Leveraging the AHS to Better Estimate Housing Needs Of Persons with Disabilities: An Exploration

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Introduction

The advent of the American Community Survey (ACS) changes the context for many smaller special purpose surveys such as the American Housing Survey (AHS). Having annual data from the ACS reduces several advantages of these smaller surveys over the decennial Census long form, their greater currency and frequency between census years. Yet, the ACS clearly does not replace these surveys. The greater detail and specificity of the smaller surveys as well as their greater flexibility to meet and measure changing conditions, situations, and policy questions all remain undiminished. For example, while both the AHS and ACS are residential address based samples, the AHS not only tracks hundreds of aspects of residential units, their buildings, their neighborhoods and their occupants lives not measured by the ACS, it also tracks the same units over time.

Rather than being a substitute, the ACS complements these surveys. What the ACS lacks in depth it makes up in breadth, reaching over one million households a year, a sample size over 20 times that of the AHS. Since the ACS is available every year it provides data for matching years and the AHS is no longer off-year survey to the nation's largest demographic survey. Also the ACS makes largely the same variables available each year. Therefore the incentive to invest in developing linkages between the smaller non-decennial year surveys and ACS is much greater than what existed with the decennial long form it has replaced. Creating these linkages could provide regular insights into smaller geographies and generally smaller populations that are otherwise inadequately identified by the smaller surveys.

One approach to making this linkage is to create an "adjustment factor" based on the relationship in one survey between the summary statistics of two variables, one that is also present in other survey and one which is either not measured or measured differently, and to apply that adjustment to a statistic based on the shared variable in the other survey. This is a univariate approach in the sense that the variation in the estimate is due entirely to a single variable. Another approach is multivariate. By determining the relationship between a survey specific variable and multiple shared independent variables in one survey, the resulting coefficients could be used to generate estimates based on the variation of these same variables in the other survey at either the level of an individual observation or at the summary level for a specific area or population.

This paper presents some results and lessons learned from ongoing research to evaluate whether the U.S. Department of Housing and Urban Development (HUD) has recently underestimated the extent of "worst case" housing needs[1] among non-elderly renters with disabilities using AHS data. While this research began by comparing the 2005 AHS and 2005 ACS, in both 2005 and 2007 HUD used an admittedly imperfect AHS proxy based on income sources to attempt to identify persons with disabilities. In 2009, both the AHS and ACS data should be better, because the AHS adopted a six-question sequence to identify persons with disabilities that had been adopted in a largely similar format a year earlier in the ACS, after being recommended for all federal surveys by a Census Bureau advisory committee.

Better information on the housing needs of persons with disabilities is particularly important because of the recent enactment of bi-partisan legislation to reform and reinvigorate HUD's Section 811 Supportive Housing for Persons with Disabilities. This information is also relevant

[1] "Worst case needs" for housing assistance are defined as unassisted very low-income renters with either severe rent burden or severely inadequate housing. We focus on non-elderly adults with disabilities because elderly persons 62+ are eligible for HUD's Section 202 housing program.

for U.S. Department of Justice activities related to enforcing the Americans with Disabilities Act, and for HUD's partnership with HHS focused on people with disabilities who are living in restrictive settings or who are chronically homeless.

The paper begins with a review of the history of HUD's estimates of worst case needs among the disabled. Results of comparisons between the 2009 AHS and the 2009 ACS data are then discussed where there appear to be significant differences between the two datasets. This is followed by the results of preliminary multivariate analyses.

We conclude with both the substantive and technical findings of the research thus far. In summary, we continue to find that despite the new questions the AHS disability numbers are likely low and that some kind of control to better survey data on disabling conditions is advisable. The ACS is one option here but other surveys more focused on health and disability may be more appropriate such as the Survey of Income and Program Participation or the National Health Interview Survey (NHIS).

While these surveys provide better estimates of the disabled subpopulation for large geographies, they too have relatively small sample sizes, and do not meet the need for small area estimates. Here we conclude, though only preliminarily at this stage, that given the limited scope of the shared variables in the AHS and ACS, the opportunities to build a more sophisticated multivariate model to estimate worst case needs among the disabled is likely limited but potentially useful and worth pursuing further. The finding that meaningful multivariate linkages between the two surveys are not straightforward to build and their potential usefulness remains to be proven reflects similar findings in recent related research on using the AHS in disasters (Eggers, 2009).

Past Estimates of Worst Case Needs among Non-elderly Renters with Disabilities

HUD estimates in past reports on Worst Case Needs. Proxies based on income from SSI, which resulted from research with the 1978 AHS Housing Modifications Supplement, were first developed for HUD's third report to Congress on Worst Case Needs in 1994 (Nelson 2008). Acknowledging the imperfections of this income proxy, the fourth Worst Case Needs report (HUD 1996) adjusted estimates of worst case needs among persons receiving SSI from the 1993 AHS against control totals from counts of non-elderly adults with disabilities who had severe rent burdens from the 1994 SSI Stewardship Review Sample. Each subsequent report continued and improved this approach.[2]

Recommendations from the Consortium of Citizens with Disabilities. By 2005, a new, explicit question on disability income ("Did [this person] receive any disability payments such as SSDI, worker's compensation, veteran's disability or other disability payments?") was added to the AHS. But HUD's report on worst case needs in 2005[3] did not include the new question on disability income in its proxy identifying households with persons with disabilities.

After the 2005 Worst Case Needs report was published, the Consortium of Citizens with Disabilities (CCD) sought an comparison of the 2005 estimates against data sources with more complete information on persons with disabilities. That evaluation (Nelson, 2008)[4] concluded that

[2] The history of improvements in estimates of worst case needs among non-elderly adults with disabilities is discussed in Appendix C of HUD's 2003 report, pp A-46 to A-50 of HUD 2003, *Trends in Worst Case Needs for Housing, 1978-1999.*

[3] *Affordable Housing Needs 2005,* HUD-PD&R 2007.

[4] Kathryn P. Nelson was the primary author of HUD's first seven worst case needs reports.

households with non-elderly adults with disabilities constitute a much larger share of total worst case needs than HUD's published estimates for 2005 implied.[5] In 2008, HUD used income from this source, together with income from SSI, Social Security, or public welfare, as its AHS proxy to identify non-elderly renters with disabilities6 in a supplement to its report on worst case needs in the year 2005.

Table 1

Estimating Worst Case Needs among Non-Elderly Adults with Disabilities in 2007 from the Best Available Data on Numbers of Adults 18-61 with Disabling Conditions

	Households with nonelderly adults with disabilities			All household types@
	Childless households	Families with children	All	
1) 2007 AHS has best questions on worst case needs, but only income source proxy for disabilities:@				
Very-low-income renter households (000s)	1,707 a)	973 b)	2,680	15,940
with rent burden>50% of income	845	517	1,362	7,167
reporting rental assistance	790	350	1,140	4,366
unassisted with burden>50%	na	396		5,720
with worst case needs	**602**	**404**	**1,006**	5,910
Worst case as % of severe rent burden	71.2%	78.1%	73.9%	82.5%
2) 2007 American Community Survey data have 6 questions on disabling conditions, including those limiting work:				
Very-low-income renter households (000s)	2,282 c)	1,470		
with rent burden>50% of income	1,273	836		
reporting rental assistance	question not asked on the ACS			
unassisted with burden>50%	not available from the ACS			
Estimate of worst case needs (assumes AHS ratios of worst case needs as % of severe rent burden for same household type)	**907**	**653**	**1,560**	

3) The SIPP and NHIS have more questions, and better data, to identify non-elderly adults with disabling conditions	Number of U.S. adults 18-61 with disabling conditions (000s)*	Ratio compared to ACS:
American Community Survey, 2003	18,813	
National Health Interview Survey, 2002	25,318	1.35
Survey of Income and Program Participation, 2002	29,046	1.54

4) Estimates of very-low-income renter households with worst case needs consistent with counts from NHIS and SIPP (0 (The 2007 ACS estimates in panel 2 are adjusted by ratios shown in panel 3)			
Consistent with control total from:			
National Health Interview Survey	**1,220**	**879**	**2,099**
Survey of Income and Program Participation	**1,400**	**1,009**	**2,409**

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@ HUD, 2010 *Worst Case Housing Needs 2007*, Table A-1a & A-3, pp. 55 & 59.
@@ HUD, 2010 *Worst Case Housing Needs 2007*, Table A-5, p. 64.
a AHS estimate based on receipt of income from Social Security, SSI, public assistance, or disability payments.
b Estimate from PD&R based on AHS receipt of income from from Social Security, SSI, or disability payments.
c ACS data based on 6 questions on disabling conditions, tabulated by NLIHC
* Table 11, Robert R Weathers, 2005. *A Guide to Disability Statistics from the American Community Survey*,

Estimates for 2007 with the CCD approach. The CCD report, however, recommended that when estimating worst case needs HUD continue to adjust AHS estimates to be consistent with control totals from the best sources of data available on persons with disabling conditions. Table 1 summarizes the approach recommended by the CCD research with data from the 2007 AHS and

[5] Nelson, 2008, www.tacinc.org/downloads/HiddenHousCrisis.pdf, p. 2.
[6] *Housing Needs of Persons With Disabilities: Supplemental Findings to the Affordable Housing Needs 2005 Report*, HUD-PD&R, February 2008.

the 2007 American Community Survey (ACS), supplemented by comparison between the 2003 ACS and the National Health Interview Survey and the Survey of Income and Program Participation, both from 2002.

The recommended adjustment steps that are summarized in Table 1 are:

1. The 2007 AHS provided all variables used to estimate worst case needs, but identified disabling conditions from an income-source proxy rather than explicit questions. Households with severe rent burden comprise most of those with worst case needs, but households reporting rental assistance are excluded from needs for housing assistance by definition, while unassisted renters with severely inadequate housing are included.[7] Based on income from sources often paid to disabled persons, the AHS estimates that some 1.006 million worst case households have non-elderly adults with disabilities.
2. The 2007 ACS had six questions on disabling conditions, including one on conditions that limit work activity.[8] It did count very-low-income renters with severe rent burden but not those receiving rental assistance. The panel estimates worst case needs for non-elderly adults with disabilities from the 2007 ACS by assuming that the AHS ratios between worst case needs and renters with severe rent burden hold both for childless households and for families with children.
3. The National Health Interview Survey (NHIS) and the Survey of Income and Program Participation (SIPP) provide the best available estimates of persons with disabilities because of the many detailed questions they ask about disabling conditions. As the third panel summarizes, comparison of ACS counts of adults 18-61 with disabling conditions in 2003 against more comprehensive NHIS and SIPP data from 2002 imply that ACS estimates of numbers of non-elderly adults with disabling conditions are low by 35 to 54 percent.
4. Adjustments using these factors thus imply that worst case needs among non-elderly adults with disabilities in childless households were as high as 1.2 to 1.4 million in 2007. Among non-elderly adults with disabilities in families with children, worst case needs ranged from 0.9 to 1.0 million.

The resulting levels of need are quite similar to the estimates made for 2005 using the same procedures (Nelson, 2008). Together, the two estimates imply that worst case needs among non-elderly adults with disabilities were more than double those estimated from HUD's income-based proxy in both 2005 and 2007.

Aims of This Paper

The AHS and ACS estimates of households with non-elderly adults in 2005 and 2007 were not directly comparable because the AHS estimates came from an income-based proxy known to be imperfect. But since 2009, both the ACS and the AHS have adopted a similar sequence of six questions about disabling conditions that a Census Bureau advisory committee had recommended for use by all major surveys.[9]

Three questions summarize the technical goals for this research:

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[7] Homeless persons should also be included as worst case, but surveys of housing units do not cover them.
[8] The question on conditions limiting work was dropped in 2008, when the recommended six-question sequence began.
[9] Add reference to advisory committee recommendations here (or else when discussing impact of dropping work-limitations question below)

1) Do the AHS and ACS, asking the same 6 questions, similarly identify households with persons with disabling conditions, especially for adults younger than 62? More basically and importantly, albeit harder to answer, how well do the AHS and ACS estimates identify the "true" number of households with persons with disabling conditions?

2) Do the AHS and ACS similarly identify households with the severe housing problems that define worst case needs?

3) Can we develop multivariate model(s) from AHS data that could estimate worst case needs of disabled persons from ACS data better than the simple approach used in Table 1? It essentially assumes that ratios between severe rent burden and worst case needs derived from AHS national data hold for ACS data, but this assumption is highly unlikely to hold in all locations and housing markets.

Answers to these technical questions should provide insight into our basic substantive questions: whether AHS estimates of worst case needs among households with non-elderly adults with disabilities are accurate; whether such estimates should be adjusted to conform to evidence from the best available data on persons with disabilities; and whether reliable estimates could be developed for states and other sub-national locations.

We began this paper with hopes that having the same questions on disabling conditions in both the AHS and the ACS would make the estimates of the number and characteristics of disabled persons in the two surveys more comparable and AHS-ACS estimates of worst case needs among non-elderly disabled adults more credible. We hoped also to develop statistics on the housing problems, particularly worst case needs, and housing situations faced by households with persons with disabling conditions from applying multivariate estimation techniques to provide synthetic estimates of AHS-only variables for the smaller geographies of the ACS.

We found, however, that even using the same questions, the 2009 ACS estimates of the number of households with disabled adults are some 50% higher than those of the AHS. But the ACS does well match the AHS in identifying households with severe and moderate housing problems. Together these two results support the CCD's claim that AHS estimates of worst case needs among households with non-elderly adults with disabilities are quite low, and their recommendation that AHS estimates should be adjusted to conform to evidence from the best available data on persons with disabilities.

Results of Comparisons between the 2009 AHS and the 2009 ACS

Estimates of Numbers of Households with Adults with Disabling Conditions

To determine whether the 2009 AHS and 2009 ACS identify similar populations of persons with one or more of the six disabling conditions asked about, we first count all households with an adult, or a reference person younger than 18, that identified at least one of these conditions. As Table 2 (next page) shows, the AHS and ACS give quite similar totals for all owners, but the ACS estimate of *disabled* owners is 40% higher than its AHS equivalent. For all renters, the disparity between the ACS and AHS is even greater: the 2009 ACS estimate of adult renters with disabling conditions is 52% higher than that of the AHS, 8.8 million rather than 5.8 million. For both owners and renters, the incidence of households with adults with disabling conditions is some 7 percentage points higher in the ACS: it is 23% or slightly less in the ACS compared to slightly over 16% in the AHS data.

Table 2

AHS and ACS estimates of households with adults with disabling conditions, 2009, by tenure and age

		AHS households	% Disabled	ACS households	% Disabled	ACS/AHS
All Owners	Total	76,427,983		74,929,333		98%
	Disabled	12,321,505	16.1%	17,213,114	23.0%	140%
All Renters	Total	35,377,812		38,686,859		109%
	Disabled	5,779,719	16.3%	8,807,238	22.8%	**152%**
Elderly Head or Spouse						
Owners	Total	22,499,354		23,376,878		104%
	Disabled	7,325,673	32.6%	9,263,749	39.6%	126%
Renters	Total	5,338,559		5,964,436		112%
	Disabled	2,353,963	44.1%	3,151,616	52.8%	134%
Nonelderly Adults						
Owners	Total	53,928,629		51,552,455		96%
	Disabled	4,995,832	9.3%	7,949,365	15.4%	159%
Renters	Total	30,039,253		32,722,423		109%
	Disabled	3,425,756	11.4%	5,655,622	17.3%	165%
All households by disabling condition						ACS/AHS
Vision	Seeing	2,821,140		5,131,241		**182%**
Self-care	Dressing	2,828,892		5,616,948		**199%**
Physical difficulty	Walking	11,521,393		15,875,990		**138%**
Cognitive difficulty	Memory	4,966,776		9,030,138		**182%**
Going outside	Going outside	6,134,353		10,459,048		**170%**
	Hearing	5,839,474		8,757,470		**150%**
Very low-income renters						
Total	Total	17,118,386		16,325,065		95%
	Disabled	4,058,651	23.7%	5,272,006	32.3%	130%
Elderly	Total	3,646,164		3,425,482		94%
	Disabled	1,790,817	49.1%	2,017,877	58.9%	113%
Nonelderly	Total	13,472,222		12,899,583		96%
	Disabled	2,267,834	16.8%	3,254,129	25.2%	**143%**

Source: NLIHC tabulations of AHS and ACS

Distinguishing households by age in addition to tenure, the ACS "overcounts" are greater for adults younger than 62, both owners and renters, than for the elderly. Worse still for our purposes, the disparity is greatest for nonelderly renters, with the ACS recording 65% more renters with disabling conditions than the AHS does.

Separately identifying each of the six disabling conditions for all households reveals that the ACS counts are 50-99% above the AHS for all but one condition. The number of households mentioning physical difficulties on the ACS is "only" 38% greater than that from the AHS.

The final panel of Table 2 focuses on very low-income renters, the group for which worst case needs are defined. Notably, fewer households are classified as having very low incomes in the ACS tabulations, which may be an artifact of NLIHC procedures for defining income groups.[10]For households with both elderly and nonelderly heads, the ACS estimates of very low-income renters are some 5 percent lower than the (presumably more accurate) AHS numbers. Despite this apparent undercount of all very low-income renters, among *non-elderly* very low-income renters, 43% more report disabling conditions on the ACS than on the AHS, 3.3 rather than 2.7 million.

To summarize, contrary to our expectation, the ACS consistently counts substantially more households with adults with disabilities than the AHS does. According to Matthew Brault of the Census Bureau, there are a number of reasons the ACS and the AHS might generate such different results from the same questions, yet both be correct. Different methods of question implementation, survey design and survey context could all affect the estimates.[11]

Furthermore, as discussed below, answers to other questions on the AHS and the ACS, as well as other research on survey questions about disabling conditions, imply that on both surveys the new six-question sequence probably undercounts the numbers of persons with disabilities.

Evidence that the six-question sequence does not identify all persons with disabilities. The AHS question on disability income that was added in 2005 suggests strongly that the new AHS disability questions do not include all households with disabling conditions. Of the 408,000 very low-income renters reporting SSDI or other disability income in 2009, almost half—186,000—are not identified as disabled by the six-question sequence. Including them would increase the number of very low-income non-elderly adult renters who are disabled by 21%. Similarly, SSI income is provided only to very poor persons who can prove that they are disabled. Yet 347,000

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[10] The AHS microdata contain information on the HUD-Adjusted Area Median Family Income for each household so that households can quite accurately be classified as "very low income" with incomes below 50% of the local HAMFI. Lacking such data on the ACS, NLIHC follows HUD's rules for adjusting income by household size, but compares each household's income to its *state* median family income. This procedure probably underclassifies the number of households with very low income because fewer of the households in higher-income, more expensive, large MSAs fall under the state median income than under HUD's official HAMFI for their MSA.

[11] With regard to implementation, the same six questions are asked in different ways in the two surveys. In the ACS, the questions are asked in turn about each person living in the household. In the AHS, the respondent is merely asked whether a particular problem exists in the household generally. Only after a "yes" answer is the respondent asked which person has that difficulty. No prompt makes the respondent think specifically about each member of the household.

In terms of design, the ACS is a mail-back survey with telephone and in-person non-response follow-ups whereas the AHS is conducted in-person. To the extent that those with a disability may be more reluctant or less able to respond in person, the addition of mail-in and telephone follow-ups may increase the participation of people with disabilities. Also, when contact is made, a perceived stigma or concern might deter respondents from identifying a disability in personal interviews but less in mail-back surveys.

Lastly, context reflects the stated purpose of the survey and what questions are asked. For example, AHS respondents may evaluate a disability's effect on their housing, such as where they live or the structure or facilities in their house, while ACS questions on disabling conditions are considered in a broader context.

Thus it is not unexpected that the two surveys provide very different estimates of the incidence of households with adult members with disabilites, and neither estimate is necessarily "wrong".

of the very low-income renters who report SSI income did not report any of the six disabling conditions. Their number would increase the AHS estimate of very low-income non-elderly adult renters who are disabled by some 34%.

In addition to the six-question sequence, the ACS asks veterans about their disability rating. In 2009, 1.7 million veterans with a disability rating, equivalent to another 7 % of those reporting disabling conditions, did not report any of the six-question limiting conditions. Prior to 2008, the questions about disabling conditions asked by the ACS (and by the decennial Censuses since 1970) included one about disabilities limiting work activity. Research with the 2008 Current Population Survey evaluated the impact of dropping the work-limitation question by comparing the populations identified by the six-question sequence and by a work activity limitation. They found that only about 40% of the population identified as disabled by either set of questions contained the same people, suggesting that the six-question sequence omitted some 30% of the broader population identified by all 7 of these questions. Moreover, the people excluded by the six-question sequence were poorer and less likely to be employed.12

These considerations imply that future estimates of the disabled population from the AHS and ACS should continue to be compared to better data sources, whenever possible, and adjusted when necessary. As Stapleton et al conclude about the six-question sequence: "these questions will not meet the needs of all…Some people who are truly at high risk of disability will not be captured by these questions….No short set of questions can adequately define this population for specific purposes."13 Moreover, research on how well these six specific questions count those with disabling conditions continues. For example, Houtenville plans to compare the populations identified by the six ACS questions against those identified by the 68 questions included in new SIPP data in late 2011, and a CPS disability supplement is planned for 2012.14

The Incidence of Severe and Moderate Housing Problems

Whereas we had expected the 2009 AHS and ACS to be similar in counts of adults with disabilities, we examined their coverage of severe and moderate housing problems because we expected to find differences. The ACS should cover rent burden and crowding adequately,15 but its only questions about housing quality – summed up as whether either plumbing or kitchen facilities are incomplete – are minimal compared to the AHS's many questions on this subject.16 Moreover, rent burdens might differ because the ACS probes more into income than the AHS does, while the AHS asks in more detail about rent and utility payments.[17]

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[12] Richard V. Burkhauser, Andrew Houtenville and Jennifer Tennant "Capturing the Elusive Work-Age Population with Disabilities: Who the Six Question Sequence in CPS-BMS and ACS Capture and Who They Miss." October 2010

[13] David C. Stapleton et al, Options for Improving Disability Data Collection, p. 391 in Andrew Houtenville et al, *Counting Working-Age People with Disabilities: What Current Data Tell Us and Options for Improvement,* Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 2009.

[14] See <http://disabilitysupplement.econsys.com>

[15] However, past research on differences between the AHS and Current Population Survey in crowding found that the CPS tends to show more crowding because it counts more people and fewer rooms than the AHS does.

[16] According to published AHS data [Table 4-7: Additional Indicators of Housing Quality], some 60% of severely inadequate units lack complete plumbing. Thus although the ACS has very few questions on housing quality, its question about complete plumbing should identify many of the units that are severely inadequate.

[17] However the AHS also probes into circumstances underlying severe rent burdens, such as whether some person living outside the household contributes some of the rent and/or utilities paid.

As Table 3 (next page) summarizes, however, the incidence of housing problems captured by ACS questions is quite similar for the AHS and ACS. For all households, the incidence of severe and moderate problems in the ACS is quite similar to that of the AHS.[18]Possibly reflecting the ACS' incomplete identification of severely inadequate units, the ACS classifies only 17% of all households as having severe problems. As Table 3 shows, this is two percentage points less than the AHS's estimate of 19%. Conversely, the ACS records 62% of all households as having no problems, 2 percentage points above the AHS estimate of 60%.

Among very low-income renters, the ACS classifies larger shares as having severe problems, and fewer with moderate problems, than does the AHS. This tendency is even more pronounced among non-elderly very low-income renters, 61% of whom have severe rent burdens according to the ACS, compared to 55% according to the AHS. Among the non-elderly *disabled* renters who are our main concern, 58% have severe rent burdens in the ACS, closer to the AHS' 55% but still higher.

Taken together, the ACS undercounts severe problems for all households, but it is somewhat more likely than the AHS to classify very low-income renters as having severe cost burdens. Among non-elderly disabled very low-income renters, however, the ACS' higher count of severe problems mainly results from its higher identification of renters with disabling conditions.

[18] The first two panels of Table 3 list the problems classified as "moderate" or "severe" below the summary lines for "moderate" and "severe" problems. Severe problems essentially include those with gross rent burdens more than 50% of income.

Table 3

AHS and ACS estimates of severe and moderate housing problems,* 2009
(Households in thousands)

	AHS households		ACS households		ACS/AHS
		Pct distribution		Pct distribution	
All households	111,806	100%	113,616	100%	102%
No problems	**66,628**	**60%**	**70,210**	**62%**	**105%**
Moderate problems	**24,360**	**22%**	**24,023**	**21%**	**99%**
Incomplete plumbing/kitchen or crowded	2,575	2%	2,507	2%	97%
Moderate (31-50%) cost burden only	20,541	18%	20,479	18%	100%
Moderate burden & other** problems	1,245	1%	1,037	1%	83%
Severe problems	**20,817**	**19%**	**19,383**	**17%**	**93%**
Severe cost burden (>50%) only	19,360	17%	18,189	16%	94%
Severe burden and other problems	1,457	1%	1,194	1%	82%
Very-low-income Renters	17,118	100%	16,325	100%	95%
No problems	**2,774**	**16%**	**2,610**	**16%**	**94%**
Moderate problems	**5,170**	**30%**	**4,379**	**27%**	**85%**
Incomplete plumbing/kitchen or crowded	328	2%	281	2%	86%
Moderate (31-50%) cost burden only	4,249	25%	3,642	22%	86%
Moderate burden & other* problems	593	3%	457	3%	77%
Severe problems	**9,175**	**54%**	**9,336**	**57%**	**102%**
Severe cost burden (>50%) only	8,169	48%	8,481	52%	104%
Severe burden and other problems	1,006	6%	855	5%	85%
Nonelderly VLI Renters	13,472	100%	12,900	100%	96%
No Problems	1,825	14%	1,580	12%	87%
Moderate Problems	4,226	31%	3,470	27%	82%
Severe Problems	**7,421**	**55%**	**7,849**	**61%**	**106%**
Nonelderly Disabled VLIR	2,268	100%	3,254	100%	143%
No Problems	389	17%	512	16%	132%
Moderate Problems	637	28%	851	26%	134%
Severe Problems	**1,242**	**55%**	**1,891**	**58%**	**152%**

*Both the AHS and ACS counts of problems are based on indicators available from the ACS, I.e. crowding, incomplete plumbing or kitchen, and gross rent burdens > 30% of income

**Other problems =incomplete plumbing/kitchen or crowded, with 1.01+ persons/room

Source: NLIHC tabulations of 2009 AHS and ACS microdata

Estimates of Worst Case Needs in 2009

The fact that the 2009 ACS counts many more persons as disabled while identifying severe problems similarly to the AHS supports the evidence from past comparisons that worst case needs among non-elderly adults with disabilities are substantially higher than shown by AHS data. It furthermore indicates that the differences between the ACS and the AHS result mainly from the ACS's higher count of persons with disabilities, and very little from differences in identifying severe housing problems. This updated evidence based on more comparable disability questions strongly supports CCD's recommendation that AHS estimates of worst case needs among adults for disabilities should be compared to control totals from more comprehensive sources of data on persons with disabilities and adjusted if necessary.

Table 4 (next page) accordingly updates Table 1 by using 2009 data from the AHS and the ACS. The ACS results imply that in 2009 the number of worst case needs households with a non-elderly disabled adult was again at least more than 50% above the AHS estimate. The ACS estimate for families with children and disabled adults is actually more than 70% higher than the AHS estimate, while the disparity is 40% for childless adults.[19]

[19] The AHS numbers for worst case needs in Table 4 are less than the totals for "unassisted with severe problems" given in Table A-5B of HUD's 2009 report. Because our numbers are restricted to non-elderly *adults* with disabilities while the report's text and tables refer to "nonelderly persons with disabilities" we hypothesize that the report's tabulations include households with children with disabling conditions.

Table 4

Estimating Worst Case Needs among Non-Elderly Adults with Disabilities in 2009 from the Best Available Data on Numbers of Adults 18-61 with Disabling Conditions

	Households with nonelderly adults with disabiliti Childless households		Families with childrer		All nonelderly Disabled	All household types@
1) 2009 AHS has best questions on worst case needs, and new 6-question sequence on disabilities:@						
Very-low-income renter households (000s)	1,514	a)	754	a)	2,268	17,088
with rent burden>50% of income	816	a)	426	a)	1,242	8,392
reporting rental assistance	623	a)	257	a)	880	4,274
unassisted with burden>50%	na		na			
with worst case needs	**548**	a)	**309**	a)	**857**	7,095
Worst case as % of severe rent burden	67.1%		72.6%		69.0%	84.5%
2) 2009 American Community Survey data have same 6 questions on disabling conditions						
Very-low-income renter households (000s)	2,029	b)	1,225	b)		Nonelderly
with rent burden>50% of income	1,154	b)	736	b)		disabled
reporting rental assistance	question not asked on the ACS					worst case
unassisted with burden>50%	not available from the ACS					as share of
						all worst case
Estimates of worst case needs (assume AHS ratios of worst case needs as % of severe rent burden holds for same household type)	**775**		**535**		**1,310**	**18%**

3) The SIPP and NHIS have more questions, and better data, to identify non-elderly adults with disabling conditions

	Number of U.S. adults 18-61 with disabling conditions (000s)*	Ratio compared to ACS:
American Community Survey, 2003	18,813	
National Health Interview Survey, 2002	25,318	1.35
Survey of Income and Program Participation, 2002	29,046	1.54

4) Estimates of very-low-income renter households with worst case needs consistent with counts from NHIS and SIPP (000s)
(The 2009 ACS estimates in panel 2 are adjusted by ratios shown in panel 3)

Consistent with control total from:				
National Health Interview Survey	**1,043**	**720**	**1,763**	**25%**
Survey of Income and Program Participatior	**1,197**	**826**	**2,023**	**29%**

@ HUD, 2011 *Worst Case Housing Needs 2009*, Table A-1A, p. 28.
a AHS data based on 6 questions on disabling conditions, tabulated by NLIHC
b ACS data based on 6 questions on disabling conditions, tabulated by NLIHC
* Table 11, Robert R Weathers, 2005. *A Guide to Disability Statistics from the American Community Survey*, Cornell University Employment and Disability Institute

As the final column of the Table shows, if 1.3 million households with non-elderly disabled adults have worst case needs, they would comprise almost one-fifth of the total with worst case needs. If ACS estimates of the disabled population continue to be lower than the SIPP and NHIS surveys would show, as many as 25 to 29% of the 7.1 million households with worst case needs in 2009 may include non-elderly adults with disabling conditions.[20]

Comparison of Table 1 and Table 4 implies that worst case needs among non-elderly adults with disabilities dropped between 2007 and 2009. However, because both the AHS proxy in 2007 and

[20] As noted above, Andrew Houtenville plans to study 2010 SIPP data to evaluate the number and characteristics of people identified as disabled from the SIPP's 68 questions.

the ACS 2007 questions had changed by 2009, the data in the two tables are not directly comparable.

Because the AHS identification of disabilities changed from only an income-based proxy in 2007 to the six-question sequence in 2009 AHS, HUD chose to evaluate trends in its 2009 worst case report by examining 2007 to 2009 changes in its income-based disability proxy. By this measure, worst case needs among households that include people with disabilities grew by 13.3 percent, less than the 20.1 percent increase in worst case needs observed overall. (HUD, 2011, p.7)

Because the ACS disability questions changed between 2007 and 2008, a direct comparison between 2007 and 2009 is also not possible from ACS data. Between 2008 and 2009, however, the number of households with disabled adults increased slightly (0.46%), almost exactly matching the overall increase in households. Among very low-income renters, households with disabled adults rose an insignificant 0.04%. Looking specifically at problems among very low-income renters (Table 6) according to the ACS, the incidence of severe problems increased significantly for households with disabled adults, but the rate of increase was much less than the increase for households without disabled adults.

Table 6

Percent Change In Problems for VLI Renter Households 2008 to 2009, by presence of adult household member with a disability

Renter Total		0-30% burden, no other problems	0-30% burden, with incomplete plumbing/kitchen or crowded	31-50% burden, with no other problems	31-50% of Income and incomplete plumbing/kitchen or crowded	>50% burden, no other problems	>50% burden, and incomplete plumbing/kitchen or crowded	Total
Disability for TAC 2008 Definition	No	-8%	-7%	-3%	-2%	11%	21%	5%
	Yes	-5%	1%	-2%	-12%	6%	4%	1%
Total		-6%	-5%	-2%	-4%	9%	16%	3%

Source: Authors' tabulations of 2008 and 2009 ACS data

Our final exercise before exploring multivariate approaches was to review our tabulations from the AHS of severe and moderate problems as defined only by variables available in the ACS, as done in Table 3. As Table 7 (next page) illustrates, we then examined how many of worst case households and assisted renters have severe problems.

Table 7

% with housing problem Worst case needs?

	Disabled non-elderly adult present?	Severe housing problem (Burden> 50%)	Another problem (Burden 31-50%, crowded, incomplete kitchen)	Worst Case Needs	Asst'd	Other	% of WCN with severe problem	% of assisted with severe problem	WCN as % of Unasstd
Very-low-income renters by household type and disability									
With Children	No	54%	34%	40%	24%	36%	97%	47%	53%
	Yes	56%	30%	41%	34%	25%	100%	40%	62%
Head or Spouse 62	No	50%	27%	40%	30%	31%	97%	33%	56%
	Yes	46%	25%	33%	43%	24%	98%	30%	58%
No Children, Famil	No	51%	33%	47%	12%	41%	97%	32%	53%
	Yes	46%	32%	36%	34%	30%	98%	29%	55%
No Children, Non-F	No	58%	29%	48%	12%	40%	98%	45%	55%
	Yes	56%	26%	36%	43%	21%	96%	39%	64%
No Children, total	No	57%	30%	48%	12%	40%	98%	42%	54%
	Yes	54%	27%	36%	41%	23%	96%	37%	62%
All Very-low-income renters		54%	30%	41%	25%	34%	98%	40%	55%

Source: Author's tabulations of 2009 AHS

Virtually all (96-100%) of very low-income renters with worst case needs have ACS-identified severe problems. Furthermore, almost 2 of every 5 (38%) of non-elderly disabled renters who are assisted have severe problems. This implies that identifying which renters with severe problems are assisted is the main challenge to estimating worst case needs from the ACS.

Of the household types identified in Table 7, households with disabled adults, particularly those without children, have a lower incidence of worst case needs than households without disabled adults. This occurs, however, because very low-income renters with disabled adults are appreciably more likely to receive assistance already. When the incidence of worst case needs among unassisted households is considered (final column), 62% of families with children and a disabled adult have worst case needs, as do 64% of non-elderly adults living without other family members. Thus, if they are unassisted, disabled adults are much more likely to have worst case needs than similar households without persons with disabilities.

Multivariate Approaches to Estimating Worst Case Needs from ACS Data

The first difficulty in linking the ACS and the AHS to better address questions about smaller subpopulations such as those with disabilities is the low overlap between the two surveys' variables (See also Eggers 2007, 2009). The ACS clearly has few of the hundreds of AHS variables focused on housing. A second difficulty illustrated above is that survey context,

question format and other factors mean that nominally similar questions in the two surveys may measure what are actually different concepts and populations.

The analysis above, however, also shows that critical variables for measuring housing needs are quite similar in the two surveys, especially the presence of severe cost burden and of lacking complete plumbing or kitchen facilities. This seems to provide support for adjusting the AHS using ACS controls based on these variables.

The most important limitation of the univariate approach toward leveraging AHS data with other surveys used in Tables 1 and 4 is that it assumes that average national relationships between the two variables of severe rent burden and worst case needs hold for the single shared variable of severe rent burden. Using a multivariate approach could provide a more nuanced linkage between the surveys and thus potentially more accurate estimates nationwide, particularly for small areas where conditions may diverge greatly from the national or regional norms available from the AHS.

One potential approach to creating this linkage is to use ACS equivalent variables within the AHS to predict an AHS-specific variable. As mentioned above, identifying which renters with severe housing problems are actually assisted, and therefore by definition do not have worst case needs, appears to be the main challenge to estimating worst case needs from the ACS. We therefore explore using variables shared by both surveys to predict whether a household in the AHS is assisted in terms of the questions on housing assistance available from the AHS. After estimating that model we apply the coefficients from the model to the corresponding variables in the ACS to predict the likelihood an individual household is assisted.[21]

Whether a household is or is not subsidized is a dichotomous variable, so our logit model takes the following form,

(1)

$$logit(Si) = ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \sum \beta_j X_{ij} + \sum \beta_k X_{ik} + \sum \beta_l X_{il}$$

where S is indicates the presence of a housing subsidy as measured in the 2009 Worst Case Needs report for household i. Pi indicates the probability of S occurring, and the dependent side of the equation is the natural log of the odds (or logit) of S occurring. On the right hand side, X_{ij} represent a series of variables describing the household i's economic and demographic characteristics. Households select to seek subsidies, and subsidy programs select applicants, based on household characteristics. Households also seek subsidies because they need appropriate housing, while most subsidy programs have some kind of quality standards or program history that determines the housing that made available under the program. For such reasons, X_{ik} represent a series of variables describing a household's housing. Program history, funding formulas, and the varying availability of subsidies from state and local jurisdictions all mean the presence of subsidy is likely to vary by location. Similarly the housing stock, particularly rental housing, is unevenly distributed over space. Therefore the model also includes a series of variables describing the location of household *i*'s housing. Location in the national AHS is limited to broad descriptions of Census region and whether a household is in a city, suburb or rural area.

[21] We should note that while we have chosen to create a household level model it is also possible to create a model to predict summary statistics for specific geographies (Eggers, 2009).

Table 8 presents the full set of variables considered and some basic descriptive statistics. These are presented for the entire sample, although much of the analysis that follows is for very low-income renter households only.

Table 8

	ACS				AHS				
	Min.	Max.	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Mean ACS/AHS
Ratio of household income to poverty	0.00	114.51	4.29	4.44	0.00	54.59	4.06	4.10	106%
income to typical rent ratio	26.06	109.24	61.96	12.81	21.80	146.28	65.36	17.02	95%
Food Stamp Receipt	0.00	1.00	0.10	0.30	0.00	1.00	0.06	0.24	175%
Public Assistance receipt	0.00	1.00	0.03	0.16	0.00	1.00	0.02	0.13	145%
Social Security Receipt	0.00	1.00	0.28	0.45	0.00	1.00	0.25	0.43	111%
Retirement Receipt	0.00	1.00	0.17	0.38	0.00	1.00	0.14	0.35	123%
Wages and Saleries	0.00	1.00	0.76	0.42	0.00	1.00	0.73	0.44	104%
Married Couple	0.00	1.00	0.49	0.50	0.00	1.00	0.51	0.50	97%
Black Householder	0.00	1.00	0.03	0.18	0.00	1.00	0.11	0.32	30%
Hispanic Householder	0.00	1.00	0.06	0.23	0.00	1.00	0.13	0.33	46%
Number of Kids	0.00	14.00	0.67	1.09	0.00	9.00	0.65	1.07	102%
Number of People	1.00	20.00	2.51	1.47	1.00	14.00	2.53	1.45	99%
Multifamily rental property	0.00	1.00	0.21	0.41	0.00	1.00	0.20	0.40	106%
Building has 50 units or more	0.00	1.00	0.05	0.21	0.00	1.00	0.04	0.19	126%
Built prior to 1939	0.00	1.00	0.14	0.34	0.00	1.00	0.15	0.36	90%
Number of Rooms	1.00	28.00	5.90	2.33	1.00	21.00	5.74	1.80	103%
Number of Bedrooms	0.00	14.00	2.76	1.14	0.00	10.00	2.79	1.04	99%
Rent level	4.00	3900.00	797.83	498.72	1.00	4738.00	825.04	626.17	97%
Severe cost burden	0.00	1.00	0.18	0.38	0.00	1.00	0.17	0.38	101%
Plumbing	0.00	1.00	0.99	0.08	.00	1.00	1.00	.04	100%
Crowded	0.00	1.00	0.03	0.18	0.00	1.00	0.02	0.15	142%
MWMetro	0.00	1.00	0.17	0.37	0.00	1.00	0.19	0.39	91%
Snonmetro	0.00	1.00	0.08	0.27	0.00	1.00	0.07	0.25	115%
Wnonmetro	0.00	1.00	0.02	0.15	0.00	1.00	0.02	0.14	122%
Smetro	0.00	1.00	0.29	0.45	0.00	1.00	0.30	0.46	96%
Wmetro	0.00	1.00	0.20	0.40	0.00	1.00	0.20	0.40	98%
MWnonmetro	0.00	1.00	0.06	0.24	0.00	1.00	0.04	0.20	144%
NEnonmetro	0.00	1.00	0.02	0.14	0.00	1.00	0.02	0.14	99%

Along with income below some threshold, expressed as a proportion of the poverty standard, households that receive one subsidy are assumed to be more likely to participate in other welfare programs such as food stamps. The receipt of additional retirement or wage earnings may limit one's need for assistance and those who are married are less likely to participate, particularly once income is controlled. Race and ethnicity may play a role, though this is often also related to income and location.

Housing subsidies are thought to be particularly attractive for larger households and families with children who may have particular difficulty finding housing in the private market. This difficulty may also lead them to be unsuccessful in finding an appropriate unit with tenant based vouchers and within some project based programs, so the expected direction of the influence of these variable is ambiguous.

Landlords with multifamily rentals and larger properties, including PHAs, are the most likely to provide or accept subsidies, and the major project-based housing programs all began to produce new housing since the 1940s. As for the larger households mentioned above, a subsidized household may be expected to use a subsidy for larger unit or one that provides separate bedrooms for its members, because program rules likely require certain minimums based on family composition.

Because of housing and program standards, subsidies should limit the chance of severe housing cost burdens and in general limit severe housing quality problems. For location, Census region and metropolitan area classification dummies were tested. Within the ACS the metro classification was based on classifying the metro status of PUMAs in the ACS.[22]

Predicting being assisted from AHS data

These variables were entered stepwise beginning with the individual household characteristics.[23] Table 9 shows the results from the preferred model at this stage of the research in terms of goodness of fit and the independence and significance of the right hand variables. The population being tested is very low-income renters.

Table 9

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.977	8	.267

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	povratio	-.947	.068	191.013	1	.000	.388
	QFS1_bin	1.320	.078	289.772	1	.000	3.745
	PPQWELF_BIN	.640	.117	29.944	1	.000	1.897
	PPQSS_BIN	.928	.086	115.685	1	.000	2.529
	PPQSAL_BIN	-.345	.083	17.459	1	.000	.708
	HHMAR_BIN	-.495	.103	23.280	1	.000	.610
	hhblk_$	.777	.075	107.000	1	.000	2.175
	MFrental	.826	.091	81.511	1	.000	2.284
	NUNIT50	.908	.094	93.135	1	.000	2.480
	Built1939	-.891	.095	87.171	1	.000	.410
	bedrms	.172	.043	16.001	1	.000	1.188
	rent	.000	.000	26.437	1	.000	1.000
	Costi2_bin	-1.591	.078	415.637	1	.000	.204
	PLUMBACS	1.263	.633	3.982	1	.046	3.535
	crowded	-1.113	.184	36.609	1	.000	.329
	NEmetro	.293	.154	3.621	1	.057	1.340
	MWMetro	-.299	.153	3.819	1	.051	.741
	Smetro	-.302	.151	3.976	1	.046	.739
	Wmetro	.224	.157	2.030	1	.154	1.251
	Constant	-2.009	.655	9.401	1	.002	.134

[22] See Wardrip, 2011 for more information.

[23] In the Homer-Lemeshow test, the null hypothesis is a good fit, therefore not being able to reject the null hypothesis is a positive indication for goodness-of-fit.

Overall, the coefficients all differ from zero and influence the odds of being subsidized in the expected directions. Income, marriage, a building built before 1939 and the presence of housing problems all decrease the likelihood a household receives assistance, while being black or in a multifamily rental unit or large building increases that likelihood. Being in a northeast metro area also increases the likelihood of assistance. The residual category is rural areas. The direction of the influence of these variables was robust across the specific models tested.

The results of the AHS model indicate that it does a decent job of predicting the outcomes. Fewer than 10% of the unsubsidized households were incorrectly identified as subsidized, with a magnitude of specificity of 92%. The magnitude of sensitivity was 51% with just less than half of the subsidized households incorrectly identified as being unsubsidized. Overall, model predicts correctly 81% of the time.

Predicting Subsidies in the ACS

The coefficients, B in Table 9, are used to generate predicted probabilities for each very low-income renter household (j) in the ACS as in equation 2.

(2)

$$\frac{e^{\alpha+\sum \beta_j X_{ij}+\sum \beta_k X_{ik}+\sum \beta_l X_{il}}}{1+e^{\alpha+\sum \beta_j X_{ij}+\sum \beta_k X_{ik}+\sum \beta_l X_{il}}} = Probability\,(Si)$$

In each instance where the household is determined to have a 50% or greater chance of being subsidized the household is coded as having a subsidy.

The aggregation of the predicted cases among the 16 million VLI renter households is 2.5 million. This is well below the 4.2 million VLIR assisted households shown in the AHS but is reasonable enough to support further considering this approach to estimation. Using this estimate of subsidized households together with the severe housing problems from the ACS generates a total estimate of WCN of 9.2 million, well above the 7.1 million estimate of WCN from the AHS. Without the estimated households the WCN proxy in the ACS would be over 400,000 larger at 9.6 million.

Table 10 shows the breakdown of disability and WCN by household type and disability.

Table 10

WCN proxy based on estimated subsidies * Family/Household Type for TAC * Disability for TAC 2008 Definition Crosstabulation

Count

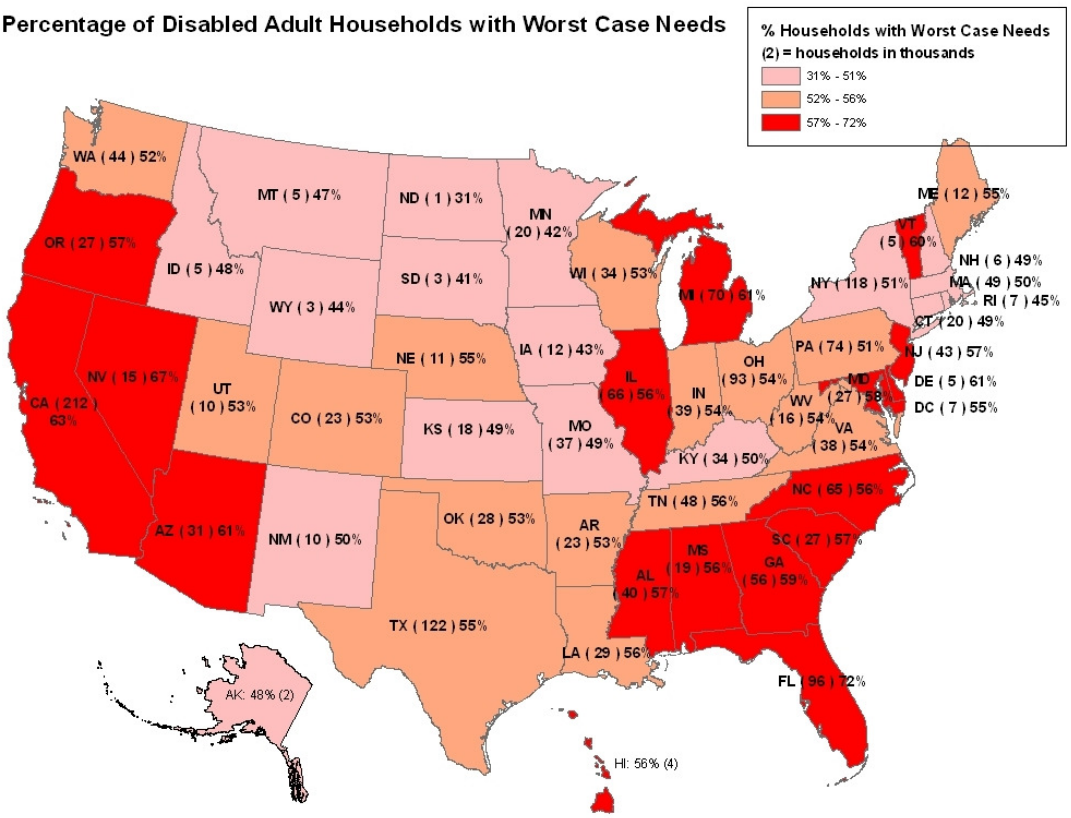
Disability for TAC 2008 Definition			Family/Household Type for TAC				
			At Least 1 Child Present	No Children, Householder or Spouse 62+	No Children, Non-Elderly, Family	No Children, Non-Elderly, Non-Family	Total
No	WCN proxy based on estimated subsidies	No or missing	2157427	795536	270470	1243916	4467349
		Yes	2901129	612069	413048	2659464	6585710
	Total		5058556	1407605	683518	3903380	11053059
Yes	WCN proxy based on estimated subsidies	No or missing	525520	1203996	214672	708628	2652816
		Yes	699520	813881	252248	853541	2619190
	Total		1225040	2017877	466920	1562169	5272006

At 2.6 million, the estimate of WCN among adult disabled households is even higher than the 2009 estimates in Table 4 based on disabled adults from the NHIS (1.8 million) or the SIPP (2.0 million).

As an initial attempt to extend this analysis to smaller areas within the ACS, Figure 1 shows state data on the number of adult nonelderly disabled households with worst case needs by state.

These initial results suggest that with further work on to develop truly comparable shared variables and improved models the possibility exists to use the ACS to more accurately estimate housing characteristics that are only measured in the AHS for smaller areas and populations. The results of our modeling efforts have steadily improved and we are optimistic they can be improved further.

Figure 1



There are of course also reasons for pessimism. First, while there remain numerous variables and variable combinations to be considered and tested, the number of relevant variables in the ACS is limited. More importantly, perhaps housing subsidy programs themselves are highly varied, and since none is an entitlement the receipt and use of housing subsidies is particularly idiosyncratic.

The multivariate methods described here may eventually prove better suited to other dependent variables and addressing different policy questions.

Conclusions

Based on our earlier research (Nelson, 2008) we asked three technical questions related to the relationship between the ACS and the AHS as concerns households with members with disabling conditions.

1) Do AHS and ACS, asking the same six-question sequence, similarly identify the disabled, especially for adults younger than 62? More basically and importantly, although harder to judge, how well do the AHS and ACS estimates identify the "true" number of households and persons with disabling conditions?

2) Do AHS and ACS similarly identify severe and moderate housing problems?

3) Can we develop multivariate model(s) from AHS data that could estimate worst case needs of disabled persons from ACS data better than the simple approach of assuming that AHS national relationships hold for ACS data?

As our results show, the answer to our first question is a clear "No." Despite using the same questions, we found, contrary to our original expectation, that the ACS' estimates of the number of households having persons with disabling conditions are some 50% higher than those recorded by the AHS. Moreover, both responses to other questions on the AHS and ACS and other research imply that the 6-question sequence fails to identify all persons with disabilities.

The answer to the second question is a qualified "Yes". Comparisons of shared housing and income variables appear to be valid although the lack of specific HUD income limits on the ACS, requiring either state or PUMA based estimates, limits the comparisons that external researchers can make for many HUD program-specific questions.[24] The comparability of these variables provides the basis for using the disability control totals from the ACS and housing problem relationships from the AHS to develop estimates. It should be noted, however, that comparisons of ACS counts with NHIS and SIPP data imply that both the AHS and ACS estimates of the disabled population are low.

Though results for the multivariate exercise presented here must ultimately be judged disappointing, there is also strong reason for optimism that for some questions and variables the answer to our third question will also be yes.

[24] As Mierzwa, Nelson, and Newberger (2010) illustrate for Pennsylvania, because many PUMAs correspond to metropolitan areas, official HUD median income estimates could be assigned for most of the locations identified on ACS microdata.

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