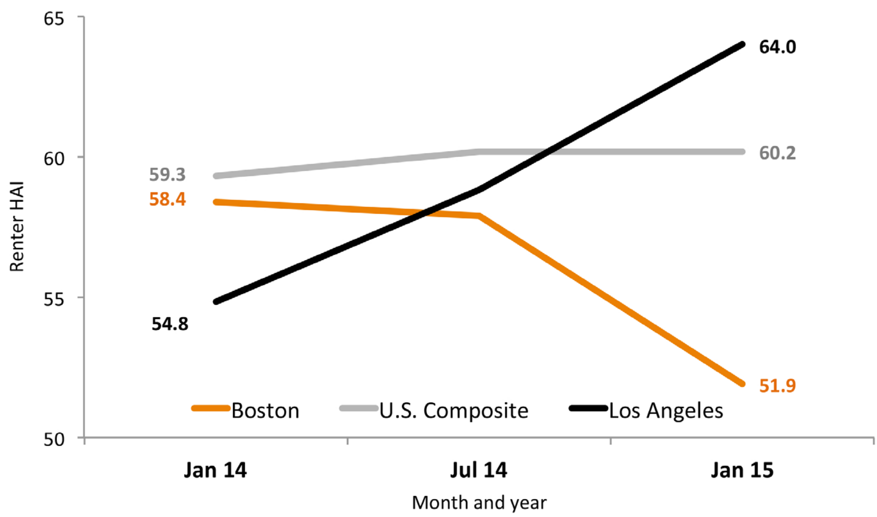
Homeownership Aspirations

The All-Tenure U.S. Composite Homeownership Aspirations Index is presently 62.5, down slightly (by 0.2 points) from its level in July 2014 and up only marginally (also by 0.2 points) year over year. This lackluster 2014 performance contrasts with that of the two other composite indicator indices, but analysis of metropolitan-level HAI data reveals that homeownership aspirations are neither uniform nor static.

- Residents of the Los Angeles metropolitan area presently have the strongest aspirations for homeownership (all-tenure HAI: 66.7), while Boston households have the lowest (56.6) among the 20 metropolitan areas surveyed.
- Between July 2014 and January 2015, the composite index of homeownership aspirations among renters did not change. For a number of individual metropolitan areas, however, the Renter HAI changed substantially: in San Jose and Miami, it surged by more than 7 points; in Detroit, it plummeted by more than 9 points.
- Year-over-year changes in homeownership aspirations were more dramatic among renters than homeowners. In January 2015, the Los Angeles Renter HAI strengthened by more than 9.0 points from its year-earlier level, while the Boston Renter HAI weakened by 6.5 points during the same period. Exhibit 4 illustrates the divergent paths of renter homeownership aspirations since January 2014.
- The year-over-year divergence between these two metropolitan areas for this key indicator of confidence can be traced directly to the decidedly more positive feedback collected from Los Angeles renter households over time. The HCS response data described in exhibit 5 explain the changes in the Boston and Los Angeles Renter HAIs.

Exhibit 4

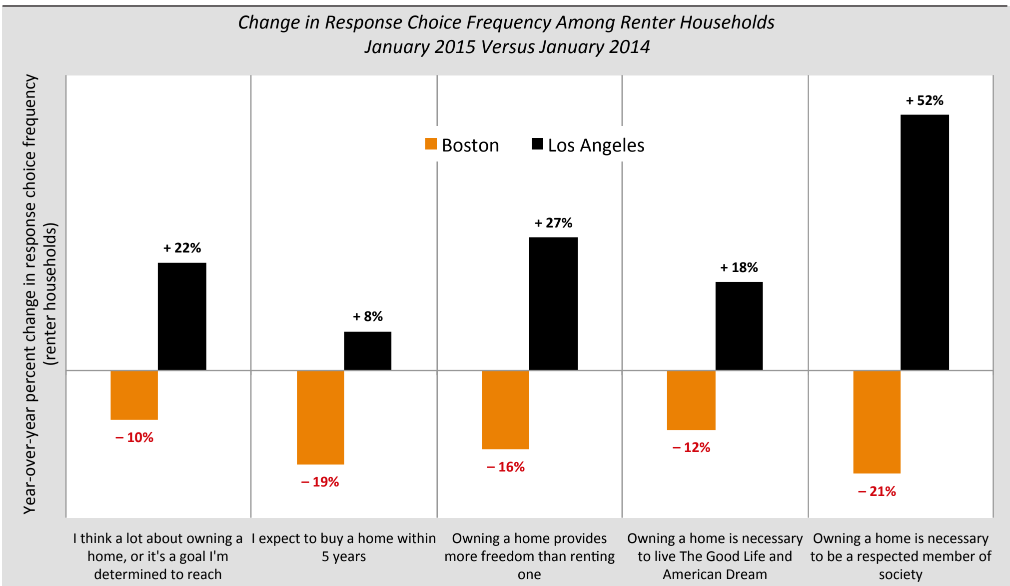
Renters' Homeownership Aspirations: What a Difference a Year Makes



HAI = Homeownership Aspirations Index.
Source: Pulsenomics LLC

Exhibit 5

Boston and Los Angeles: The Tale of Two Cities



Source: Pulsenomics LLC U.S. Housing Confidence Survey

HCS Response Data

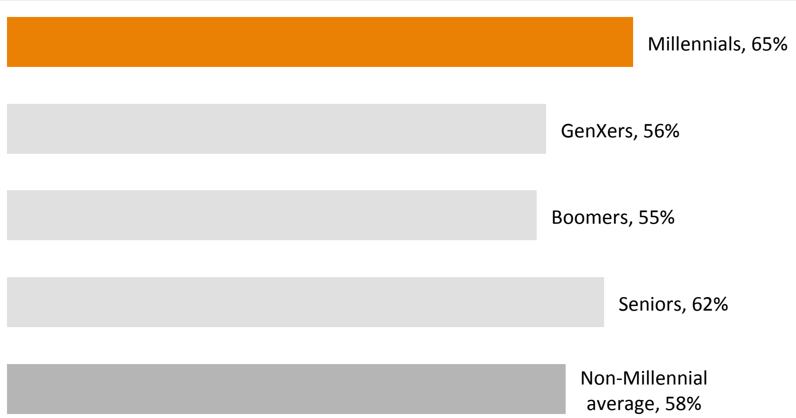
In recent years, researchers have speculated the impact of the past decade's housing bust and how it shaped the attitudes of today's prospective first-time home buyers and their view of homeownership for years to come. Some observers have suggested that although parent homeowners suffered the financial complications of the foreclosure crisis, their millennial children shared in the emotional toll (or witnessed it among friends). Amidst a significant post-bust decline in the U.S. homeownership rate, predictions of a secular decline in appetite for homeownership among young adults have followed.

The November 2014 American Real Estate Society Newsletter cited a variety of data from the then latest edition of HCS to reveal that the appetite for homeownership among the millennial generation remains strong (Pulsenomics LLC, 2014).[21] A few insights on this topic follow and were gleaned from HCS research and published by ARES.

- Nearly two-thirds (65 percent) of all millennials interviewed believe that owning a home is necessary to live the good life and the American Dream (exhibit 6).
- Nearly three-fourths (74 percent) of millennials believe that owning a home provides a person more freedom than renting a home (exhibit 7).
- Notwithstanding their uncertain income growth prospects, increasing student debt loads, and consensus expectations that mortgage rates are likely to increase in the near future, 82 percent of millennial renters are confident, or somewhat confident, that they will be able to afford to own a home some day (exhibit 8).

Exhibit 6

Adults Who Say That Owning a Home Is Necessary To Live The Good Life and The American Dream

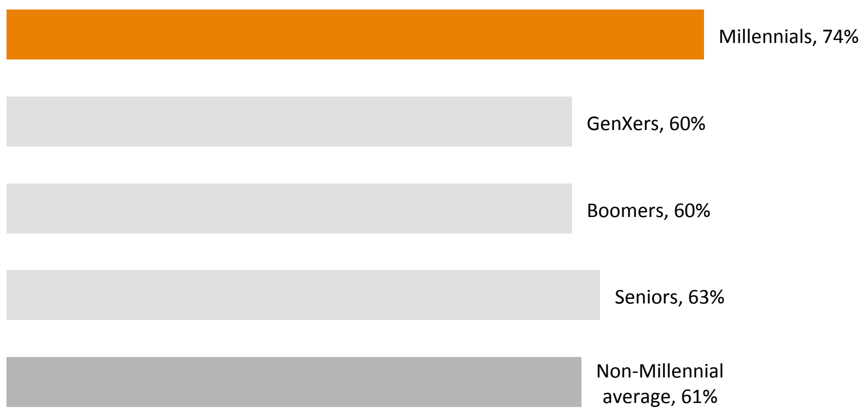


Notes: Sample size is 500 adults in each of 20 metropolitan statistical areas. The margin of sampling error is +/- 1.2 percent.
Source: Pulsenomics U.S. Housing Confidence Survey, July 2014

[21] These and other data were initially reported in a September 2014 research brief by Pulsenomics LLC. This brief and other Pulsenomics housing research briefs are available upon request: e-mail info@pulsenomics.com.

Exhibit 7

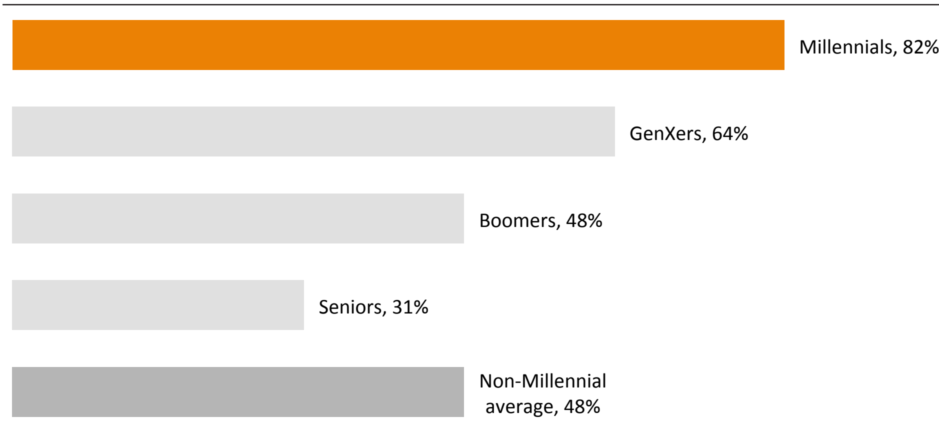
Adults Who Say That Owning a Home Provides a Person More Freedom Than Renting a Home



Notes: Sample size is 500 adults in each of 20 metropolitan statistical areas. The margin of sampling error is +/- 1.2 percent.
Source: Pulsenomics U.S. Housing Confidence Survey, July 2014

Exhibit 8

Renters Who Say That They Are Confident or Somewhat Confident They Will Be Able To Afford a Home Some Day



Notes: Sample size is 3,764 renter households. The margin of sampling error is +/- 2.0 percent.
Source: Pulsenomics U.S. Housing Confidence Survey, July 2014

Home Value Expectations

The HCS questionnaire includes several questions regarding expectations for short- and long-term changes in home values within the local market where each respondent resides.

Among the generation cohorts, millennials and seniors tend to be the most and least optimistic, respectively, about future home value appreciation (in the short term as well as over the long run).

In January, in every city except Los Angeles and St. Louis, households headed by millennials were more optimistic about 2015 home value appreciation than the overall metropolitan area population.

Of course, the relative strength of expectations for short- and long-term future home value changes for any population segment can vary considerably by metropolitan area. The data presented in exhibit 9 illustrate this variation. For example, millennials and seniors in St. Louis expect that home values will increase an average of about 1.0 percent in 2015, while members of these age groups who reside in San Jose expect home value appreciation of 6.4 and 3.8 percent, respectively.

Exhibit 9

Rankings of Home Value Change Expectations for 2015

All Respondents			Millennials			Seniors		
Rank	Metropolitan Area	Mean (%)	Rank	Metropolitan Area	Mean (%)	Rank	Metropolitan Area	Mean (%)
1	San Jose	4.60	1	San Jose	6.41	1	San Jose	3.75
2	San Francisco	4.06	2	Miami	5.35	2	Las Vegas	3.14
3	Miami	3.93	3	Tampa	5.22	3	San Francisco	3.06
4	Tampa	3.27	4	San Francisco	4.62	4	Seattle	2.69
5	Las Vegas	3.20	5	Washington, D.C.	4.09	5	San Diego	2.57
6	San Diego	3.18	6	Detroit	4.03	6	Tampa	2.50
7	Denver	3.06	7	New York	3.75	7	Los Angeles	2.42
8	Seattle	2.98	8	Las Vegas	3.68	8	Miami	2.14
9	Detroit	2.97	9	Denver	3.57	9	Denver	2.04
10	Washington, D.C.	2.84	10	Phoenix	3.50	10	Detroit	2.01
11	New York	2.81	11	San Diego	3.33	11	Washington, D.C.	1.99
12	Los Angeles	2.76	12	Chicago	3.23	12	Phoenix	1.99
13	Phoenix	2.63	13	Boston	3.19	13	Minneapolis	1.74
14	Dallas	2.59	14	Seattle	3.17	14	Atlanta	1.71
15	Boston	2.55	15	Minneapolis	2.92	15	Boston	1.64
16	Atlanta	2.51	16	Dallas	2.77	16	New York	1.59
17	Minneapolis	2.35	17	Atlanta	2.64	17	Dallas	1.56
18	Chicago	2.29	18	Philadelphia	2.32	18	Chicago	1.56
19	Philadelphia	1.90	19	Los Angeles	2.23	19	Philadelphia	1.20
20	St Louis	1.47	20	St Louis	1.21	20	St Louis	1.06
20-metropolitan area average		2.90	20-metropolitan area average		3.56	20-metropolitan area average		2.12

Source: Pulsenomics U.S. Housing Confidence Survey, January 2015

Accessing ZHCI Values and HCS Response Data

Index values, and cross-tab analyses pertaining to individual survey questions, are available in familiar electronic formats.

ZHCI Data

The comprehensive ZHCI dataset is freely available via the Zillow Research and Pulsenomics websites. This collection of 252 individual time series is available in Microsoft Excel format, as are a variety of preformatted index lists and rankings (exhibit 10 is one example). Related research briefs also are available.

Exhibit 10

Sample ZHCI Ranking (All-Tenure, ranked by 1-year change in index points)

Zillow Housing Confidence Index™
January 2015

Powered by pulsenomics® Pulsenomics LLC

INDEX LEVELS: 1 Year Change Sort

ALL-TENURE

Headline Index Levels — Housing Confidence

Metro Area	HCI	6 mo Change	1 yr Change
Dallas	69.7	5.5	5.3
Detroit	64.4	0.4	5.0
St. Louis	63.8	3.0	4.9
Los Angeles	69.2	2.7	4.8
Denver	69.1	2.0	4.7
San Francisco	70.5	2.3	4.1
Philadelphia	64.8	5.1	4.1
New York	66.7	4.1	3.8
Seattle	67.9	0.4	3.7
Atlanta	66.5	1.3	3.6
Minneapolis	66.2	1.1	3.5
Washington DC	69.2	2.3	3.4
Miami	70.6	4.1	3.2
Boston	66.2	0.7	2.8
Tampa	65.3	2.0	2.7
Las Vegas	66.3	2.8	2.2
Chicago	64.8	4.8	2.2
San Jose	71.5	4.1	2.0
San Diego	69.2	4.1	2.0
Phoenix	68.4	4.2	1.7
US Composite	67.4	3.2	3.6

Indicator Index Levels — Housing Market Conditions

Metro Area	HMCI	6 mo Change	1 yr Change
Dallas	73.5	9.6	12.1
Detroit	66.1	5.1	11.7
St. Louis	60.2	5.0	10.6
Atlanta	64.3	2.7	10.1
Chicago	62.1	8.1	9.4
Philadelphia	61.5	7.4	9.3
Miami	72.4	7.6	9.3
Denver	73.7	2.1	8.3
Boston	69.3	2.8	8.2
Las Vegas	68.7	6.5	8.1
Seattle	71.1	3.1	7.5
Tampa	64.7	4.5	6.8
Minneapolis	68.7	1.3	6.5
New York	65.1	6.7	6.4
Washington DC	69.4	4.2	6.2
Los Angeles	67.6	3.1	3.9
San Diego	69.3	4.1	3.8
San Francisco	72.8	1.3	3.1
San Jose	72.9	3.7	2.3
Phoenix	67.6	4.6	0.6
US Composite	67.3	5.2	7.3

Indicator Index Levels — Housing Expectations

Metro Area	HEI	6 mo Change	1 yr Change
Denver	70.7	2.1	5.2
Detroit	66.0	0.5	5.2
Los Angeles	71.3	2.8	4.9
New York	70.1	6.5	4.8
San Francisco	73.2	2.8	4.4
St. Louis	67.0	3.3	4.4
Dallas	70.0	5.3	4.1
Miami	72.3	3.3	3.8
Boston	69.5	2.1	3.7
Minneapolis	68.4	1.2	3.6
Seattle	70.4	0.0	3.6
San Diego	73.1	6.2	3.3
Philadelphia	67.8	5.9	3.2
Washington DC	71.8	2.2	3.0
Atlanta	69.1	1.7	2.4
Phoenix	71.1	6.0	2.3
San Jose	73.5	4.2	1.9
Tampa	68.1	1.4	1.7
Chicago	67.4	5.4	0.8
Las Vegas	66.5	1.4	0.1
US Composite	69.9	3.8	3.6

Indicator Index Levels — Homeownership Aspirations

Metro Area	HAI	6 mo Change	1 yr Change
Los Angeles	66.7	2.3	5.4
San Francisco	62.6	2.2	4.5
San Jose	65.9	4.3	2.2
Phoenix	63.8	0.2	1.7
Washington DC	63.9	0.5	1.4
Dallas	65.3	2.1	1.0
Tampa	60.3	0.8	0.9
Las Vegas	63.5	2.1	0.6
Philadelphia	62.2	1.4	0.6
Minneapolis	59.1	0.6	0.4
St. Louis	61.1	0.6	0.3
Denver	61.1	1.6	0.2
Seattle	59.7	-1.3	0.0
Atlanta	63.4	-1.1	-0.4
New York	61.5	-3.3	-1.0
Detroit	59.4	-4.5	-2.0
Chicago	62.3	0.3	-2.1
San Diego	61.2	-0.4	-2.5
Miami	65.5	2.2	-4.2
Boston	56.6	-4.1	-4.4
US Composite	62.5	-0.2	0.2

HAI = Homeownership Aspirations Index. HCI = Housing Confidence Index. HEI = Housing Expectations Index. HMCI = Housing Market Conditions Index. ZHCI = Zillow Housing Confidence Index.
Source: Reproduced from http://www.pulsenomics.com

HCS Response Data

An extensive volume of HCS data is available. These data are compiled in the form of cross-tab analysis reports for each metropolitan area (or any combination of metropolitan areas) surveyed in a given field period. For any question(s) within the HCS instrument, these reports provide an easy-to-read summary analysis of weighted respondent-level data. The reports are available in Microsoft Excel format.

Basic Cross-Tab Analysis Reports

The basic cross-tab analysis report format summarizes respondent-level survey data for any HCS question(s) according to key demographic variables: tenure, gender, age, income, race/ethnicity, and phone type. Exhibit 11 is an excerpt from a basic cross-tab report produced by Pulsenomics; it reflects response data aggregated from the 20 individual metropolitan areas for five HCS questions.

Exhibit 11

Basic HCS Cross-Tab Analysis Report (sample)

U.S. Housing Confidence Survey™ **20 Metros** July 2014 Field Period: 7/6/2014 - 7/13/2014

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www.pulsenomics.com

Question 1	Do you own your home? Rent? Live with someone else? Or have some other living arrangement?																		
10,000 Adults		Tenure		Gender		Age				Income				Race/Ethnicity				Phone Type	
Margin of Sampling Error: ± 1.2%	All	Own	Rent	Male	Female	18-34	35-49	50-64	65+	< $25K	$25K -	$50K - $	> $90K	White	Black	Hispanic	Asian /	Cell	Landline
Own	62.4%	100.0%	0.0%	64.4%	60.5%	48.2%	65.0%	68.7%	75.8%	32.2%	50.2%	70.0%	86.2%	69.4%	43.6%	56.3%	55.5%	58.6%	64.9%
Rent	33.5%	0.0%	89.1%	31.7%	35.3%	42.8%	33.2%	29.5%	22.4%	61.1%	44.4%	26.3%	12.2%	26.7%	51.4%	40.1%	39.6%	34.7%	32.8%
Live With Someone Else	3.1%	0.0%	8.2%	2.9%	3.1%	7.6%	1.1%	1.2%	0.7%	5.2%	4.1%	2.5%	1.3%	2.8%	4.0%	3.1%	3.3%	5.4%	1.5%
Other	1.0%	0.0%	2.7%	1.0%	1.0%	1.4%	0.8%	0.7%	0.9%	1.6%	1.2%	1.1%	0.2%	1.2%	0.9%	0.5%	1.0%	1.4%	0.8%
Total (# counts)	10,000	6,236	3,764	4,846	5,154	3,119	2,760	2,546	1,573	1,747	2,691	2,816	2,579	5,922	1,233	1,756	1,091	3,967	6,033
Composition of Adults	100.0%	62.3%	37.7%	48.6%	51.5%	31.3%	27.7%	25.4%	15.7%	17.8%	27.4%	28.5%	26.3%	59.2%	12.3%	17.6%	11.0%	39.8%	60.3%

Question 2	Is this the first home you have owned?																		
6,225 Homeowners		Tenure		Gender		Age				Income				Race/Ethnicity				Phone Type	
Margin of Sampling Error: ± 1.5%	All	Own	Rent	Male	Female	18-34	35-49	50-64	65+	< $25K	$25K -	$50K - $	> $90K	White	Black	Hispanic	Asian /	Cell	Landline
Yes	49.3%	49.3%	N/A	50.8%	47.7%	78.8%	54.0%	36.2%	24.2%	53.1%	57.3%	56.1%	38.8%	42.6%	57.4%	67.3%	57.6%	69.0%	37.5%
No	50.5%	50.5%	N/A	49.0%	52.1%	20.6%	45.9%	63.9%	75.6%	45.5%	42.1%	44.0%	61.3%	57.1%	42.4%	32.9%	42.4%	30.8%	62.2%
Not Sure	0.2%	0.2%	N/A	0.2%	0.2%	0.4%	0.1%	0.0%	0.4%	0.5%	0.4%	0.1%	0.0%	0.3%	0.2%	0.0%	0.2%	0.3%	0.2%
Total (# counts)	6,236	6,236	N/A	3,121	3,116	1,502	1,794	1,749	1,193	563	1,350	1,972	2,224	4,107	538	988	606	2,323	3,914
Composition of Homeowners	100.0%	100.0%	0.0%	50.2%	49.9%	24.2%	28.8%	28.0%	19.0%	9.1%	22.1%	32.2%	36.7%	64.9%	8.4%	16.5%	10.1%	37.4%	62.7%

Question 7	Think about how much you owe on your home, from your mortgage and any home equity loans. Would you say that your home is worth more than you owe? Less than you owe? Or about what you owe?																		
4,320 Homeowners With Mortgages		Tenure		Gender		Age				Income				Race/Ethnicity				Phone Type	
Margin of Sampling Error: ± 1.9%	All	Own	Rent	Male	Female	18-34	35-49	50-64	65+	< $25K	$25K -	$50K - $	> $90K	White	Black	Hispanic	Asian /	Cell	Landline
More Than You Owe	64.4%	64.4%	N/A	65.2%	63.6%	56.8%	62.6%	72.4%	67.4%	46.9%	55.4%	61.9%	73.3%	68.0%	50.0%	58.0%	63.7%	61.5%	66.5%
Less Than You Owe	19.8%	19.8%	N/A	19.9%	19.9%	19.6%	20.1%	18.6%	22.1%	30.9%	23.8%	21.2%	15.1%	17.4%	30.3%	22.8%	21.9%	19.4%	20.1%
About What You Owe	13.9%	13.9%	N/A	13.5%	14.1%	20.2%	15.3%	8.3%	8.2%	16.8%	17.4%	15.4%	10.6%	12.8%	17.0%	16.4%	13.5%	16.9%	11.7%
Not Sure	1.9%	1.9%	N/A	1.4%	2.5%	3.6%	1.6%	0.9%	1.2%	6.3%	3.5%	1.2%	1.1%	1.7%	3.0%	2.7%	0.9%	2.2%	1.7%
Total (# counts)	4,237	4,237	N/A	2,061	2,176	1,084	1,489	1,165	497	256	822	1,394	1,711	2,751	370	676	443	1,744	2,491
Composition of Homeowners With Mortgages	100.0%	100.0%	0.0%	49.0%	51.1%	25.5%	35.0%	27.6%	11.8%	6.2%	19.9%	33.2%	40.7%	63.9%	8.8%	16.8%	10.9%	41.1%	58.9%

Question 11	How confident are you that you will be able to afford to own a home someday? Confident? Somewhat confident? Somewhat unconfident? Or not confident?																		
3,775 Renters		Tenure		Gender		Age				Income				Race/Ethnicity				Phone Type	
Margin of Sampling Error: ± 2.0%	All	Own	Rent	Male	Female	18-34	35-49	50-64	65+	< $25K	$25K -	$50K - $	> $90K	White	Black	Hispanic	Asian /	Cell	Landline
Confident	35.4%	N/A	35.4%	37.3%	33.9%	44.5%	38.1%	22.2%	18.4%	23.9%	37.4%	41.7%	52.4%	31.0%	47.8%	33.8%	37.5%	46.3%	27.0%
Somewhat Confident	29.6%	N/A	29.6%	29.2%	30.1%	37.7%	26.1%	25.9%	12.6%	26.7%	31.5%	33.1%	25.4%	29.0%	28.1%	34.2%	27.4%	36.1%	24.6%
Somewhat Unconfident	14.7%	N/A	14.7%	13.4%	16.0%	10.7%	17.0%	18.5%	18.1%	17.8%	14.4%	12.8%	9.9%	16.1%	12.1%	17.3%	9.9%	8.6%	19.6%
Not Confident	17.5%	N/A	17.5%	16.3%	18.5%	5.7%	15.5%	29.4%	46.7%	28.2%	14.1%	9.9%	10.1%	21.4%	10.8%	11.8%	21.2%	7.0%	25.4%
Not Sure	2.6%	N/A	2.6%	3.6%	1.7%	1.2%	3.1%	4.4%	3.7%	3.1%	2.8%	1.9%	2.0%	2.5%	1.4%	3.0%	3.5%	1.9%	3.1%
Total (# counts)	3,764	N/A	3,764	1,727	2,032	1,619	965	798	381	1,183	1,338	841	355	1,815	695	769	485	1,642	2,120
Composition of Renters	100.0%	0.0%	100.0%	46.0%	54.0%	43.4%	25.5%	21.2%	9.9%	32.1%	36.3%	22.3%	9.2%	49.3%	19.6%	19.1%	11.9%	44.3%	55.7%

Question 24	What would you say provides a person more freedom ... (Question options and answer choices rotated) owning a home? Or renting?																		
10,000 Adults		Tenure		Gender		Age				Income				Race/Ethnicity				Phone Type	
Margin of Sampling Error: ± 1.2%	All	Own	Rent	Male	Female	18-34	35-49	50-64	65+	< $25K	$25K -	$50K - $	> $90K	White	Black	Hispanic	Asian /	Cell	Landline
Owning	64.8%	68.2%	59.2%	66.2%	63.4%	73.8%	60.4%	59.4%	63.4%	61.9%	69.7%	66.5%	60.1%	61.9%	68.0%	71.2%	66.2%	72.2%	59.9%
Renting	29.4%	26.6%	33.8%	27.9%	30.7%	21.8%	32.7%	33.7%	31.3%	30.3%	24.9%	27.8%	34.3%	31.8%	26.6%	24.5%	26.8%	22.5%	33.9%
Not Sure	5.9%	5.2%	7.0%	5.9%	5.8%	4.5%	7.0%	6.7%	5.0%	7.8%	5.3%	5.6%	5.6%	6.2%	5.2%	4.6%	6.7%	5.3%	6.3%
Total (# counts)	10,000	6,236	3,764	4,846	5,154	3,119	2,760	2,546	1,573	1,747	2,691	2,816	2,579	5,922	1,233	1,756	1,091	3,967	6,033
Composition of Adults	100.0%	62.3%	37.7%	48.6%	51.5%	31.3%	27.7%	25.4%	15.7%	17.8%	27.4%	28.5%	26.3%	59.2%	12.3%	17.6%	11.0%	39.8%	60.3%

Source: Reproduced from http://www.pulsenomics.com

Custom Cross-Tab Analysis Reports

Custom cross-tab analyses are also available. For every metropolitan area surveyed in any edition of the survey, for each individual HCS question, Pulsenomics can provide response data that is cross-tabbed to responses to any number of other HCS survey questions. An example appears as exhibit 12. It was generated from responses to the same five HCS questions featured within the preceding report excerpt, but in this case, it reflects data collected from only Los Angeles respondents. Also, instead of summarizing response data for each HCS question according to the same, standard set of demographic variables, the report "crosses" response data collected in connection with HCS question numbers 1, 2, 7, and 11 with responses to question number 24.

Exhibit 12

Custom HCS Cross-Tab Analysis Report (sample)

U.S. Housing Confidence Survey™ Los Angeles July 2014 Field Period: 7/6/2014 - 7/13/2014

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Pulsenomics LLC
www.pulsenomics.com

Question 24		What would you say provides a person more freedom ... (Question options and answer choices rotated) owning a home? Or renting?															
		Question 1				Question 2			Question 7				Question 11				
500 Adults		Own or Rent				First Home?			Home value more or less than mortgage(s)?				Confident you will be able to afford to own a home someday?				
Margin of Sampling Error: ± 4.3%	**All**	Own	Rent	Live Wit	Other	Yes	No	Not Sure	More	Less	About Same	Not Sure	Confiden	Somewh Con	SomewhUnc	Not Conf	Not Sure
Owning	64%	71%	56%	95%	73%	75%	65%	100%	64%	70%	90%	42%	61%	66%	58%	37%	29%
Renting	29%	23%	36%	5%	27%	19%	28%	0%	30%	29%	10%	0%	33%	30%	26%	51%	56%
Not Sure	7%	6%	9%	0%	0%	5%	7%	0%	6%	1%	0%	58%	6%	4%	16%	12%	15%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Composition of Adults	100%	50%	48%	1%	1%	63%	37%	0%	64%	18%	17%	1%	35%	26%	19%	17%	2%

Source: Reproduced from http://www.pulsenomics.com

Home Value Change Assessment and Expectations Reports

The HCS instrument includes several questions concerning home value changes in the respondents' respective local markets. These pertain to households' assessments of recent home value changes (that is, perceptions of actual change for the preceding 12-month period) and expectations for short- and long-term future changes (that is, expected changes for the coming 12-month and 10-year periods, respectively).[22] Because assessments of and expectations for home value changes vary considerably according to geography and population cohort, Pulsenomics compiles related summary statistics to facilitate analysis and study. Exhibit 13 illustrates sample report content and format.

[22] Regarding long-term home value expectations, respondents are asked to indicate the annual percentage change in value expected (for homes in the market where the respondent resides) in an average year for the coming 10-year period.

Exhibit 13

Home Value Change Assessment and Expectations Report (sample)

U.S. Housing Confidence Survey™
January 2015
Las Vegas

Powered by pulsenomics
Pulsenomics LLC

Home Value Change Assessments & Expectations (Mean of Responses, %*)

Selected Population Cohorts, Grouped

	Mean of Responses (%)	Assessment Past 12 mos	Expectations Next 12 mos	Expectations Avg Ann Next 10 Yrs
	All Households	4.92	3.20	3.07
TENURE	All Homeowners	4.65	4.05	3.50
TENURE	All Renters	4.18	0.72	2.77
BUYER PROFILE	Recent Buyers	5.10	7.50	4.05
BUYER PROFILE	Non-Recent Buyers	4.31	2.89	3.43
BUYER PROFILE	First-Time Buyers	6.23	5.05	4.55
BUYER PROFILE	Not First-Time Buyers	3.72	3.24	2.93
HOME EQUITY	Underwater Owners	4.44	3.70	4.73
HOME EQUITY	Above-water Owners	5.92	4.67	3.12
AGE	College Age	1.38	5.60	0.50
AGE	Early Career	7.31	3.24	4.83
AGE	All Millennials	6.35	3.68	3.65
AGE	Generation X	4.06	1.25	2.90
AGE	Younger Boomers	2.38	2.73	2.33
AGE	Older Boomers	4.24	3.05	2.60
AGE	Seniors	3.89	3.14	2.56

Rankings of Selected Population Cohorts

Assessment — Past 12 mos

Rank	Population Cohort	Mean (%)
	All Households	**4.92**
1	Early Career	7.31
2	All Millennials	6.35
3	First-Time Buyers	6.23
4	Above-water Owners	5.92
5	Recent Buyers	5.10
6	Home Owners	4.65
7	Underwater Owners	4.44
8	Non-Recent Buyers	4.31
9	Older Boomers	4.24
10	Renters	4.18
11	Generation X	4.06
12	Seniors	3.89
13	Not First-Time Buyers	3.72
14	Younger Boomers	2.38
15	College Age	1.38

Expectations — Next 12 mos

Rank	Population Cohort	Mean (%)
	All Households	**3.20**
1	Recent Buyers	7.50
2	College Age	5.60
3	First-Time Buyers	5.05
4	Above-water Owners	4.67
5	Home Owners	4.05
6	Underwater Owners	3.70
7	All Millennials	3.68
8	Early Career	3.24
9	Not First-Time Buyers	3.24
10	Seniors	3.14
11	Older Boomers	3.05
12	Non-Recent Buyers	2.89
13	Younger Boomers	2.73
14	Generation X	1.25
15	Renters	0.72

Expectations — Avg Ann Next 10 Yrs

Rank	Population Cohort	Mean (%)
	All Households	**3.07**
1	Early Career	4.83
2	Underwater Owners	4.73
3	First-Time Buyers	4.55
4	Recent Buyers	4.05
5	All Millennials	3.65
6	Home Owners	3.50
7	Non-Recent Buyers	3.43
8	Above-water Owners	3.12
9	Not First-Time Buyers	2.93
10	Generation X	2.90
11	Renters	2.77
12	Older Boomers	2.60
13	Seniors	2.56
14	Younger Boomers	2.33
15	College Age	0.50

*10% trimmed mean

The U.S. Housing Confidence Survey is sponsored by Zillow, Inc.

www.pulsenomics.com

Source: Reproduced from http://www.pulsenomics.com

HCS Response Data Access

For commercial uses, these data are furnished by Pulsenomics to subscribers for modest license fees, which help to defray research and production costs. For certain noncommercial uses (for example, institutional research and public policy development), Pulsenomics can license these data for no charge.

Conclusion

The increasingly speculative and volatile nature of our real estate markets, the powerful wealth effects of actual and expected home values, and the profound impact that changing consumer attitudes and impending demographic shifts will have on economic performance underscore the imperative to explore new types of housing market data that can help address blind spots exposed in the aftermath of the historic bust. Timely, authoritative measurements of housing confidence by geographic market, tenure, and key demographic variables can enhance our ability to anticipate and better manage real estate risk in the 21st century. For researchers, policymakers, and market stakeholders, HCS and ZHCI are unique and valuable complements to legacy indicators of economic confidence and housing market health.

Acknowledgments

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Author

Terry Loebs is the Founder and Managing Member of Pulsenomics LLC.

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Industrial Revolution

Every home makes compromises among different and often competing goals: comfort, convenience, durability, energy consumption, maintenance, construction costs, appearance, strength, community acceptance, and resale value. Often consumers and developers making the tradeoffs among these goals do so with incomplete information, increasing the risks and slowing the adoption of innovative products and processes. This slow diffusion negatively affects productivity, quality, performance, and value. This department of Cityscape *presents, in graphic form, a few promising technological improvements to the U.S. housing stock. If you have an idea for a future department feature, please send your diagram or photograph, along with a few well-chosen words, to elizabeth.a.cocke@hud.gov.*

Rainscreens: An Established Technique for Advanced Wall Construction

Brian Wolfgang
Ehsan Kamel
Pennsylvania Housing Research Center

Abstract

Exterior wall claddings have been found to be durable over many years when installed on poorly insulated, inefficient structures. As emphasis has been put on increased insulation in the building envelope—the lack of heat transmission across wall assemblies has reduced the ability of these systems to dry after they become wet. That is when rainscreen systems become a solution to increase the durability of light-frame wall systems. The increased ability to drain bulk water and to dry by convection allows for wall systems to have a sustainable interaction with the environment.

The Status Quo

Since the publication of the 2006 International Residential Code (IRC), residential structures have been constructed with a code-mandated water-resistive barrier (IRC R703.2) as one layer within exterior wall assemblies. This water-resistive barrier is the primary layer that provides a dedicated drainage plane for shedding bulk water resulting from rain and snow events. Numerous manufacturers produce wraps and papers that comply with water-resistive barrier code requirements, making this provision a commonly understood and implemented practice.

Although a properly installed water-resistive barrier can be an effective means of preventing bulk moisture intrusion in building cavities, it is commonly accepted in the building community that all wall assemblies will become wet at some point during their service life (Matthews, 2010). Some limitations of conventional wall assemblies employing water-resistive barriers include the following—

- Simply installing a code-compliant water-resistive barrier does not necessarily address the need for a wall assembly to effectively dry should it become wet.
- Flashing at wall openings (doors, windows, etc.) and utility penetrations is commonly installed incorrectly, increasing the likelihood of moisture intrusion or entrapment.
- Increased levels of insulation in walls reduce the ability of walls to dry through diffusion when water vapor is present and when it is necessary to dry moist building materials.

As energy codes continue to require increased insulation levels in wall cavities, the need for additional drying capability becomes crucial to providing a building that can sustain the effects of wetting and drying over time.

Rainscreen Cladding Assemblies

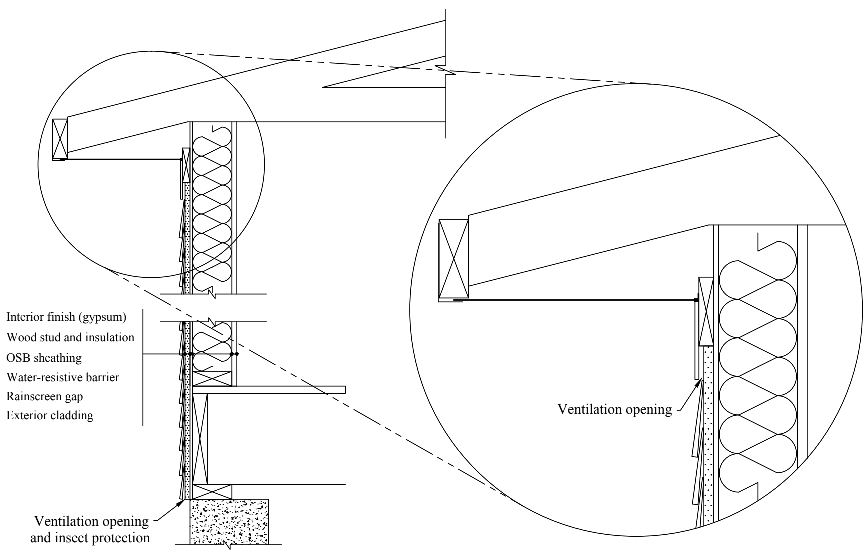
Rainscreen cladding assemblies modify conventional light-frame wall assemblies by including an additional layer or air space behind the exterior cladding. This layer's primary purpose is to enhance drainage and to provide additional drying capability through ventilation. Builders can achieve this enhancement by manipulating commonly available building materials or by implementing proprietary rainscreen components that are commercially available through building component suppliers.

The main concept behind a rainscreen assembly (or system) is the designed inclusion of a gap behind exterior cladding, whether that cladding is a brick veneer, a fiber cement siding, or any number of other common products. This gap provides enhanced drainage and drying characteristics to the overall wall system. Research and observation have shown that an effective rainscreen must employ a gap with a minimum depth of 1/4 inch (Holladay, 2013). It is common, however, for rainscreen gaps to have dimensions of 1/4, 3/8, 1/2, or 3/4 inch. The depth of the gap will often depend on the material used to construct the gap. For example, plywood furring strips typically come in thicknesses of 1/2 or 3/4 inch, while some proprietary products are manufactured to depths of 1/4 inch. Some literature recommends other gap thicknesses such as 1 inch, which has proven to be suitable for providing a rainscreen for masonry claddings (Mas et al., 2011).

A true rainscreen system also employs ventilation openings at the top and bottom terminations of the wall system. These ventilation openings, shown in exhibit 1, enhance the drying process by allowing convective currents to travel through the rainscreen gap. Although these ventilation

Exhibit 1

Rainscreen Wall Section and Ventilation Detail



openings provide an optimal rainscreen assembly, it is important to note that a rainscreen assembly without ventilation openings still provides enhanced drainage and drying capability (Holladay, 2013).

Although other studies have attempted to develop an analytical model for different phenomena involved in the drying process (Baskaran, 1994), most rainscreen design recommendations are based on field observation. Ongoing research, however, continues to attempt to bridge the gap between theory and practice (Kumar, 2000).

Typical Rainscreen Cladding Assembly

Conventional light-frame wall assemblies employed in residential construction will vary slightly, depending on geographic location and climate. It is quite common, however, for these assemblies to include 2x4 or 2x6 wall studs at a spacing of 16 or 24 inches on center and oriented strand board (OSB) or plywood exterior sheathing of a thickness near 1/2 inch, on top of which a code-compliant, water-resistive barrier has been installed as a house wrap or building paper.

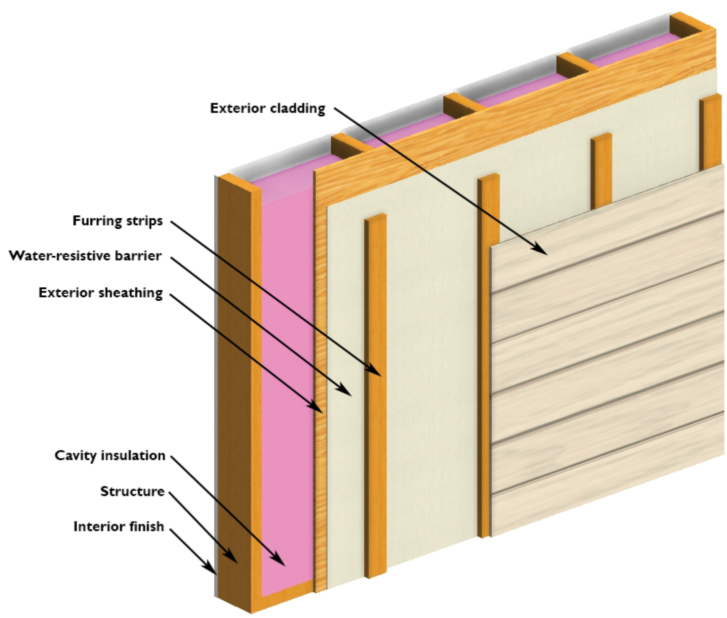
Wall assemblies that are without a rainscreen gap will typically consist of an exterior cladding product installed on top of these components. When employing a rainscreen system, however, an additional component, product, or series of products will be installed before the installation of the cladding. These rainscreen components can be categorized into two main installation strategies—

1. Furring strips.
2. Three-dimensional mesh or mat products.

Furring strips have been used on buildings for years in a variety of different configurations for a variety of purposes. When furring strips are used as part of a rainscreen system, they commonly are made of wood-based materials or plastic products that are fastened into the main structure of the building as shown in exhibit 2. Furring strips are most commonly installed vertically, although

Exhibit 2

Three-Dimensional Schematic of Rainscreen Wall Assembly



horizontal installation may be employed for those types of cladding that run vertically. For horizontal vented battens, however, the air-change rate is approximately one-half that of the vertical battens (Falk and Sandin, 2013).

Three-dimensional mesh or mat products—proprietary systems installed beneath exterior claddings—provide a rainscreen gap in the wall assembly. These products are often manufactured in rolls and are installed in rows on the exterior of the building. Some mesh or mat systems are specifically designed for specific cladding types, including hardcoat stucco and manufactured stone veneer.

Benefits of Rainscreen Cladding Assemblies

Including a rainscreen gap in the design of a light-frame wall assembly has numerous benefits—

- Rainscreen systems provide an additional factor of safety against moisture damage for high-R walls (Karagiozis and Kuenzel, 2009).
- The rainscreen gap provides a capillary break between the cladding and the water-resistive barrier.
- Rainscreen systems can be used on top of conventional water-resistive barriers and wall insulation products and do not commonly have issues with material compatibility.
- A rainscreen gap can be provided with readily available building materials, which can limit costs and reduce implementation barriers.

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Authors

Brian Wolfgang is the Housing Systems Specialist with the Pennsylvania Housing Research Center at The Pennsylvania State University.

Ehsan Kamel is a Ph.D. candidate in civil engineering at The Pennsylvania State University.

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Impact

A regulatory impact analysis must accompany every economically significant federal rule or regulation. The Office of Policy Development and Research performs this analysis for all U.S. Department of Housing and Urban Development rules. An impact analysis is a forecast of the annual benefits and costs accruing to all parties, including the taxpayers, from a given regulation. Modeling these benefits and costs involves use of past research findings, application of economic principles, empirical investigation, and professional judgment.

Proposed Rule on Section 3

Yves Sopngwi Djoko
Alastair McFarlane
U.S. Department of Housing and Urban Development

The views expressed in this article are those of the authors and do not represent the official positions or policies of the Office of Policy Development and Research, the U.S. Department of Housing and Urban Development, or the U.S. government.

Abstract

The mission of Section 3 of the Housing and Urban Development Act of 1968 is to use existing federal funding streams for low-income housing and community development to maximize economic opportunities to low-income individuals. This article assesses the benefits and costs of a proposed rule to update the Act's Section 3 regulations.

The proposed regulation would result in a more rigorous targeting of economic opportunity emanating from U.S. Department of Housing and Urban Development funds to those individuals and firms eligible under Section 3. A reasonable estimate of the incremental impact of the proposed rule would be an additional 1,400 jobs targeted to Section 3 concerns annually. The regulatory changes would not create additional *jobs; the regulatory action is expected to affect the allocation of resources.*

A secondary impact is possible, however, when assisted *tenant incomes rise as a result of employment from Section 3. Federal rental subsidy for those tenants would decline. It is estimated that the subsidy impact may be as large as $28.5 million annually. The total reporting and recordkeeping burden is estimated at $8.7 million, including $6.5 million the first year the rule would go into effect and $2.2 million annually.*

Background and Context

Section 3 of the Housing and Urban Development Act of 1968[1] gives the U.S. Department of Housing and Urban Development (HUD) a legislative directive for providing preference to low- and very low-income residents of the local community (regardless of race or gender) and to the businesses that substantially employ these people for new employment, training, and contracting opportunities resulting from HUD-funded projects. As a condition of receiving HUD financial assistance, recipients certify that they will comply with the requirements of Section 3 annually. HUD accordingly has the legal responsibility to monitor recipients for compliance and can impose penalties on those that fail to meet these obligations.

In practice, Section 3 requires certain projects funded by HUD to meet, "to the greatest extent feasible," specific goals for hiring and training local low-income people and awarding contracts to businesses that substantially employ those people to work on these projects. Priority consideration is to be given to "Section 3 residents" and "Section 3 Business Concerns" when making hiring and procurement decisions. A Section 3 resident is either a resident of public housing or a low-income individual residing in the metropolitan area or nonmetropolitan county where the Section 3 covered assistance is spent. A Section 3 Business Concern is a business that satisfies either ownership or employment criteria regarding Section 3 residents or that can provide evidence of a firm commitment to award 25 percent of subcontracts to other Section 3 Business Concerns.

Public housing agencies (PHAs) that administer Public and Indian Housing operating or capital fund program assistance are the primary subjects of Section 3. Recipients of HUD housing and community development grants are also subject to Section 3 but only if the grantees' annual expenditure on construction-related activity exceeds a specific threshold.[2]

Impact Analysis

Section 3 requirements and reporting are not a new phenomenon. Section 3 requirements have been in effect since the enactment of the Section 3 of the Housing and Urban Development Act of 1968. The proposed rule would clarify and strengthen existing regulations. The key provisions of the rule that may have an effect are clearer compliance requirements related to new hires under Section 3, refinement of program thresholds, and requirements that increase reporting costs.

Costs Impact of the Proposed Rule

Program participants are already required to report on Section 3 activities. It is therefore anticipated that the implementation of this proposed rule would have only a marginal negative effect on the administration of the program and on program participants.

[1] 12 *U.S.C.* 1701u and 24 *CFR* Part 135.

[2] Approximately 7,500 people (that is, PHAs, local and state governments, multifamily property owners, and nonprofit organizations) are direct recipients of HUD funding. Approximately 86,000 subrecipients and contractors that receive HUD-funded contracts would also be required to comply with the proposed rule.

Administrative Burden

The proposed rule would impose additional recordkeeping, verification, procurement, monitoring, and complaint processing requirements on covered recipients. Additional administrative work would be one of the outcomes of an invigorated effort to provide economic opportunities to the greatest extent feasible.

HUD estimates that compliance with the requirements of this proposed rule would necessitate approximately 70,000 hours of additional effort annually, plus 202,400 hours in the first year (various adjustment costs).[3] Assuming an average hourly wage of $32,[4] the total reporting and recordkeeping burden would be $8.7 million, including $6.5 million the first year the rule would go into effect and $2.2 million in recurring costs.[5] These expenses represent additional administrative costs that would need to be financed either by a reduction of services or by additional appropriations.

Reducing Flexibility of Contractors

The proposed rule would require covered recipients to monitor contractors more closely for compliance and impose sanctions as appropriate. Some contractors may have to alter their business practices to meet these more precise Section 3 regulations. These are likely to be short-run adjustment costs and possibly may be offset by the greater transparency provided by the proposed rule.

Benefits Impact of the Proposed Rule

If effectively structured and implemented, Section 3 can reduce poverty, overcome spatial barriers to employment, and reduce federal costs. Section 3 could leverage a substantial portion of more than $20 billion in annual federal housing investments into economic opportunities for low-income people.

Greater Employment: Increased Income for Eligible Workers

HUD assumes that, on net, participation will be greater in Section 3 as a result of the proposed rule.[6] The effect of the rule would be to increase the income for eligible participants in the labor force. For example, suppose that the proposed rule has the desired impact of increasing employment among eligible workers. Using HUD's office of Fair Housing and Economic Opportunity estimates, the Section 3 program reported 28,407 new jobs and $885 million in contracts in 2012[7] provided to program participants who otherwise would not have had these economic opportunities. If we assume that, as a result of the rule, the number of jobs held by Section 3 residents

[3] Computations were made by HUD's Office of Fair Housing and Economic Opportunity, which is responsible for the administration and compliance with the Section 3 requirements.

[4] Average total compensation of all workers (BLS, 2014).

[5] A "loaded wage," often used in benefit-cost analysis to reflect the opportunity cost of time, is often greater than the wage rate to include benefits, taxes, and overhead. The loaded wage rate can be as high as twice the wage received by the employee, in which case the periodic cost of the rule would be $4.4 million.

[6] To facilitate the success of the regulatory reform, the proposed rule would require recipients to coordinate with U.S. Department of Labor workforce investment boards, and other local resources, to target Section 3 residents for training programs as appropriate.

[7] HUD (2012).

would increase 5 percent above the current number reported, an additional 1,420 jobs would be available for Section 3 residents annually. Assuming 2,087 work hours per year[8] at $32 an hour,[9] an additional $95 million in income would be generated locally for Section 3 participants (1,420 x 2,087 x $32). In addition in the proposed rule, economic activity and local tax revenue may be transferred to Section 3 areas.

Reduced Federal Subsidies: Transfer From Tenants to Federal Government

Section 3 might indirectly reduce the federal costs of providing affordable housing. Public housing residents generally pay 30 percent of their income in rent, with federal subsidies paying the rest. When residents' incomes rise, the rent payments they make rise as well, so the federal housing subsidy declines. The same pattern holds for Section 8-assisted households. Section 3 can reduce the cost of federal housing assistance by increasing the incomes of assisted households. Each $1,000 in extra income the households earn will reduce federal costs by roughly $300.

Applying the 30-percent figure to the increased earnings estimate of $95.0 million yields a reduction of approximately $28.5 million. This figure is almost certainly an overestimate of the reduction in housing subsidies because not all Section 3 residents receive housing assistance; a Section 3 resident only has to be a local resident that is eligible to receive housing assistance. Furthermore, the earned income disregard provision may negate some of the transfer to the Treasury.

Raising Thresholds: Excluding Some Entities From Section 3 Responsibilities

Although HUD expects that, on net, the implementation of Section 3 will be more rigorous and lead to greater employment of Section 3 residents, one aspect of the proposed rule may not lead to greater participation—increasing the threshold for which Section 3 requirements apply to grantees. The proposed rule would raise the threshold for non-PHA recipients from the receipt of $200,000 of covered HUD assistance to the expenditure of $400,000 of such funds. This change acknowledges that it is the expenditure of covered funds that produces economic opportunities—not the receipt of it. Recipients of housing and community development assistance that are above the current threshold but under the proposed threshold will benefit from reduced administrative burden. Section 3 residents who live in areas that are covered by the current rule, however, but who would not be covered under the thresholds in the proposed rule, would not receive a job preference under the proposed rule.

In addition to setting the threshold level, the proposed rule would clarify how the threshold level should be measured—as the aggregate expenditures of covered HUD funds. Depending on current practices of grantees, this clarification may increase Section 3 activity by some community development grantees that previously applied a "per project" threshold in error. The joint effect of formalizing the definition of a threshold and raising its level is not immediately evident.

[8] http://www.opm.gov/policy-data-oversight/pay-leave/pay-administration/fact-sheets/computing-hourly-rates-of-pay-using-the-2087-hour-divisor/.

[9] BLS (2013).

Reducing Poverty

Section 3's most obvious potential benefit is to increase the incomes of low-income people by making more jobs available to them. Public housing residents, who receive first preference for Section 3 opportunities on HUD-funded public housing projects, experience high levels of unemployment. HUD reports that 42 percent of families living in public housing that are headed by an individual who was not elderly or disabled had no earnings in 2008. Section 3 can also enhance the long-term employment prospects of other low- and very low-income people within the metropolitan area or nonmetropolitan county. Possessing basic job skills has a positive impact on an individual's short- and long-term earnings. Many low-income people unfortunately lack access to the job training programs that teach those skills. Section 3 is intended to provide that access, because grantees would be required to make training or apprenticeships available on covered projects and would be required to coordinate with local U.S. Department of Labor training providers, as appropriate.

Conclusion

The mission of Section 3 is to use existing federal funding streams for housing and community development to enhance economic opportunities to low-income individuals. By directing economic opportunities to Section 3 residents and businesses in the service area, the expenditure of HUD funds would have secondary effects, such as reducing poverty, lowering federal housing subsidies, and overcoming spatial barriers in labor markets. Federal expenditures on housing and urban development are made via annual appropriation and, as such, the only uncertainty is with the size of the funding and its associated impact on Section 3. The increased oversight and compliance requirements that engender these beneficial effects may come at a cost to grantees in the form of an increased administrative burden. Such a cost would have to be met either by a reduction in services or by additional appropriations.

Notwithstanding the gains accruing to the Section 3 program participants, particularly in hiring and contracting, it can be argued that the success of the program could be at the expense of those non-Section 3 participants who would have received jobs or contracts without the change in regulation. Whether this transfer is significant can be measured only retrospectively. If the change has its intended impact, then the economic transfer would be significant. Many good reasons for redistributing economic opportunity may exist; however, any gain in economic well-being for the community would carry with it the costs of displacing some of the current recipients of Section 3 funds.

In summary, the proposed regulatory changes better realize the goals of Section 3, which originate from the Housing and Urban Development Act of 1968.

Authors

Yves Sopngwi Djoko is a senior economist in the Economic Development and Public Finance Division at the U.S. Department of Housing and Urban Development, Office of Economic Affairs.

Alastair McFarlane is Director of the Economic Development and Public Finance Division at the U.S. Department of Housing and Urban Development, Office of Economic Affairs.

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Evaluation Tradecraft

Evaluation Tradecraft presents short articles about the art of evaluation in housing and urban research. Through this department of Cityscape, *the Office of Policy Development and Research presents developments in the art of evaluation that might not be described in detail in published evaluations. Researchers often describe what they did and what their results were, but they might not give readers a step-by-step guide for implementing their methods. This department pulls back the curtain and shows readers exactly how program evaluation is done. If you have an idea for an article of about 3,000 words on a particular evaluation method or an interesting development in the art of evaluation, please send a one-paragraph abstract to* marina.l.myhre@hud.gov.

Improving Program Evaluation: Using Direct Time Measurement for Estimating Administrative Costs

Kevin Hathaway
RSG

Jennifer Turnham
Abt Associates Inc.

Abstract

Benefit-cost analysis is a common component of evaluation studies. Although techniques to establish the benefits continually improve, approaches to estimate costs based on how staff distribute their time remain antiquated, with imprecise timesheet instruments and precarious assumptions. For government agencies and researchers interested in accurately evaluating these costs, and with labor remaining the largest share of administrative spending for many programs, better techniques are needed for recording and measuring staff time. We present the direct time measurement approach from the Housing Choice Voucher Program Administrative Fee Study, describing the techniques and technologies used and discussing the logistical work required to ensure a successful time measurement effort.

Introduction

The Housing Choice Voucher Program Administrative Fee Study (HCV Study) was a multiyear economic evaluation that the U.S. Department of Housing and Urban Development (HUD), Office of Policy Development and Research, commissioned to ascertain how much it costs to administer a high-performing and efficient HCV program and to recommend a revised formula for allocating administrative fees to public housing agencies (PHAs) based on objective cost drivers. Because objective fee allocation would require a determination of administrative costs measured through staff time allocation while adjusting for agency and region-specific variables, a detailed analysis of HCV frontline activities was one of the study's main priorities. During the study's design period, HCV staff time at four PHAs on all program activities was evaluated using three test approaches: (1) traditional paper timesheets, (2) direct human observation, and (3) smartphone-based Random Moment Sampling (RMS). The research team determined that RMS was the most accurate for the level of detail required by the study and that it minimized staff burden and provided unparalleled research scalability compared with the other approaches. This article describes the RMS approach in detail and discusses the technology and staff resources needed to implement a successful multi-site time measurement effort using RMS.

Methodology

The HCV Study required a complex combination of research design, software development, and data collection logistics that evolved over several years. While describing the full extent of research design decisions that were needed or the technical details of building the underlying software frameworks are beyond the scope of this article, we briefly outline the key aspects that should be of highest use to researchers conducting similar evaluation studies.

Time Measurement Instrument Design and Approach

RMS, also known as activity sampling or work sampling, is a method for estimating the time spent on work activities based on randomly sampled data points collected during working hours over a period of time (Bolstein, 1986). Research goals, required time estimate precision, and the presumed a priori variance in work behavior dictate data-collection length and work-activity detail. Our approach issued random RMS notifications to participants via smartphone. Each notification contained an activity survey that required the participant to assign what they were predominantly doing for the previous 5 minutes to a work area and specific activity within that work area. For our purposes, we did not permit multitasking responses, so all answers required the participant to select one and only one activity. Participants submitted their responses to the notifications through a series of touchscreens on the smartphone.

During the early stages of the study, our team completed the following steps to design the time measurement instrument.

1. Reviewed differences in how identical work functions are identified by staff at the studied agencies and create a common language for all participants to reference.

2. Created a mutually exclusive and exhaustive list of HCV frontline activities and also categories for frontline work on other programs operated by the PHA and for overhead work, so all staff time could be assigned to an activity and to only one activity.
3. Provided accessible definitions in the smartphone app and supporting materials to help staff accurately assign their time.

The time measurement instrument included more than 50 frontline HCV activities, organized in a tiered structure so that participants started by identifying the program they were working on, then a main work area within the program, then an activity within that work area, and then (for some activities) a subactivity. Two reasons justify this level of detail. The first is that the study needed a certain level of detail to answer its research questions. For example, the study needed to quantify the time spent on eight special voucher programs (serving specific populations) and a related program (the Family Self-Sufficiency program) in addition to the regular HCV program. Within these programs, the study also needed to measure the relative time spent on six core program functions and specific activities within those functions. The other reason for the level of detail, however, is that we learned from testing the approach that the participating staff needed to see the specifics of their work reflected in the time measurement instrument to feel invested in the data-collection effort. Staff members who had highly specialized roles found that repeatedly entering their time under one or two categories was demoralizing. Some staff also felt that grouping their work under broader activity headings without permitting them to provide more detail implicitly devalued their work, which was not the study's intention.

Sampling

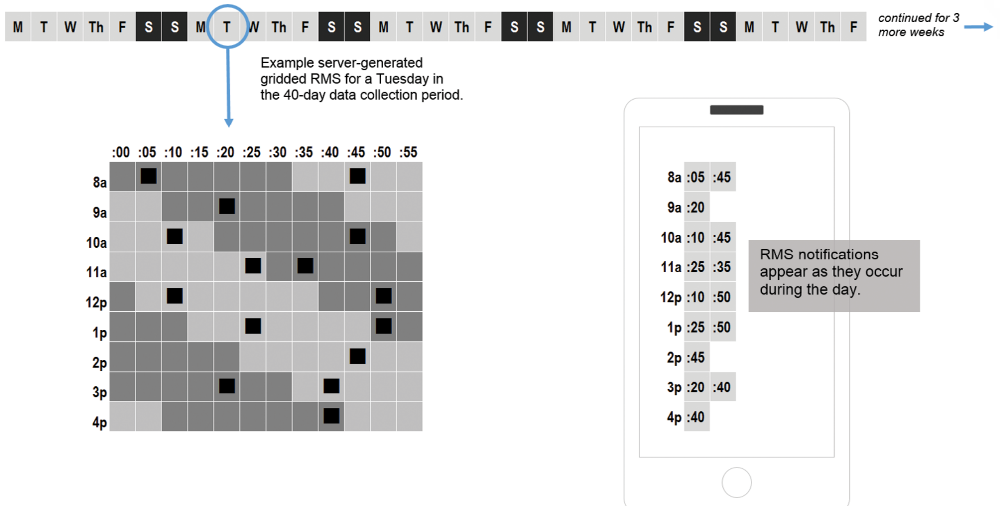
The RMS time measurement effort included 60 PHAs that all had a track record of several years of high performance as defined by HUD's performance measurement system for the HCV program, and the study team confirmed each PHA was high performing and efficient using onsite reviews. The 60 agencies participated in the RMS time measurement component in 12 waves covering nearly 18 months. Each agency participated for 8 continuous weeks. In selecting each PHA's 8-week timeframe, the study team balanced the need to conduct time measurement throughout the year with roughly equal cohorts of PHAs against individual PHA preferences for when time measurement would probably occur. We did not permit PHAs to select their 8-week period but tried to avoid times when key staff would be unable to participate because of long-term schedule leaves, such as maternity leaves or leaves of absence.

Every PHA staff member who worked on frontline HCV activities was included in the time measurement component at all but the largest PHA sites. At the largest PHAs, the study team selected a sample of staff to participate, with input from the PHA, based on the number of staff in each job category or work role. All staff who played a unique role in the program were selected for participation, but the team selected a random sample of staff for job categories—such as housing inspector—in which multiple staff were serving the same role.

At all sites, we conducted time measurement on participants for 40 working days during an 8-week period responding to 12 to 15 RMS notifications per day and tailored to each individual staff's work schedule (exhibit 1). Any nonscheduled night and weekend work was captured with

Exhibit 1

The 40-Day RMS Period With 1 Day of RMS Notifications for a User



RMS = Random Moment Sampling.

an additional sampling feature on the device. These irregular notifications persisted on the phone for only a few hours and then disappeared if left unanswered. In this way, the sample frame was partially dynamic, allowing for a person to work a long week and for the study team to capture that effort. This sampling plan was designed to detect small agency-level effects using power analysis with the arcsine transformation for differences in proportions (Cohen, 1988).

Technology

The team authored a native Android™ application, written in Java, that implemented a full RMS time measurement approach. Working with Verizon Wireless, more than 250 LG Vortex smartphones (devices) with network data plans were acquired for the data collection. Devices were provided to each participant in the first set of PHAs and then recycled to participants at subsequent PHAs to measure more than 900 participating PHA employees during the study. On average, each device was used by four different participants over the course of the data collection, for 32 weeks of daily use.

An intelligent web service (written in the Ruby on Rails framework) and secure database (MySQL) ran on a Linux web server. The web service was designed so the team could add participating PHAs and define their data-collection dates, add the roster of staff members and their unique work schedules, and add specific settings that affected how the RMS was conducted for each participant. The web service then autogenerated a full sampling scheme for a participant with pregenerated times, which would be synced to the participant's issued device for their 8-week period. The user was blind to all pending RMS notifications, which showed as an unanswered work survey displayed on a simple daily calendar in the app. Notifications used the device's native ringers or vibrate setting, which could be easily changed by the participant. Answers were streamed instantly to the web server, assuming a data connection existed. Automatic database backups and the ability to launch a replicate web server and database were implemented in the event of a server problem.

Our team designed the Android app and web service to work together but to continue functioning correctly if data connections were lost, particularly for those PHAs located in rural communities. For example, if 3G service was lost as a housing inspector drove to a rural location, the app would continue to issue notifications at the predetermined times. Without the data connection, the answers were cached locally on the device until the data connection was restored. The web server, at the same time, reported the device had gone “dark” because the app and server were designed to communicate every 5 minutes. No action was taken by the study team unless a device remained dark for more than 1 day.

RMS Training

Although smartphone data collection was relatively easy for PHA staff, it still required training and ongoing support. Each of the 60 PHAs participating was assigned to two research team members serving as site liaisons. We also asked each PHA to designate a staff member to serve as the PHA liaison to troubleshoot any problems and encourage staff to answer notifications in a timely manner.

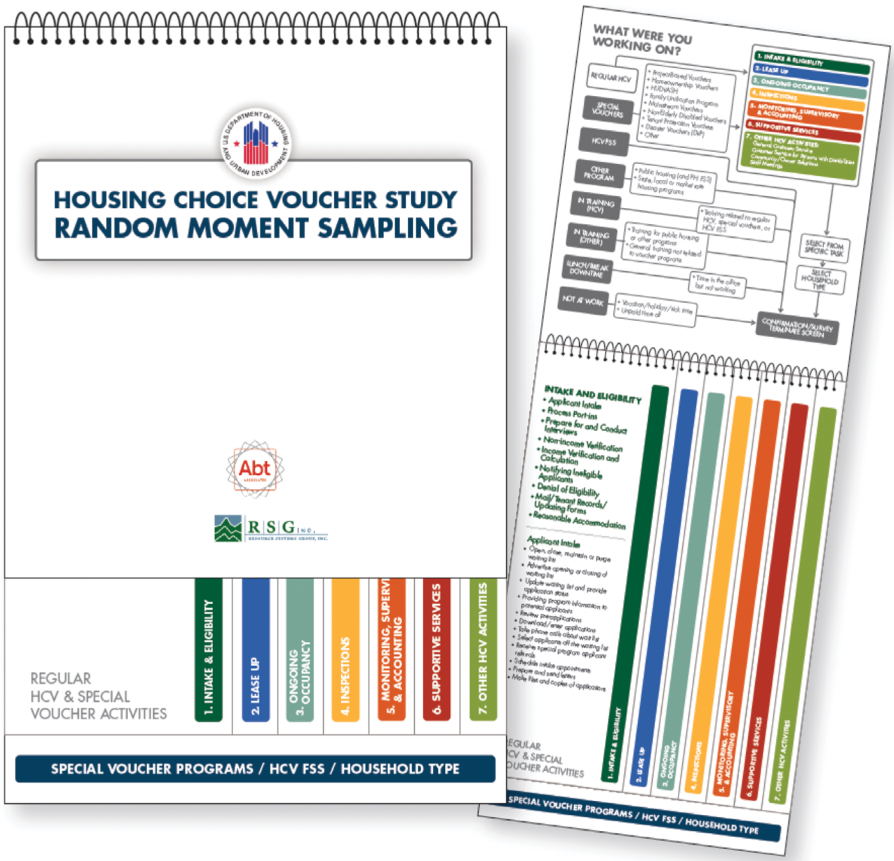
Research site liaisons conducted an in-person, 2-day training event at each PHA. On the first day of the training, the research team met with PHA staff to introduce study goals and to demonstrate how to use the smartphones and how to classify their work using the HCV activity and subactivity categories. At smaller agencies, all staff were trained together. At larger agencies, the training was grouped by staff function (for example, inspectors were often trained together). The staff began responding to notifications immediately after the training, although we did not use the first day’s data in the analysis.

On the second day of training, the site liaisons met individually with each participating staff member (or in groups of two to three at the larger sites) to address questions and determine what specific categories and subcategories staff would probably be using for their own work functions. These sessions were highly productive because they came after staff had had an opportunity to practice with the device the previous day. These individual meetings also gave the site liaisons an opportunity to take detailed notes on individual staff members’ HCV activities so they could monitor the accuracy of their responses during the 2-month period.

To reinforce the training, the team provided all staff with a 6- by 8-inch spiral-bound training booklet, with easy-to-read tabs, describing the response categories that staff would see on their smartphones. Under each response category, the training booklet included a listing of all the possible activities and tasks that could fall under that category, so that staff could readily find the right category for the particular task they were working on (exhibit 2). The team updated the training booklet at several points during the study with new tasks under the response categories based on feedback from participating staff. As mentioned previously, it was very important for accuracy and staff member motivation that staff be able to see the specific work they do reflected in the training materials. The Android app contained similar helper buttons but had less detail than the booklet.

Exhibit 2

Random Moment Sampling Training Booklet



Monitoring Data Collection

The team established several methods for monitoring RMS participation, including ongoing communication with the PHA liaison, a messaging system through the smartphone for participants' questions, and monitoring of the PHA staff responses to RMS notifications through a shared website dashboard. One benefit of using the smartphone technology was that all notifications were continuously uploaded to a central server where the study team could view them virtually in real time. For each PHA, the website included information on staff participating in RMS, their work schedules, how many RMS notifications were outstanding, their actual answers, how long after each notification the user answered the RMS survey, all text messages sent to and from each staff member, and the current battery power of each RMS device. The study team dedicated one staff member to monitor the website dashboard and incoming messages during working hours. The study team developed a series of decision rules regarding when to contact PHA staff if it looked as if they had stopped responding to their notifications. The team also made extensive use of the app's custom messaging function, which worked like a text message, to send reminders to participating staff.

Estimating Time and Costs

This systematic surveying of activities for the sampled agencies returns several needed pieces of information. The first is a count of notifications assigned to mutually exclusive HCV functions. The second is the total estimated time staff worked during regularly scheduled hours and any time they worked outside those regularly scheduled hours. Because RMS sampling was designed to grid the notifications within the 36-minute blocks, or approximately 1.66 notifications per hour, the resulting activity counts were converted into total minutes of activity in the data-collection period. This sampling was completed using time expansion with appropriate sampling weights, because the RMS notifications were drawn with known probability. Simultaneous confidence intervals were computed using several methods, depending on the aggregation level, including Wilson Scores and intervals based on bootstrapping, but a number of alternative methods can perform well with multinomial data (Efron, 1987; Glaz, 1999). Calculating activity-specific costs for the full-time HCV employee is a simple extension of the computations using the resulting activity-level time distributions. We calculated overall HCV program costs and costs for each activity within the HCV program by multiplying the time spent that each individual staff member spent on the program and component activities by that staff member's salary and benefits. This calculation produced a direct labor cost for each PHA, to which we added nonlabor costs and a share of overhead costs. (We collected information on nonlabor and overhead costs directly from each PHA through a combination of interviews and reviews of financial documents.)

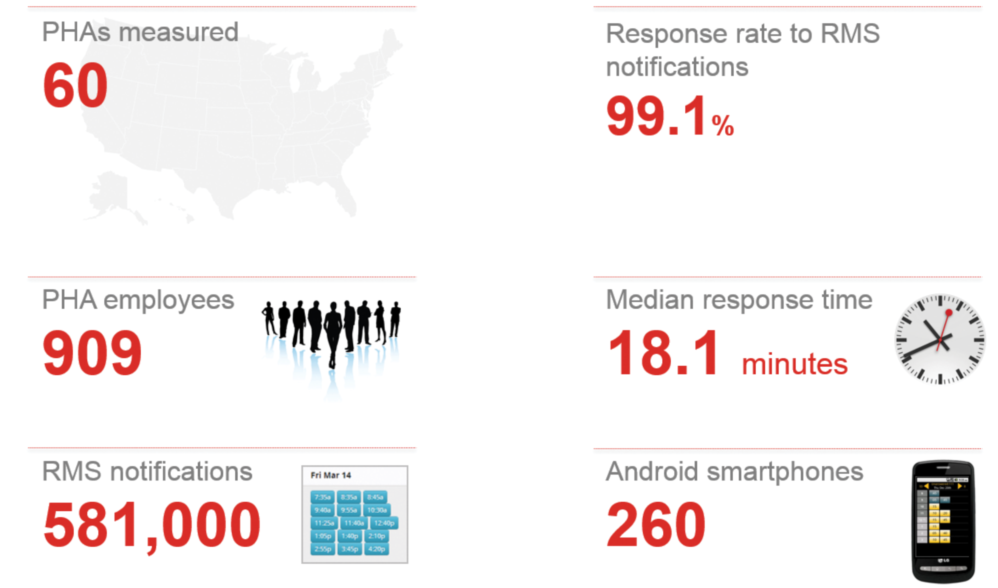
Discussion

Because data quality was a high-priority goal, the data-collection instrument, training materials, and monitoring work reflected that goal. For example, to simplify the monitoring tasks, the web service generated summary reports and automatically e-mailed the study team every 2 hours. The report included a list of PHA employees with outstanding notifications, a list of users who were waiting too long to answer the RMS notification (that is, response time), notification of an employee who was assigned the same activity more than 10 times in a row, notification of the server losing data communication with any smartphones, and notification of battery levels if they dropped below 5-percent power for any device. These reports enabled the liaisons to investigate further, using a series of interactive data visualizations (programmed using the D3 library for web development) on the shared website, using customized tools, or communicating with the participant when necessary. Team members communicated to any or all participants directly using an online text messaging service. Text messaging with participants proved invaluable to keeping participants answering all RMS surveys, doing so quickly, and assigning their work accurately. In the end, approximately 581,000 RMS notifications were answered, resulting in a 99-percent response rate across all staff (exhibit 3).

Response time in smartphone-based RMS is the amount of time after an RMS notification is issued that the respondent actually answers the notification. Minimizing response time addresses some of the recall bias issues plaguing so much self-reported data. Although keeping response times low was a primary goal, we expected response times to vary by work activity. For safety reasons, we instructed inspectors never to answer an RMS notification while driving. Similar guidance

Exhibit 3

Overview of RMS Data Collection



PHA = public housing agency. RMS = Random Moment Sampling.

was provided for participants while in staff meetings and meetings with voucher holders, because answering a smartphone survey could be considered rude in both contexts. As a result of this guidance, RMS answer categories for "driving to/from inspections" and "staff meetings," showed longer average response times than other core activities. Across all HCV activities, the median response time was 18 minutes. This median value indicates that of the 581,000 RMS notifications, approximately 290,000 were answered faster than 18 minutes from when they were issued.

To ensure the RMS responses were accurate and correctly assigned, the study team continually reviewed staff responses and compared those answers with the staff member's assigned work areas, as provided by the PHA liaison and by the participant during the second day of training. Any inconsistencies were confirmed with the participant via messaging. For example, if a housing specialist who primarily worked on annual recertifications responded to a notification claiming she was conducting an inspection, the team confirmed with her that the response was accurate. If the study team detected any unusual patterns in responses that could indicate trouble in understanding the reporting categories, we contacted the PHA liaison or staff directly to retrain on the HCV activity definitions. In a small number of instances, staff had systematically assigned work to the wrong category. Several features were available in the web system to enable the research team to reassign those specific answers to the correct category. Participants could also edit their own RMS responses for up to 24 hours via the touchscreen. In all cases, the original answers and any edits were maintained in the database for the study team's records.

In addition to providing the remote monitoring, we provided the PHA liaison with a report on the RMS responses in aggregate for all participating RMS staff and their overall median response time after 1 month of data collection had passed. This midpoint report was another opportunity to detect any inconsistencies in reporting and it served as a motivator to staff to continue their timely responses to notifications.

The primary advantage of using RMS on a smartphone is data quality. Before mobile computing, RMS methods were typically conducted by supervisors recording their employees' work activities on a clipboard at predetermined and randomly drawn times. Eventually the methodology was migrated to mediocre software on the desktop computer, requiring a user to be at a computer to respond. With the advent of the smartphone, many of the historical challenges are gone and the burden drastically reduced for both the evaluators and the participants. Further, the ability to monitor and communicate easily in real time has further elevated its application and usefulness in modern evaluation studies.

The study team also gained operational efficiency by using tools built to support the research goals. Because field data collection always carries some level of uncertainty, having technologies facilitate flexibility can be crucial. When the team arrived at a PHA to start data collection, it was common to discover additional staff needed to be included in the RMS work or that participating staff had work schedules that differed from what the PHA had previously indicated. In only a few minutes, all changes could be made using the web service—the sampling scheme instantly regenerated and the updates were pushed to the appropriate smartphone. If a device was lost or broken at any time, spare devices left at the PHA were swapped in with only a few touches. The lost or stolen devices were remotely locked, so they became useless. These and many other operational research functions were made easier by using the described technologies.

Caveats and Conclusions

Using a technology-based RMS approach generated a vast amount of high-quality data. Estimating the labor component of administrative costs from RMS, however, relies on several assumptions.

- Participating staff must accurately answer the RMS surveys and correctly assign their work at the selected time to the proper RMS activity category. To achieve this accuracy, researchers must build (and test) strong data-collection and training tools and have a means for monitoring responses and communicate with participants in real time.
- In the case of normalizing time across different participating agencies, the denominator (normalization variable) must be known without error. For example, if you wish to define time per housing inspection, then a separate data-collection effort to ascertain the number of inspections that took place during the time measurement period is required. (This calculation was done for the study by requesting counts of important transactions from each PHA for the study period and the preceding 12 months.)
- The resulting statistics describe activity time during the RMS period only and may or may not represent longer term patterns of work. Alternative RMS designs are available to address this issue, such as extending the data-collection period or repeating the data collection at several points during the year. These alternatives carry varying levels of logistical burden to the evaluation and to participating staff.

Evaluation studies can be expensive, and relying on technology-based methods for collecting data carries measured risk. Network reliability, undetected software bugs that emerge in the middle of data collection, catastrophic server failures, or lost data can be expensive to remedy. Because of these risks, systems must be designed thoroughly, with as much protection as can reasonably be included. As the use of technology continues to invade all aspects of modern research and evaluation, so too will the expectations for how well these systems should work. The public is increasingly exposed to great technologies offered by today's largest companies; researchers offering their own solutions that are not as easy to use, are less reliable, and are not as robust may experience challenges.

For those researchers interested in similar approaches, we recommend thinking about the scale of the work and if technologies will be sufficiently leveraged. When data-collection efforts become large enough, the benefits of technology become more obvious and the economics become more attractive. Off-the-shelf options that are also emerging may satisfy a large number of simpler evaluation studies in the near future.

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Authors

Kevin Hathaway is a senior researcher and the Vice President of Quantitative Methods and Advanced Technologies at RSG.

Jennifer Turnham is a senior associate in the Social and Economic Policy Division of Abt Associates Inc.

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