Risk Models for Returns to Housing Instability Among Families Experiencing Homelessness

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Abstract

This study developed risk models for returns to housing instability (that is, homelessness and unstable doubling-up situations) among families exiting emergency shelter. Participants included 446 families randomly assigned to receive priority offers of long-term housing subsidies and 578 families randomly assigned to usual care in the Family Options Study, a multisite experiment designed to test the impact of various housing and service interventions for homeless families. Relationships between family features recorded at shelter entry and returns to housing instability 20 months later were examined empirically. Correlation, hierarchical logistic regression, and receiver operating characteristic curves were used to combine family features into predictive risk models. Results indicated that few observable family features beyond previous housing instability offered predictive utility. Access to long-term housing subsidies appears to reduce housing instability. Further research should examine whether disability benefits, reliable employment, or effective substance dependence treatment reduce housing instability.

Introduction

Family homelessness has been a persistent concern in the United States since the 1980s (Bassuk et al., 2014). Today, more than one-third of individuals experiencing homelessness live in families with children, and they face substantial challenges (Henry et al., 2016). Adults in homeless families have elevated rates of HIV/AIDS and tuberculosis (Kerker et al., 2011). Homeless mothers experience high rates of depression (Bassuk et al., 1998; Weinreb et al., 2006). Homeless children are more likely than others to experience asthma (Cutuli et al., 2010), obesity (Schwarz et al., 2007),

and cognitive and behavioral difficulties (Yu et al., 2008). Both homeless and highly mobile youth have poor academic performance (Cutuli et al., 2013; Fantuzzo et al., 2012; Obradović et al., 2009; Voight, Shinn, and Nation, 2012).

Doubling up, defined in this article as living with family or friends out of economic necessity, can also be harmful for families, although that is not always the case. Doubling up may be particularly harmful for families exiting emergency shelter, whose doubling-up options may be last resorts. Bush and Shinn (2017) find that family heads who doubled up after leaving emergency shelter reported mostly negative doubling-up experiences. Although doubling up improved some respondents' quality of life relative to emergency shelter, many respondents indicated feelings of impermanence, lack of autonomy, lack of privacy, and interpersonal conflict. Other negative experiences included exploitation, residential mobility, and unhealthy physical and social environments.

Family housing instability, defined here as experiencing homelessness *or* doubling up, is also costly to the American public, although Kertesz et al. (2016) highlighted the moral and strategic limits of addressing the issue on financial rather than humanitarian grounds. For example, emergency shelter is a major cost among families experiencing homelessness. Culhane et al. (2007) found that short-term and long-term shelter stays for families in Massachusetts cost $10,900 and $48,500, respectively. Gubits et al. (2016, 2015) reported that families who received usual care in the Family Options Study (that is, those not immediately referred to another housing intervention) used housing and service assistance costing approximately $30,000 and $41,000 over 20 and 37 months, respectively. A third study found that families experiencing first-time homelessness accrued homeless system costs between $3,184 and $20,031 (Spellman et al., 2010).

Other social costs of housing instability include child protection and health expenses. Children experiencing homelessness enter foster care at higher rates than their peers, and doubling up may draw attention from child protection services concerned about overcrowding, frequent moves, or domestic violence (Shdaimah, 2009; Zlotnick, 2009). Children in homeless families also receive more emergency room healthcare than do their housed counterparts (Shinn et al., 2008). To the extent that doubling up results in residential crowding, it may increase psychological distress (Evans, Lercher, and Kofler, 2002) and childhood asthma (Weitzman, Gortmaker, and Sobol, 1990), both of which might require emergency care.

Given the personal and social costs of housing instability, it is important to prevent not only first-time instability but *returns* to instability among families already in emergency shelter. However, allocating limited resources to families who will experience housing instability after leaving shelter is difficult. For example, of the minority of low-income families who experience homelessness, most experience single episodes (Culhane et al., 2007). Furthermore, families receiving long-term housing subsidies are even less likely to return to homelessness or to double up after leaving shelter than families without subsidies (Gubits et al., 2016, 2015). Directing limited housing assistance to sheltered families who need it most requires knowing which families will return to housing instability without that assistance. It also requires understanding why some families return to instability despite the advantage of long-term housing subsidies.

This study attempts to address the following questions concerning returns to housing instability after an initial shelter stay. First, can observable family features explain why some families return

to housing instability after exiting emergency shelter? Second, do families who return to housing instability after having used long-term housing assistance differ observably from families who return without having used such assistance? Because previous studies show large associations between long-term subsidies and housing stability, it is important to understand whether families receiving such assistance face housing barriers above and beyond housing affordability. Second, can family features be used to better allocate housing or other resources to families most likely to return to housing instability? Improved allocation does not replace the need to address structural drivers of housing instability like unaffordable housing or limited employment opportunities (Shinn, Baumohl, and Hopper, 2001). However, more efficient allocation could create a better fit between households' apparent needs and the assistance they receive.

Literature Review

Policymakers seeking to prevent families from experiencing housing instability face a dilemma. Most families at risk for losing housing at any given time avoid it. Thus, assuming families who experience housing instability share identifiable, internal qualities that set them apart from housed families offers the appeal of predictability. If groups of families who share distinctive features disproportionately experience housing instability, prevention resources could be targeted more efficiently by directing them toward households that possess those features. This goal is supported modestly by studies demonstrating some predictive utility of actuarial predictions in homelessness research (Greenberg et al., 2006; Greer et al., 2016; Hudson and Vissing, 2010; Shinn et al., 2013, 1998). It is also supported by correlations between housing instability and family features like previous homelessness (Shinn et al., 2013; Smith and Flores, 2005; Weitzman, Knickman, and Shinn, 1992), threatened or actual domestic violence (Smith and Flores, 2005; Weitzman, Knickman, and Shinn, 1992; Wood et al., 1990), and limited social support (Bassuk et al., 1997; Wood et al., 1990). Although fewer family features have been associated with doubling up, heads of doubled-up families are more likely to be younger and have less education and work experience (Winkler, 1993).

However, some researchers challenge the notion that families nearing housing instability can be identified by observable features. They argue that political-economic factors leave all poor families precariously housed, and that events like homeless episodes result from "bad luck" or unpredictable events endemic to poverty (O'Flaherty, 2010). According to this perspective, resources needed to identify highly vulnerable families are better used removing structural barriers to housing stability among all low-income families. This position is supported by inefficiencies in multivariate prediction models for homeless entry (Shinn, Baumohl, and Hopper, 2001) and similarities between homeless and housed low-income families (Bassuk et al., 1998; Goodman, 1991).

The search for observable risk factors extends beyond first-time housing instability to include *returns* to instability. This distinction is important, because one could argue that, although single episodes of housing instability reflect economic circumstances, multiple episodes reflect family features. Family features that are correlated with homeless reentry include pregnancy, eviction, or low income prior to shelter entry (Lin and Smith, 2004a; Wong, Culhane, and Kuhn, 1997) and younger heads of household (Lin and Smith, 2004b; Shinn et al., 1998; Wong, Culhane, and Kuhn, 1997). Variables with inconsistent relationships to repeated homelessness include

number of children (Lin and Smith, 2004b; Rodriguez, 2013; Wong, Culhane, and Kuhn, 1997) and minority racial status (Lin and Smith, 2004b; Wong, Culhane, and Kuhn, 1997). Receiving subsidized housing is consistently reported as a protective factor after a homeless episode (Lin and Smith, 2004b; Stojanovic et al., 1999; Wong, Culhane, and Kuhn, 1997). To our knowledge, no study explicitly examines characteristics of families who double up *after* exiting emergency shelter. However, Shinn et al. (1998: 1652) defined stability as living in "one's own residence" for a year without a move nearly 5 years after shelter entry.

Noting the potential benefits of targeting prevention resources based on observable risk, researchers attempted to combine features correlated with family homeless entry into risk models. Such models enable researchers to determine the ability of a combination of variables to efficiently predict an outcome based on hit rates (that is, sensitivity) and false alarm rates (that is, 1-specificity). The hit rate is the proportion of correct predictions of an outcome among those who actually experience that outcome. The false alarm rate is the proportion of incorrect predictions of an outcome among those who do not experience it. Each model has multiple hit rates and corresponding false alarm rates, depending on the stringency of the risk cutoff used. That is, when returns to housing instability are predicted even for families with few risk factors, both hit rates and false alarm rates are high. Conversely, when the cutoff is set at higher levels of risk, both hit rates and false alarm rates decrease.

In one study of families using welfare in New York City, Shinn et al. (1998) correctly predicted shelter entry for 66 percent of families although incorrectly predicting entry for 10 percent of families. In a similar study, Shinn et al. (2013) developed a screening model to help prevention programs allocate resources to New York City families at risk for homelessness. Allocating services according to the model rather than worker decisions improved the correct prediction rate from 71.6 to 90.4 percent while serving the same percentage of clients. However, this model incorrectly predicted shelter entry for 65.7 percent of families who remained housed. Achieving the previous study's 10 percent false prediction rate using this model would require reducing the rate of correct predictions to approximately 33 percent. Together, these studies suggest that predicting housing instability is possible but limited.

Studies rarely organize correlates of returns to housing instability into risk models. In one exception, Shinn et al. (1998) found subsidized housing and age to be the most potent predictors of housing stability after shelter entry. Lin and Smith (2004a) also modeled family risk factors for shelter reentry but noted imperfect measures of substance use, public assistance, and domestic conflict as study limitations. Because both studies focused on data from New York City, models for other locations can help to generalize their results.

Hypotheses

This study examines risk factors for family returns to housing instability after shelter exit and attempts to create risk models for such returns. Based on previous findings, we propose the following four hypotheses. First, we hypothesize that several family features measured at shelter entry will predict returns to housing instability 20 months later. This hypothesis follows the assumption that some groups face increased barriers to stable housing after a homeless episode. Second, we hypothesize that risk factors will not consistently include internal characteristics such as substance dependence or psychological distress.

Third, we hypothesize that protective factors *will* include economic supports like disability income and long-term housing subsidies. Finally, we hypothesize that predictive models composed of family features will add weak predictive utility over and above chance among families *not* using a long-term form of housing subsidies. Because families returning to housing instability after using these subsidies may have more acute challenges, models in this group may have stronger predictive power. Weak predictive models would extend support for O'Flaherty's (2010) "bad luck" thesis beyond homeless entry to repeated housing instability in general. If strong models are created, they can be used to better allocate resources to families exiting shelter.

Methods

This study analyzes data from the Family Options Study (Gubits et al., 2015), an experimental evaluation of housing and service interventions for families experiencing homelessness. Researchers randomly assigned 2,282 families to usual care or to priority offers of long-term housing subsidies, project-based transitional housing, or short-term rapid re-housing subsidies. They also recorded family features through surveys administered at shelter entry and housing stability outcomes through surveys administered 20 months later. Intermediate surveys administered 6 and 12 months after shelter entry supported housing stability outcome data. Public and Indian Housing Information Center (PIC) data also provided information on housing assistance received through the U.S. Department of Housing and Urban Development's Housing Choice Voucher and public housing programs. Tenant Rental Assistance Certification System (TRACS) data provided information on housing assistance received through project-based Section 8 programs (Gubits et al., 2015).

Participants

Families enrolled in the Family Options Study as they entered emergency shelter between September 2010 and January 2012 in 1 of 12 communities: Alameda County, California; Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Denver, Colorado; Honolulu, Hawaii; Kansas City, Missouri; Louisville, Kentucky; Minneapolis, Minnesota; New Haven and Bridgeport, Connecticut; Phoenix, Arizona; and Salt Lake City, Utah. Study eligibility required families to be in shelter for at least 7 days with at least one child age 15 or younger. Participants in this study come from the set of 1,857 Family Options Study households that completed surveys at *both* shelter entry (the point of random assignment) and the 20-month followup (81 percent of original sample). This analysis focused on two groups of families who enrolled in the study. To examine predictors independent of housing intervention effects, the first group included families randomly assigned to the usual care group. Usual care was defined as "any housing or services that a family accesses in the absence of immediate referral to the other interventions" (Gubits et al., 2015: 11). Of the 746 families assigned to usual care, 578 families (77.5 percent) completed followup surveys and were included in this study. The second participant group included families who were randomly assigned to the long-term subsidy group *and* were able to successfully lease a housing unit using that assistance. This group was included in order to examine why some families returned to housing instability after accessing long-term subsidies, which have been shown to decrease the odds of such an outcome (Gubits et al., 2015). Of the 599 families assigned to priority offers of long-term subsidies, 530 families (88.5 percent) completed the 20-month followup survey. The final subsidy-only group

included 446 participants who leased up using subsidies, or 84.2 percent of long-term subsidy families who completed the followup survey. Demographic information for both participant groups is provided in exhibit 1.

Exhibit 1

Baseline Features of Participating Families: 12 U.S. Communities, September 2010 to October 2013

	Usual Care (n = 578)	Long-Term Housing Subsidies (n = 446)
Demographics		
Median age	29.0	28.0
Female (%)	93.1	93.2
Race[a] (%)		
Black non-Hispanic	41.6	36.5
Hispanic	21.7	25.1
Asian/Pacific Islander	7.5	6.4
Mixed or other	9.1	11.7
Marriage-like situation[b] (%)	28.3	25.0
Median number of children	2.0	2.0
Child 1–5 years old (%)	63.4	66.4
Multiple adults in shelter (%)	30.0	26.0
Human capital (%)		
Education level[c] (%)		
High school	32.7	40.8
Greater than high school	27.4	25.1
No work in 24 months (%)	33.0	32.1
Receives TANF (%)	40.4	47.6
Receives SSI/SSDI (%)	12.3	9.8
Median annual income ($) (SD)	2,315 (6,213)	1,619 (4,837)
Psychosocial profile		
Fair or poor health (%)	30.9	29.9
Health problem (%)	64.5	56.9
Behavioral health problem (%)	8.6	6.1
Personal disability (%)	17.1	16.2
Family disability (%)	16.8	16.2
Psychological distress (%)	24.2	23.1
Post-traumatic stress disorder (%)	24.0	2.8
Substance dependence (%)	21.1	16.9
Felony history (%)	13.7	12.1
Mean Psychosocial Challenge Index (SD)	2.3 (2.1)	2.2 (2.0)
Interpersonal disruption (%)		
Interpersonal violence	50.1	48.9
Separation from child	23.2	24.9
Separation from partner	9.5	9.6
Childhood experiences (%)		
Foster care in childhood	24.0	27.7
Homeless in childhood	16.1	16.7
Housing security history and barriers		
Previously homeless (%)	62.8	63.5
Previously doubled up (%)	84.9	84.2
Eviction or landlord problems (%)	45.0	42.0
Mean Housing Barriers Index (SD)	6.5 (2.8)	6.6 (2.9)

SD = standard deviation. SSI/SSDI = Supplemental Security Income or Social Security Disability Insurance. TANF = Temporary Assistance for Needy Families.

[a] Reference group is White non-Hispanic.

[b] Reference group is respondents who are divorced, widowed, or single and never married.

[c] Reference group is less than high school education.

Measures

Study variables were chosen based on their importance in the literature and their availability in Family Options Study data. Although using these data enabled us to examine nearly all key variables, we were unable to examine social support.

Family Features: Family Options Baseline Survey

Respondents reported on family features in the Family Options baseline survey. Family features are organized here according to categories provided in exhibit 1.

- **Demographics.** Dummy variables in this category included sex; a series of race and ethnicity variables comparing those identifying as Black non-Hispanic, Hispanic or Latino, Asian or Pacific Islander, or multiple or other races with White non-Hispanics; a variable for respondents who were married or living in a marriage-like situation; baseline pregnancy status; the presence of a child between 1 and 5 years old; and the presence of more than one adult in shelter. Respondents' age and number of children in shelter were measured continuously. After determining that individual racial categories did not significantly predict outcomes, we collapsed the race and ethnicity variables into a dummy variable comparing all minority race and ethnicity groups with White non-Hispanics.
- **Human capital.** Dummy variables in this category included two education variables comparing those with high school or greater than high school education with those with less than a high school education; a variable indicating long-term unemployment (more than 24 months); and two public assistance variables indicating receipt of Temporary Assistance for Needy Families benefits or disability benefits (Supplemental Security Income [SSI] or Social Security Disability Insurance [SSDI]). Annual family income was measured continuously.
- **Psychosocial profile.** Dummy variables in this category included a variable comparing respondents reporting poor or fair health with those reporting good health; a variable indicating the respondent reported a health problem; a variable indicating the respondent reported a behavioral health problem, including attention deficit disorder and attention deficit hyperactivity disorder, depression, or bipolar; two disability variables indicating the respondent reported a personal disability or reported caring for a family member with one; and a variable indicating the respondent had a past felony conviction.

Several dummy variables were adapted from standard measures of behavioral health issues. A psychological distress variable adapted from the Kessler 6 Psychological Distress Scale indicated the respondent reported serious psychological distress (Kessler et al., 2003). This scale ranges from 0 to 24, with higher scores indicating more distress, and scores of 13 or higher indicating serious distress. In a sample of 155 respondents, Kessler 6 displayed a Cronbach α of 0.89 and predicted serious distress with a sensitivity of 0.36 and a specificity of 0.96 (Kessler et al., 2003). A variable indicating the respondent experienced post-traumatic stress symptoms in the previous month was adapted from the Posttraumatic Diagnostic Scale (Foa et al., 1997). This scale is based on diagnostic criteria for post-traumatic stress disorder. Its internal consistency is 0.92, and its kappa test-retest reliability is 0.74 (Foa et al., 1997). Scores are positively associated with measures of depression (that is, Beck Depression Inventory) and anxiety (that is, State-Trait Anxiety Inventory).

An alcohol dependence variable was adapted from the Rapid Alcohol Problems Screen (Cherpitel, 2000). In a sample of emergency room users, positive responses to any item on this scale identified alcohol dependence with 93 percent sensitivity and 87 percent specificity (Cherpitel, 2000). Finally, a drug dependence variable was adapted from the Drug Abuse Screening Test (Skinner, 1982; Yudko, Lozhkina, and Fouts, 2007). This test is correlated with the theoretically related Addiction Severity Index Psychiatric Composite Score ($r = 0.40$; Cocco and Carey, 1998). It also displays sensitivity scores between 41 and 95 percent and specificity scores between 68 and 99 percent (Carey, Carey, and Chandra, 2003).

In the interest of model parsimony, measures of alcohol and drug dependence were combined into a single substance dependence dummy variable. The Psychosocial Challenge Index was measured continuously. This index is a count of psychological and social circumstances related to housing instability. Such circumstances include health, mental health, and substance use challenges, intimate partner violence, felony history, and institutional experience (Gubits et al., 2015).

- **Interpersonal disruption.** Dummy variables in this category included a variable indicating the respondent experienced interpersonal violence during adulthood and two family separation variables indicating the respondent was currently separated from a child or a partner.
- **Childhood experiences.** This category included two dummy variables for any homeless episode in childhood and any foster care experience in childhood.
- **Housing stability history and barriers.** Dummy variables in this category included any homeless episode in the previous 5 years, any previous doubling-up experience, and past eviction or landlord problems. The Housing Barriers Index was measured continuously. This index was a count of 15 factors that families entering shelter might perceive as impediments to stable housing. Such factors included unemployment, insufficient income, previous evictions or lease violations, insufficient transportation, and family composition (Gubits et al., 2015).

Outcomes: Returns to Housing Instability

Three dummy variables were used to measure returns to housing instability. The first was a variable indicating that a family spent a night in emergency shelter in the 12 months preceding the followup survey. Data for this variable came from program usage data based primarily on homeless management information systems at participating sites. Homeless management information systems are community-level electronic databases that collect basic information on households that access homeless assistance programs in a given community. In this study, data from these systems were supplemented by Family Options 6- and 12-month tracking surveys, PIC files, and TRACS files (Gubits et al., 2015). The second and third housing instability dummy variables measured self-reported homelessness in the 6 months preceding followup and self-reported doubling up during those 6 months. Data for both variables came from the Family Options Study 20-month followup survey.

Analyses

Three risk models were created for each housing instability outcome by regressing outcomes on the family features in exhibit 1. Predictor variables were entered into a given outcome model if they correlated to that outcome at $p < .1$.

Model Reduction via Backward Regression

After developing full models, final trimmed models were created using backward logistic regression. In this method, nonsignificant variables were removed from full models until only predictors that were significant at $p < .05$ remained. To account for differences between intervention sites, all logistic regressions were two-level hierarchical models with intercepts varying randomly between sites. Next, each eliminated variable was individually reintroduced to its final model to verify its nonsignificance in the context of other variables. All previously excluded variables remained nonsignificant. The final models for families assigned to usual care and those who leased up with long-term housing subsidies are shown in exhibits 2 and 3, respectively.

Exhibit 2

Predictors of Returns to Homelessness Among Participants Randomly Assigned to Usual Care: 12 U.S. Communities, September 2010 to October 2013

Predictor	Prevalence in Full Sample (%)	Emergency Shelter (AUC = 0.71)				Self-Report (AUC = 0.67)				Doubled Up (AUC = 0.69)			
		Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI	Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI	Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI
SSI/SSDI	12.27	– 5.73	0.39**	0.32***	[0.16, 0.61]	– 2.38	0.73			– 2.86	0.61†		
Previously homeless	62.82	+ 6.63	1.69**	1.71**	[1.18, 2.49]	+ 4.08	1.14			– 1.16	0.90		
Previously doubled up	84.87	– 1.45	0.84			+ 0.26	1.03			+ 6.21	2.53***	2.16**	[1.27, 3.67]
Substance abuse	21.07	– 0.18	1.11			+ 3.30	1.10			+ 7.41	1.59*	1.52*	[1.03, 2.25]
Any child not with family	23.19	+ 3.19	1.30			+ 11.31	2.11***	2.10***	[1.42, 3.10]	+ 5.37	1.30		
No work in 24 months	33.03	+ 4.76	1.31			+ 7.58	1.59*	1.58*	[1.10, 2.27]	– 0.08	1.03		
Fair or poor health	30.89	– 5.19	0.79			+ 0.88	1.05			+ 2.93	1.14		
Two or more adults in shelter	29.98	+ 1.22	0.91			– 3.49	0.74			– 1.64	0.86		
Any felony	13.70	+ 0.04	1.23			+ 3.57	1.13			+ 3.32	1.14		
Mean age (SD)	31.27 (10.41)	+ 1.58 (+ 0.93)	1.03**	1.04***	[1.02, 1.06]	+ 0.37 (– 0.27)	1.01			– 1.48 (– 0.95)	0.97***	0.97**	[0.95, 0.99]
Mean Psychosocial Challenge Index (SD)	2.25 (2.10)	– 0.18 (+ 0.02)	0.99			+ 0.19 (+ 0.16)	1.03			+ 0.34 (+ 0.10)	1.12*		

AUC = area under the curve. CI = confidence interval. OR = odds ratio. SD = standard deviation. SSI/SSDI = Supplemental Security Income or Social Security Disability Insurance.
*Notes: N = 578. † p < .10; * p < .05; ** p < .01; *** p < .001. All analyses weighted for survey nonresponse. Psychosocial Challenge Index score significantly contributes to the final doubled-up model when substance abuse is excluded. In this scenario, doubled-up AUC remains 0.69, and OR for age, previous doubling-up experiences, and Psychosocial Challenge Index score are 0.97** [0.95, 0.99], 2.10** [1.23, 3.56], and 1.12* [1.02, 1.23], respectively.*

Exhibit 3

Predictors of Returns to Homelessness Among Participants Leased Up With Long-Term Subsidies: 12 U.S. Communities, September 2010 to October 2013

Predictor	Prevalence in Full Sample (%)	Emergency Shelter (AUC = 0.91)				Self-Report (AUC = 0.77)				Doubled Up (AUC = 0.82)			
		Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI	Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI	Group Prevalence Deviation (%)	Individual OR	Final Model OR	Final Model CI
SSI/SSDI	9.82	– 2.26	0.81			+ 3.16	1.25			+ 1.52	1.06		
Previously homeless	63.54	– 2.80	1.08			+ 15.20	2.26†			+ 19.64	2.89*	2.67*	[1.10, 6.44]
Previously doubled up	84.15	– 11.63	0.30**	0.31*	[0.13, 0.77]	+ 12.98	7.32*	7.37*	[1.01, 54.00]	+ 10.04	2.63		
Substance abuse	16.87	– 1.90	1.11			+ 5.25	1.62			+ 2.36	1.12		
Any child not with family	24.89	+ 1.86	1.84			+ 18.06	2.50**	2.19*	[1.05, 4.54]	+ 14.91	1.88†		
No work in 24 months	32.09	+ 9.88	1.86†			+ 8.41	1.47			+ 17.84	2.26*	2.29*	[1.15, 4.54]
Fair or poor health	29.92	+ 17.30	3.03**	3.57**	[1.65, 7.72]	+ 10.96	1.35			+ 4.69	1.06		
Two or more adults in shelter	26.00	+ 19.46	4.08***	4.33***	[1.97, 9.51]	– 3.79	0.88			+ 0.82	1.18		
Any felony	12.09	+ 3.61	2.61†			+ 14.34	2.88*	2.51*	[1.08, 5.87]	3.90	1.07		
Mean age (SD)	30.07 (8.86)	+ 1.20 (– 0.25)	1.02			+ 0.77 (– 0.72)	1.01			+ 0.69 (+ 0.83)	1.01		
Mean Psychosocial Challenge Index (SD)	2.17 (1.99)	– 0.19 (+ 0.38)	1.08			+ 0.74 (+ 0.21)	1.15			+ 0.81 (+ 0.23)	1.24*		

AUC = area under the curve. CI = confidence interval. OR = odds ratio. SD = standard deviation. SSI/SSDI = Supplemental Security Income or Social Security Disability Insurance.
*Notes: N= 446. † p < .10; * p < .05; ** p < .01; *** p < .001. All analyses weighted for survey nonresponse.*

Testing Model Efficiency

Next, we examined the efficiency of the final trimmed models using receiver operating characteristic (ROC) curves that show each model's hit rates against false alarm rates for all possible decision thresholds (cutoff points for predicted values in the model). Comparing the height of a curve on the vertical axis (that is, hit rate) with its corresponding position along the horizontal axis (that is, false alarm rate) determines efficiency. Curves approaching the upper-left corner of the figure, where hit rates are high even when false alarm rates are low reflect, strong predictive models. The area under the curve (between the curve and a diagonal line representing chance, or zero diagnosticity, indicates the overall efficiency in the model.

ROC curves enable policymakers to decide the hit rate that can be achieved if a given false alarm rate is tolerable, or alternatively the proportion of a population that would need to receive a perfectly successful intervention in order to avert a given proportion of adverse outcomes (Swets, 1988, 1973).

Results

The following section describes final predictive models for self-reported returns to homelessness, emergency shelter returns, and doubling-up experiences. ROC curves for both the usual care sample and the long-term housing subsidy sample are also presented.

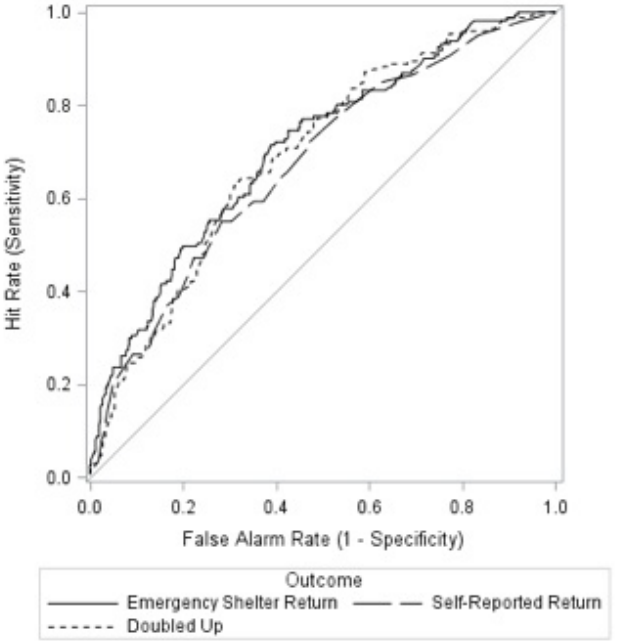
Usual Care Sample

Exhibit 2 reports risk factors for the three housing instability outcomes in the usual care sample (N = 578). Each predictor's final model odds ratio is adjusted to include other family features predicting that outcome at $p < .05$. Exhibit 2 also provides the prevalence of each feature in the total usual care sample and among respondents experiencing each outcome. Exhibit 4 shows ROC curves for each final model.

Three variables predicted returns to emergency shelter in the final model (n = 161). Odds of returning to shelter were higher for heads of household who were older or had previous homelessness experiences. Receiving SSI or SSDI benefits was associated with a lower chance of returning to shelter. Two variables contributed to self-reported returns to homelessness in the final model (n = 140). Odds of this outcome were higher for families who had a child separated from the family or whose head of household had not worked in the previous 24 months at study outset. Three variables contributed to self-reported doubling up (n = 171). As for emergency shelter returns, age mattered. However, in this case younger respondents were more likely to double up. Variables associated with higher odds of doubling up included previous doubling-up experiences and substance dependence. The Psychosocial Challenge Index score was associated with higher odds of doubling up as an individual variable but did not contribute in the context of other variables. As exhibit 4 shows, the areas under the curve for the final emergency shelter returns, self-reported homelessness returns, and doubled-up models were 0.71, 0.67, and 0.69, respectively. Together, they indicate that one could correctly predict between 25 and 30 percent of returns to housing instability if accepting the 10 percent false positive rate from Shinn et al. (1998). The appropriateness of using that rate in the present study is discussed in the following section.

Exhibit 4

Final Model ROC Curves for Usual Care Outcomes



ROC = receiver operating characteristic.

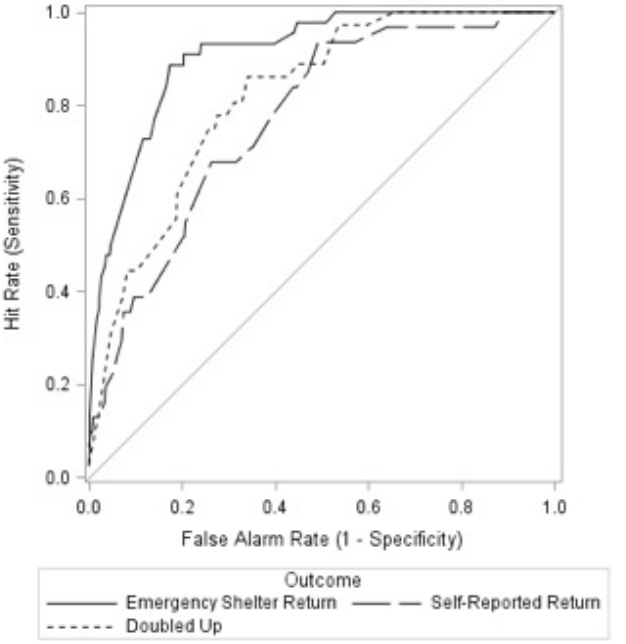
Long-Term Housing Subsidy Sample

Exhibit 3 presents parallel models for participants who were assigned to and leased up with long-term housing subsidies (N = 446). Importantly, each housing instability outcome was relatively rare among families who had leased up with long-term subsidies, affecting under 10 percent of the sample.

Three variables contributed to returns to emergency shelter in the final model (n = 44). Odds of returning to shelter were lower for respondents who had previously doubled up and higher for respondents reporting poor or fair health or multiple sheltered adults in the family. Three variables contributed to self-reported returns to homelessness in the final model (n = 31). As with emergency shelter returns, previous doubling-up experiences were associated with higher odds of return. However, past felonies and separation from a child in shelter were also associated with higher odds of return. Two variables contributed to self-reported doubling up in the final model (n = 36). Once again, previous homelessness was associated with higher odds of experiencing the outcome. Odds of doubling up were also higher among respondents who had not worked in the previous 24 months. The Psychosocial Challenge Index score was associated only with higher odds of doubling up as an individual variable, not in the final model. As exhibit 5 shows, the areas under the curve for the final emergency shelter returns, self-reported returns, and doubled-up models were 0.91, 0.77, and 0.82, respectively. Together, the models indicate that one could

Exhibit 5

Final Model ROC Curves for Long-Term Housing Subsidy Outcomes



ROC = receiver operating characteristic.

correctly predict approximately 38 percent of self-reported returns to homelessness and 45 percent of doubling-up experiences if accepting Shinn et al.'s (1998) 10 percent false positive rate. One could predict nearly 70 percent of returns to emergency shelter with the same false positive rate.

Discussion

Overall, findings suggest that observable features of low-income families are weak predictors of future housing instability findings, supporting O'Flaherty's (2010) "bad luck" argument. Among the group of families who were assigned to receive usual care, few family features predicted returns to housing instability. ROC curves for the usual care sample indicate that one can correctly predict only about one-fourth of returns to housing instability while maintaining a false alarm rate of 10 percent. One could use this study's models to predict more returns to housing instability by also accepting a higher false alarm rate. Conversely, one could preserve resources by predicting fewer returns to housing instability, although doing so would result in a lower hit rate. Deciding where to place a prediction cutoff in models like these is a political, moral, and practical act. Those who determine where to place such cutoffs must consider the personal and social costs of housing instability, as well as competing spending priorities.

The findings from the usual care group suggest that past experiences of a particular type of housing instability predict future experiences of that same type. For example, families with homeless

episodes prior to their enrollment in the Family Options Study returned to shelter more frequently than other families, and those who had previously doubled up were more likely than other families to double up again. These findings add to previous research that suggests past housing instability predicts future instability (Greer et al., 2016; Shinn et al., 1998), along with a vast social science literature suggesting that past behavior is a good predictor of subsequent behavior.

Age predicted both returns to emergency shelter and doubling-up experiences, although in opposite directions. The finding that younger heads of household doubled up more frequently is consistent with previous research (Pilkauskas, Garfinkel, and McLanahan, 2014). As heads of household get older, access to reasonable doubling-up options may decline, leading them to return to shelter instead of staying with family or friends. Although both age effects were statistically significant, each had a limited influence on housing instability outcomes. A 10-year increase in age was associated with 48 percent higher odds of returning to emergency shelter and 26 percent lower odds of doubling up.

Findings suggested a relationship between economic assistance and housing stability. Receiving SSI or SSDI was associated with a lower likelihood of returning to emergency shelter. Also, as reported previously (Gubits et al., 2015) and seen again here, housing subsidies reduced all forms of housing instability dramatically. Although substance dependence predicted doubling up and long-term unemployment predicted self-reported returns to homelessness, these relationships should be understood within the context of systemic influences like limited job opportunities and low wages (O'Connor, 2001).

The finding that families with children separated at shelter entry experienced more self-reported returns to homelessness may highlight the challenges of "invisible mothers." This term refers to mothers who attempt to remain connected with separated children while also navigating homelessness (Barrow and Laborde, 2008). Previous research notes that family homelessness may be a strong contributor to child separations (Cowal et al., 2002). Furthermore, caregivers living away from one child at shelter entry may also be more likely to become separated from more children during the course of housing instability. Caregivers who are separated from all children may become ineligible for services reserved for families with children, increasing their likelihood of returning to homelessness.

Predictive power was somewhat greater for families who had leased up with a long-term housing subsidy. It is possible that the few families who returned to homelessness and doubled-up situations after using long-term subsidies had clearer family-level housing barriers than families who returned without access to subsidies. In this study, each long-term subsidy model, especially the one predicting emergency shelter returns, improved on its usual care counterpart. Nevertheless, the modest predictive power of these models taken together is consistent with O'Flaherty's (2010) "bad luck" argument.

Findings in the long-term subsidy group may also support economic strategies for addressing housing instability. One example is the disappearance of the protective effect of disability income among families receiving long-term subsidies. In an economic construction of poverty, disability income reduces returns to housing instability by increasing the ratio of income to housing cost.

However, subsidies hold families' housing costs to 30 percent of income irrespective of source, making disability income less important. Although long-term unemployment influenced doubling-up experiences, it failed to predict other outcomes.

Some results of this study were unexpected. The reasons why previous doubling-up experiences were associated with lower odds of returning to emergency shelter among families receiving long-term subsidies are not clear. However, one explanation is that returns to other forms of housing instability served as alternatives to returns to emergency shelter, lowering the odds of that outcome. Previous doubling-up experiences were significantly correlated with self-reported returns to homelessness, $r = 0.10$, $p = 0.04$, and marginally correlated with subsequent doubling-up experiences, $r = 0.08$, $p = 0.09$. Also, the reason that reporting a felony at shelter entry predicted self-reported returns to homelessness for families who randomly received and subsequently used priority access to long-term subsidies but not for those randomly assigned to receive usual care is not clear. One explanation is that those with felonies at shelter entry may be more likely to violate publicly subsidized leases (Housing Authority of the City of Alameda, 2016).

Also, the finding that families with multiple adults were more likely to return to emergency shelter was interesting. This outcome is reported in previous studies and merits further discussion (Lin and Smith, 2004b; Rog et al., 2017; Shinn et al., 1998; Wood et al., 1990). Although Wood et al. (1990) reported similar findings, they attributed these findings to a set of policies that are no longer operational. At the time of their publication, the authors noted that two-parent families often did not qualify for programs like Medicaid, Homeless Assistance Program, and Aid to Families with Dependent Children (AFDC). However, in 1996, the Personal Responsibility and Work Opportunity Act replaced AFDC with Temporary Assistance for Needy Families, or TANF, which treats one- and two-parent families similarly in most states (Hahn et al., 2016). The data in Shinn et al. (1998) were also collected while AFDC was still operational.

Partners in shelter with mothers experiencing homelessness may serve as a destabilizing force. Partners may increase the likelihood of returning to shelter by increasing the number of family members capable of committing a lease violation. Lease agreements are often written such that terminations can result from the activity of any household member (Housing Authority of the City of Alameda, 2016). Additional adults may also be more difficult for mothers to support financially if those adults do not contribute to household earnings. A recent report reviewing family homelessness in one state observes that the average size of homeless families is growing due to an increasing number of spouses and partners living with the family (Rog et al., 2017). The same report suggests that larger families experience longer shelter stays and more returns to shelter.

Policy Recommendations

Inconsistency among predictive variables in this study raises the possibility of spurious results, making broad policy conclusions difficult to draw. However, findings still suggest potential policy directions for increasing housing stability among families leaving homelessness. The small number of families experiencing housing instability after using long-term housing subsidies suggests that these subsidies may help prevent homelessness and unstable doubling-up experiences among families leaving shelter. Making reliable employment and effective substance dependence treatment

available on shelter exit may reduce returns to housing instability, although this conclusion is extremely tentative. Our finding that long-term unemployment and substance dependence each predicted housing instability is tempered by the fact that neither predictor was consistent across outcomes or study groups.

Our finding that families assigned to usual care and receiving SSI or SSDI income had fewer returns to emergency shelter suggests this income may protect against sheltered homelessness. However, our results provide no evidence that this income protects against other forms of housing instability or assists families already receiving comparable economic support. The SSI/SSDI Outreach, Access, and Recovery program sponsored by the Substance Abuse and Mental Health Services Administration has a successful history of improving access to SSI and SSDI income among individuals experiencing homelessness. This program should be explicitly evaluated among families who are homeless or doubled up (Dennis et al., 2011). Ultimately, this study indicates that targeting resources based on predicted risk of future housing instability may be a limited endeavor. Although our findings suggest caseworkers should assess families' housing histories when deciding who most needs prevention resources, assessing other family features seems unlikely to improve resource allocation.

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