Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) Study

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

PD&R

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Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) Study

Final Report

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Acknowledgments

Foreword

Significant turnover occurs in U.S. Department of Housing and Urban Development (HUD) housing assistance, with a current median length of subsidy receipt of about 5 years for families with children. However, to date, little systematic research exists on the short- or long-term outcomes of households who leave HUD-assisted housing or on positive and negative exits for most HUD programs.

In 2020, HUD's Office of Policy Development and Research announced funding for research to help us learn more about how households that exit HUD-assisted housing fare after exit, and to help HUD and housing providers identify ways to support positive exits and improve long-term outcomes. To conduct this research, HUD asked research grant applicants to leverage HUD administrative data on tenants by linking it with other secondary longitudinal data sources.

This report, *Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) Study*, is one of two exploratory studies supported by those research grants. The research team linked HUD administrative data on assisted tenants with eight secondary data sources for households in the Seattle-King County, Washington, area to examine three research questions: 1) What constitutes a positive or negative exit from HUD-assisted housing? 2) What factors are associated with each exit type? 3) Is a positive exit associated with better post-exit outcomes than a negative exit?

The study leveraged Data Cross Sectors for Housing and Health, a successful 5-year housing and health collaborative between Public Health—Seattle & King County, King County Housing Authority, and Seattle Housing Authority designed to provide public housing authorities with information about healthcare utilization for the residents they serve. The study included a sample of 8,266 households who exited HUD-assisted housing programs.

The research team classified 13.5 percent of those exits as "positive," 31.6 percent as "negative," and 54.9 percent as "neutral." Positive exits involved "increased income, attaining homeownership, and moving to nonsubsidized rentals," and negative exits involved "eviction, lease violations, criminal activity, or abandoning the property." Other exits, such as health- or family-related factors, were classified as neutral because they could not be clearly identified as positive or negative.

The high rate of negative exits—31.6 percent—is particularly troubling because the study showed that one-in-four of those households with negative exits experienced homelessness within 1 year of exit, compared with 3 percent of those with a positive exit. Those with positive exits were much less likely to have an emergency department visit in the year following exit and were also associated with much higher incomes before and after exit.

This study explored why people exit assisted housing and what happens to them following that exit. Given the high rate of negative exits and the high rate of homelessness associated with them, it is important that we continue to work with our housing partners to find best practices for reducing negative exits and expanding positive exits and outcomes for HUD-assisted households.

Solomon Greene
Principal Deputy Assistant Secretary for Policy Development and Research
U.S. Department of Housing and Urban Development

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Executive Summary

Introduction

In 2019, the U.S. Department of Housing and Urban Development (HUD) set a goal of increasing the proportion of households that exit HUD-supported housing for positive reasons (e.g., homeownership) (HUD, 2019). However, little is known about factors related to different types of exits from housing assistance, and outcomes that follow from exiting are even less well understood. To address that gap, this research sought to answer three key questions:

1. What constitutes a positive or negative exit from HUD-assisted housing?
2. What factors are associated with categories of exits (positive, neutral, negative)?
3. Is a positive exit from housing assistance associated with better post-exit outcomes than for residents who left for negative reasons?

The project was a collaboration between Public Health—Seattle & King County (PHSKC), King County Housing Authority (KCHA), and Seattle Housing Authority (SHA). The Washington State Institutional Review Board approved the research for this report.

Literature Review

A systematic literature review was conducted to examine what was already known about the key questions. After reviewing more than 7,000 titles and abstracts, only 26 documents were deemed relevant to the topic. Younger age, male gender, White race, smaller household size, and economic and rental market conditions are all associated with exiting housing assistance. However, very few studies looked at the relationship between demographic or economic factors and positive and negative exits. Receiving housing assistance during childhood is associated with positive outcomes later in life (Andersson et al., 2016; Aratani, 2010; Chetty, Hendren, and Katz, 2016; Newman and Harkness, 2002). People who exit housing for any reason tend to be in a more precarious position in terms of residential stability and income (Gubits, Khadduri, and Turnham, 2009; Kang, 2020; McInnis, Buron, and Popkin, 2007; Richter et al., 2021; Smith et al., 2014) Positive exits are associated with improved health and better housing situations (Smith et al., 2014). Full details of the literature review are in Chapter 2 and Appendix B.

Data Sources and Linkage

Several different administrative datasets were drawn on to examine outcomes following exit across multiple domains:

- PHA demographic data from data HUD Form 50058 Moving to Work, which collects data on households and individuals receiving federal housing assistance.
- Exit reasons collected on a separate form and stored by PHAs in a different data system.
- Behavioral Health and Recovery Division (BHRD) service data that include mental health and substance use claims.
- Employment Security Department (ESD) wage data.
- Healthcare for the Homeless Network (HCHN) data.
- Homeless Management Information System (HMIS) data.
- Medicaid claims data.

The authors used an existing multisector data system to link the data sources. The King County Integrated Data Hub (IDH) combines identities across several datasets, including BHRD, HCHN, HMIS, and Medicaid. The IDH uses a mix of probabilistic and deterministic methods to match individuals across data systems via a proprietary tool, Informatica. PHA data (HUD Form 50058 and exit data from both KCHA and SHA) were probabilistically linked on

name, Social Security number, date of birth, and gender. IDH, ESD, and PHA data were then linked using the same probabilistic approach.

After applying restrictions such as excluding exits due to death or transfers between PHA programs, the basis for most analyses was 8,266 heads of household (1,118 [13.5 percent] positive, 4,538 [54.9 percent] neutral, and 2,610 [31.6 percent] negative) and 16,301 individuals (17.8 percent positive, 49.0 percent neutral, 33.2 percent negative). Additional details are in Chapter 3 and Appendix C.

Exits and Types

Exit reasons and categories were standardized in consultation with the PHAs. Positive exits consisted of reasons that were perceived as likely to be associated with self-sufficiency—for example, increased income, attaining homeownership, and moving to nonsubsidized rentals. Negative exits—such as eviction, lease violations, criminal activity, or abandoning the property—were those expected to be associated with adverse life events and poorer outcomes. Several exit reasons could not be clearly identified as positive or negative and were classified as neutral; for example, exit for health reasons or moving in with friends and family could be associated with a positive or negative trajectory, depending on the circumstances. A full list of exit reasons and their categories is in Appendix D. Deaths, voucher expiration, and moving to nonsubsidized rentals were among the top causes of exit for both PHAs. Most other common exit reasons fell into the neutral category for both PHAs, although KCHA also had two positive reasons—being over income and attaining homeownership—in its top 10.

Factors Associated with Exits from Housing Assistance

After adjusting for other factors, male gender, receiving a project-based voucher, homelessness within the previous 3 years, and having a behavioral health crisis event or emergency department (ED) visit were all associated with increased odds of exits of any type. Being older than age 25, increased time in assisted housing (6 or more years), having a large household size, having a single-caregiver household, and having a disability or chronic condition were associated with decreased odds of exit. Race or ethnicity and experiencing a hospitalization were not associated with exiting.

Among those who exited, some commonality existed between positive and negative exits compared with neutral exits. Male gender and longer time in assisted housing were positively associated with both positive and negative exits, whereas senior age (62 years or more) and receiving PBV assistance were negatively associated with both positive and negative exits.

Substantial differences also existed in factors associated with positive and negative exits. American Indian/Alaskan Native, Black, or Latinx people were more likely to have a negative exit compared with White individuals, and Asians were less likely to have a negative exit than White individuals. Heads of household who were single caregivers, had a disability, experienced a behavioral health crisis event, or had a recent ED visit were more likely to have a negative exit and less likely to have a positive exit than a neutral exit. Those who had recently been homeless were less likely to have a positive exit, but no difference existed between negative and neutral exits. Full details can be found in Chapter 5 and Appendix E.

Outcomes Following Exit

Four primary outcomes, occurring within 1 year following exit from housing assistance, were examined:

Exhibit 1: Key Outcomes

Outcome	Main Findings
Residential stability (becoming homeless or unstably housed, referred to as homelessness in this report)	One in four people with negative exits experienced homelessness within 1 year of exit, compared with 3 percent of those with a positive exit.
Physical health (ED visits, hospitalizations, and well-child checkups)	Positive exits led to lower levels of ED visits compared with negative exits or staying in housing assistance.
Behavioral health (experiencing an acute crisis event)	The biggest predictor of a post-exit behavioral health crisis was a pre-exit crisis. Even after adjusting for prior crises, negative exits were associated with double the risk of a post-exit crisis.
Wage income	Households with positive exits had $2,000 to $2,500 higher quarterly wages both before and after exit.

ED = emergency department.

Residential Stability

Among all 16,666 people who exited housing assistance, 2,682 (16.1 percent) experienced homelessness within 1 year of leaving, with a mean time to homelessness of 321 days. The risk of homelessness was not spread evenly across exit types; only 3.1 percent of people with positive exits had a homelessness event, compared with 14.5 percent for neutral exits and 25.4 percent for negative exits. After adjustment, people with positive exits were 82 percent less likely to experience homelessness than those with neutral exits, whereas people with negative exits were 74 percent more likely than those with neutral exits.

Physical Health

After adjustment, those with positive exits had 26-percent-lower odds of having one or more ED visits in the year following exit than those with negative exits. Neither positive exits nor neutral exits were significantly different from negative exits in terms of hospitalizations. No significant differences in well-child checkups were observed when comparing positive versus negative or neutral versus negative exits.

When the exit types were compared with people who continued receiving housing assistance, positive exits were again associated with 20-percent-lower odds of ED visits but were no different in terms of hospitalizations or well-child visits. Children exiting for neutral reasons had approximately 35-percent-lower odds of having a well-child checkup than children who remained. No significant differences in ED visits or hospitalizations existed between neutral exits and people remaining in assisted housing. Finally, people with negative exits had slightly higher but nonsignificant odds of one or more ED visits, were 26 percent more likely to be hospitalized, and were about 38 percent less likely to have a well-child visit than people who continued to receive housing assistance.

Behavioral Health

The proportion of people having one or more behavioral health crisis events in the 12 months following exit was 0.8 percent, 2.8 percent, and 3.5 percent for those with positive, neutral, and negative exits, respectively. Among all study participants, a negative exit was associated with 110-percent-higher odds of a behavioral health crisis event in the year following exit compared with those with a neutral exit. However, no significant difference existed in the odds of a behavioral health crisis event between those with neutral and those with positive exits. A similar trend was seen in the Medicaid subpopulation, in which, relative to those with neutral exits, those with

negative exits had 61-percent-higher odds of behavioral health crisis events in the year following exit, and no significant difference existed in the odds of a behavioral health crisis occurring among those with positive exits.

Wage Income

The relationship between exit type (positive or negative) and wages for the four quarters after the exit quarter was described. Wages for the four quarters before the exit quarter and during the exit quarter were also assessed to account for preexisting trends.

Wages at all time points varied substantially. Mean wages among positive exits were higher than those among negative exits across all time points. During the quarter of exit, those with positive exits had higher median wage earnings than those with negative exits ($7,763 versus $4,823), higher median work hours (480 versus 406), and higher median hourly wages ($18/hour versus $16/hour). Four quarters post exit, the mean wages among positive and negative exits were $8,495 and $6,146, respectively.

A model was fit predicting wages four quarters before exit, during the quarter of exit, and four quarters after exit. The model showed that, in the period before exit, wage increases were greater among positive exits, whereas after exiting, wage increases were greater among negative exits.

Conclusion

The results from the Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) study show that realizing the goal of increased exits from housing assistance due to self-sufficiency has a way to go; positive exits made up only 13.5 percent of all nondeath exits in the study. The findings also reinforce the idea that the goal is a worthy one because negative and neutral exits were associated with worse outcomes than positive exits.

Linking data across sectors offers a way to comprehensively describe the experience of people receiving housing assistance. It also enables PHAs and HUD to understand the trajectories of the people they serve, all the way from the circumstances under which a person enters housing assistance through to their outcomes following exit from housing assistance. Results show that those circumstances are intertwined; previous homelessness, ED visits, and behavioral health crises are associated with negative exits and are also more likely to occur after negative exits, even after adjusting for baseline events. The exact direction of causation is unclear and may be circular in nature. Holistic interventions that encompass health, economic, and housing elements will require collaborations between PHAs and social service and economic organizations that have mutual interests in the well-being of the populations served by PHAs.

Although the confluence of datasets used in this analysis is unique to the King County setting, the component datasets are either used nationally or have equivalents in other states. All MTW PHAs use the 50058 MTW form, HUD sets data standards for HMIS, and Medicaid claims look similar across states. Other jurisdictions will likely have wage and behavioral health service data that could be linked for an equivalent initiative. Data from other sectors, such as education and social services, would add to the completeness of data on the experience of a person receiving housing assistance.

Finally, future HUD work on exits and exit types should focus on the following:

- Consider how to build a standardized, comprehensive process for collecting exit information.
- Collect qualitative information about exit circumstances.
- Engage with current PHA housing recipients on linked data.

Chapter 1: Introduction

Housing affordability continues to be a significant challenge facing many American households. Nearly one-half of all renters are housing cost burdened, defined as spending 30 percent or more of income on housing costs (Martinez and Mather, 2022). Federal housing assistance, primarily in the form of housing choice vouchers (HCVs) or public housing (PH), reaches only 20 to 25 percent of eligible low-income households, leaving many people struggling to afford stable housing (Turner and Kingsley, 2008). One possible approach to ensuring that as many people as possible get assistance is to create pathways for people receiving housing assistance to become economically self-sufficient and no longer require housing support. To that end, in 2019, the U.S. Department of Housing and Urban Development (HUD) set a goal of increasing the proportion of households that exit HUD-supported housing for positive reasons (e.g., homeownership) (HUD, 2019).

Understanding which tenants are likely to leave for positive or negative reasons can inform policies and programs that aim to encourage positive exits. Ensuring that a positive exit is likely to be beneficial to those exiting is also imperative. In addition, a full understanding of the consequences of exiting allows for the identification of interventions that might mitigate the negative impacts.

However, little is known about factors related to different types of exits from housing assistance, and outcomes that follow from exiting are even less well understood. In response to funding opportunity FR-6400-N-58 (*Examining Long-Term Outcomes Following Exit From HUD-Assisted Housing*), the Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) Study sought to answer three key questions:

1. What constitutes a positive or negative exit from HUD-assisted housing?
2. What factors are associated with categories of exits (positive, neutral, negative)?
3. Is a positive exit from housing assistance associated with better post exit outcomes than for residents who left for negative reasons?

The project was a collaboration between Public Health—Seattle & King County (PHSKC), King County Housing Authority (KCHA), and Seattle Housing Authority (SHA). All three agencies have worked together for several years to bring housing and health data together to better understand the needs of housing assistance recipients in King County. Both SHA and KCHA are Moving to Work (MTW) public housing authorities (PHAs) that serve clients predominantly living in an urban or suburban setting, although King County also encompasses a large rural area.[1] Seattle and the surrounding area have experienced a huge increase in population over the past decade, growing at 2 to 3 times the national average of 7.4 percent from 2010 to 2020 (Office of Planning & Community Development, 2021). The population boom has been accompanied by a large increase in wealth, with the median income increasing from $60,000 in 2010 to $102,000 in 2019 in Seattle and from $66,000 to $102,000 in King County as a whole (not adjusted for inflation) (Public Health—Seattle & King County, 2022). Both population and income changes have put pressure on the housing market, leading to average rent prices increasing by 43 percent from 2012 to 2017 (Regional Affordable Housing Task Force, 2019)

This report documents the findings from the research and is organized in line with the study questions. Chapter 2 summarizes the literature to date on the topic of exits from housing assistance. Data sources and linkage methods used to answer the research questions are discussed in Chapter 3. Chapter 4 addresses the first

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[1] MTW PHAs have greater flexibility than other PHAs in how they use federal funding, with the idea that they will generate innovative ideas and programs that can be rolled out nationally.

question of how to place each exit reason into positive, neutral, and negative categories. The factors associated with exiting from housing and with each exit type are described in Chapter 5. Chapters 6–9.each focus on a different outcome following exit, covering homelessness, physical and behavioral health, and wages. Finally, the research and next steps for this work are summarized in Chapter 10. More details for each research question are provided in a series of appendixes.

Chapter 2: Literature Review Summary

Introduction

An exploratory review of the literature in response to funding opportunity FR-6400-N-58 revealed that no established consensus exists on factors related to exiting housing assistance and subsequent outcomes. The aim is to systematically summarize the existing literature relevant to housing exits and identify the gaps in knowledge that the Housing and Urban Development Health, Employment, and Residential Stability (HUD HEARS) study could fill. Specifically, the review addressed the following questions:

1. What constitutes a positive or negative exit from housing?
2. What factors are associated with positive or negative exits?
3. What health, economic, or housing outcomes are associated with exiting housing assistance (for positive or negative reasons)?

Due to the nature of the topic, it was anticipated that relevant information on housing exits would be contained in the gray literature, including reports from housing authorities and presentations. This review, therefore, relied on searches in both published and gray literature. A full description of the methods used is in Appendix B.

Results

The searches in April 2021, across all sources, yielded 9,117 articles and reports, of which 1,936 were duplicates. After screening titles and abstracts and adding in references found during a full-text review, 57 documents were selected for full-text review. Of those documents, 26 were deemed relevant to the HUD HEARS study questions. A summary of the selected documents is in Appendix B.

Exhibit 2-1: Literature Review Search Results

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│  9,117 documents    │
│     identified      │
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          ├───────────────────▶│ 1,936 duplicates    │
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│  7,181 documents    │
│  reviewed by title  │
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          │                    │   deemed not        │
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┌──────────────┐  ┌─────────────────────┐
│ 5 documents  │  │  57 documents       │
│ identified   │─▶│ reviewed by full    │
│ from         │  │      text           │
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              │  26 documents       │
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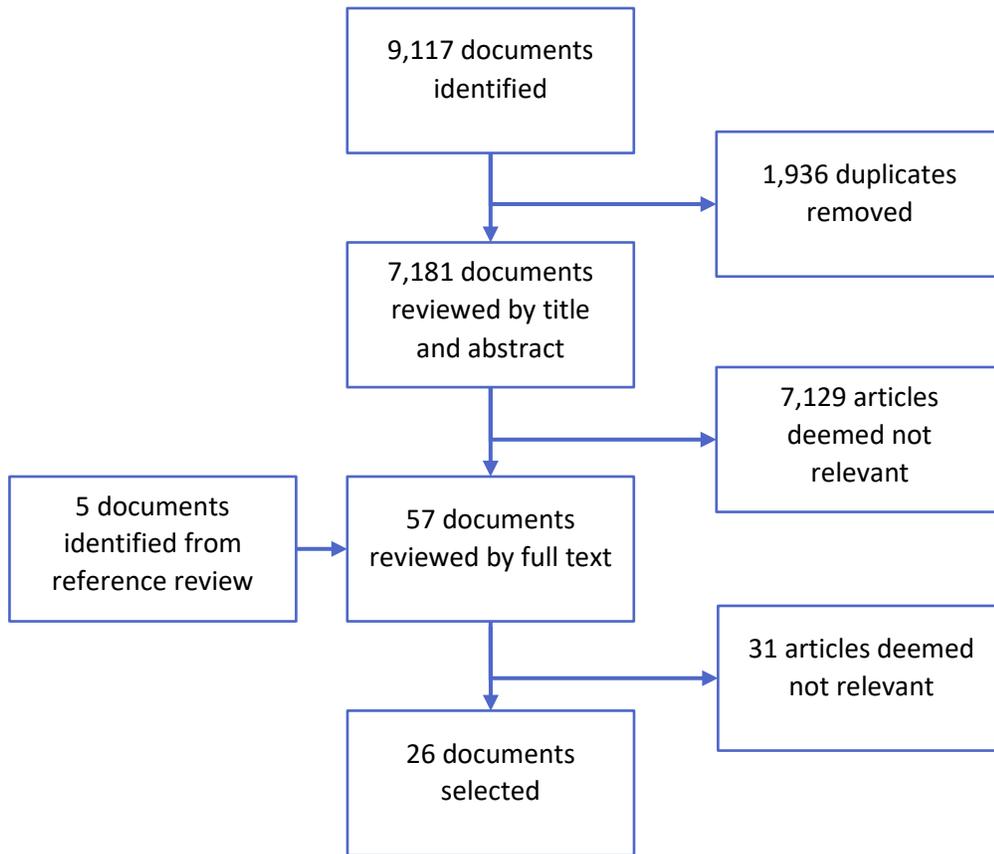
Exit Types

Only seven studies described exit types, and just three attempted to categorize exits as positive or negative. Several studies noted limitations in national databases regarding reasons for exits, which presents an opportunity for improved data collection efforts.

The literature did not reveal consistency in what was considered a positive exit; McInnis, Buron, and Popkin (2007) suggested marriage or higher income, Smith et al. (2014) used homeownership or higher income, and Rohe, Webb, and Frescoln (2016) defined a positive exit as moving to private-market housing. Similarly, negative exits were defined slightly differently. McInnis, Buron, and Popkin (2007) used the broadest definition and included breaking program rules, being evicted, being relocated from public housing and unable to move back, and rent and utility costs that were too high. Smith et al. (2014) included lease violations, evictions, and inability to lease up during the period in their definition of negative exits, whereas Rohe, Webb, and Frescoln (2016) defined them as failure to pay rent, violating lease terms, or moving without notice.

In their two studies of the HUD Veterans Affairs Supportive Housing (HUD-VASH) program, Montgomery and Cusack (2017) and Montgomery et al. (2017) listed several reasons why veterans had left the program, including accomplishing goals, being evicted, no longer interested in the program, and death, although those reasons were not explicitly categorized as positive or negative. In his evaluation of a Family Self-Sufficiency (FSS)

program, Anthony (2005) noted that people who completed the FSS program (and exited) had higher incomes than the comparison group, but he did not classify that as a positive reason for exit.

In their evaluation of the Welfare to Work program, Gubits, Khadduri, and Turnham (2009) noted that people who relinquished their voucher often did so inadvertently due to difficulty navigating the housing authority processes and rules, but the authors did not quantify the proportion who cited that reason. Studies that identified a breakdown of positive versus negative exits were not consistent in the proportion of each type. Smith et al. (2014) found that approximately 53 percent of leavers did so for positive reasons, whereas McInnis, Buron, and Popkin (2007) noted only that around 20 percent have positive reasons. Montgomery and Cusack (2017) and Montgomery et al. (2017) found a proportion in between (33 to 42 percent had met the VASH program goals). However, the difference in approach between Smith et al. and McInnis, Buron, and Popkin's classifications is important to note. Smith et al. used a hierarchy of data sources to assign all leavers to a positive or negative reason, whereas McInnis, Buron, and Popkin allowed for unclassified exits. For that reason, both articles found a similar proportion of people who had a negative exit (46 percent for McInnis, Buron, and Popkin; 47 percent for Smith et al.)

Summary: Few studies have explicitly classified exit types or quantified the proportion who exit for positive or negative reasons. Where classifications have been made, slightly less than one-half of people receiving housing assistance exit for negative reasons, although assigning exits as positive or negative can be difficult.

Factors Associated with Exits

A majority (18) of the articles and reports examined factors associated with exits from housing. Several studies used panel data or HUD data systems, such as the Multifamily Tenant Characteristics System (MTCS) and Tenant Rental Assistance Certification System (TRACS), databases to explore the topic, typically using survival analysis methods (Ambrose, 2005; Cortes, Lam, and Fein, 2008; Dantzler and Rivera, 2019; Freeman, 2005; Geyer, Dastrup, and Finkel, 2019; Hungerford, 1996; Lubell, Shroder, and Steffen, 2003; McClure, 2018; Olsen et al., 2005). Those studies generally agreed that increased age, being female, being non-White, being disabled, and tighter rental markets were all associated with a lower likelihood of exiting from housing. Larger households were generally found to be more likely to exit, but evidence on the presence of children was mixed; Ambrose (2005) found increased exits for larger households but only for project-based vouchers, whereas Cortes, Lam, and Fein (2008) found decreased exits, especially if younger children were present. Geyer, Dastrup, and Finkel (2019) found that the introduction of small-area Fair Market Rents increased the probability of exit and shortened the median time to exit. Among VASH participants, women were more likely to still be housed after one year than men (Kasprow et al., 2000), but having a service-connected disability was associated with exiting (Montgomery et al., 2017).

Two studies used evaluations of FSS programs to look at exits. Anthony (2005) found that younger adults, single participants, those without children, those with a high school diploma, and those who acquired more skills during the training were more likely to succeed at the FSS program and exit housing assistance. Rohe, Webb, and Frescoln (2016) found that completion of the program had a small effect on positive exits. However, the sample sizes in both evaluations were small, and the specific nature of the FSS programs in question limits generalizability to the wider population receiving housing assistance.

Another group of studies examined who was at risk of eviction or lease violations. Among residents of a large affordable housing organization (Mercy Housing), increased age, being Asian (versus White), and living in senior or supported housing (versus family housing) were associated with a reduced risk of lease violation, whereas being female, Black, or other race (versus White), having a larger household, and increased income were associated with increased risk of a lease violation (Brisson and Covert, 2015). Due to the counterintuitive nature of the finding regarding income, Brisson and Covert (2015) conducted further analyses and found that an increase in stable benefits was associated with decreased risk of a lease violation, but increases in work income, variable benefits income, and other income were related to a slightly higher likelihood of experiencing a lease violation. Richter et al. (2021) explored who received an eviction order compared with an eviction filing. Although most of their findings were for all landlords combined, public housing and nonprofit organizations were the landlords in more than a quarter of all filings, and an unknown number of residents with private landlords would have been receiving an HCV. The authors found that being male, being White (versus Black), having more children, and having had an eviction filing in the past were associated with an eviction order versus just a filing. Having an eviction filing by a public housing entity or nonprofit organization carried a lower risk of getting an eviction order, relative to a filing by a private entity. Among VASH participants, being male, older, having alcohol or drug disorders, and having used acute care were all associated with increased levels of eviction (Montgomery and Cusack, 2017).

Only one study examined differences between people with positive and negative exits (Smith et al., 2014). No difference existed between positive and negative exits in terms of age, gender, and household size. Those with positive exits were more likely to be married at the end of the study, have ever been married, and be Hispanic, and those with negative exits were more likely to be non-Hispanic Black. Those with positive exits were less likely to have ever been homeless, less likely to live in overcrowded housing, and less likely to have a high housing cost burden.

Summary: Certain demographic categories (younger age, male gender, White race, smaller household size) and economic and rental market conditions are associated with exiting housing assistance. However, very few studies looked at the relationship between demographic and economic factors and positive and negative exits.

Outcomes Following Exits

One-half of the selected studies examined outcomes in some way, although most compared the impact of housing assistance in general rather than the impact of positive or negative exits. Four studies considered the impact of receiving housing assistance as a child on future outcomes (Andersson et al., 2016; Aratani, 2010; Chetty, Hendren, and Katz, 2016; Newman and Harkness, 2002). More years receiving housing assistance as a child is associated with an increased likelihood of working, increased income, and reduced incarceration. Evidence on high school completion and college attendance was more mixed, with Aratani (2010) finding no effect and Chetty, Hendren, and Katz (2016) finding a positive association only among younger children.

Findings were mixed for people who leave housing for any reason. They tended to have increased mobility and were more likely to experience homelessness than those who remain in housing assistance (Gubits, Khadduri, and Turnham, 2009; Kang, 2020; McInnis, Buron, and Popkin, 2007). Some studies found higher earnings among leavers but a more precarious financial position, possibly due to reduced levels of public assistance (Gubits,

Khadduri, and Turnham, 2009; McInnis, Buron, and Popkin, 2007). People who completed FSS programs tended to have higher incomes and reduced use of public assistance compared with those who did not complete the programs (Anthony, 2005; Rohe and Kleit, 1997).

Among the VASH population, most (more than 90 percent) did not return to U.S. Department of Veterans Affairs (VA) homeless programs in the observation period (Montgomery et al., 2017), but one study found that more than 40 percent experienced 1 or more days of homelessness within 4.5 years of being housed (O'Connell, Kasprow, and Rosenheck, 2008). The difference between those two outcomes may be explained by the first study's lack of access to other data related to homelessness (e.g., the local Homeless Management Information System).

Evictions were associated with increased mobility, shelter use, school absenteeism, and reduced blood lead testing (Richter et al., 2021). People with negative exits in general were slightly more likely to feel safe in their neighborhood and less likely to say that the neighborhood had alcohol problems; loitering problems; or trash, graffiti, and abandoned buildings, compared with those who continued to receive housing assistance (Smith et al., 2014). Positive exits were associated with living in better housing and neighborhoods, better self-reported health, and reduced use of welfare (Smith et al., 2014).

Summary: Receiving housing assistance during childhood is associated with positive outcomes later in life. People who exit housing for any reason tend to be in a more precarious position in terms of residential stability and income. Negative exits are associated with worse residential stability and health outcomes than positive exits and generally compare poorly to those who continue receiving housing assistance. Positive exits are associated with improved health and better housing situations.

Conclusions

The literature provides limited evidence regarding positive and negative exits from housing assistance. Very few studies have tried to define exit types, although several noted the need for improved data collection on the topic. Only one study comprehensively looked at exit types; that study was within the context of the Moving to Opportunity experiment, so it may not be generalizable to the wider population. The literature contains almost no information regarding the health of individuals following housing exits of any kind and limited data on the sorts of neighborhoods people move to and economic outcomes. Although several studies looked at outcomes following time in housing, not many comprehensively examined the short-term impact of leaving on health, economic factors, and residential stability.

Chapter 3: Data Sources and Linkage

Several administrative datasets were used to examine outcomes following exit across multiple domains:

- Public housing authority (PHA) demographic data primarily came from data collected on HUD Form 50058 Moving to Work, which collects data on households and individuals receiving federal housing assistance.
- Exit reasons were collected on a separate form and stored in a different data system but linked using the methods described below.
- Behavioral Health and Recovery Division (BHRD) service data that include mental health and substance use claims.
- Employment Security Department (ESD) wage data.
- Healthcare for the Homeless Network (HCHN) data.
- Homeless Management Information System (HMIS).
- Medicaid claims data.

Linking administrative data from other sectors leads to a better understanding of complex individual needs, provides insight into circumstances before exit, and offers an opportunity to assess outcomes after people exit housing assistance. Because administrative data are routinely collected, this approach has the potential to be more sustainable than one-off or project-driven data collection. Successful cross-sector data linkages related to housing have previously examined physical health, behavioral health, crime, and income (Actionable Intelligence for Social Policy, 2015; Albertson et al., 2020; Chetty, Hendren, and Katz, 2016; Ellen, Dragan, and Glied, 2020; Laurent et al., 2020). However, most examples are limited in that they only linked across one nonhousing sector or were one-off linkages of administrative data.

For this study, individuals were linked across datasets through a series of probabilistic and deterministic matches using a combination of Informatica and the RecordLinkage package in R. Full details for each data source and the linkage process are in Appendix C.

Of the 19,411 exit events recorded by the King County Housing Authority (KCHA) and Seattle Housing Authority (SHA), 19,008 (97.9 percent) were matched to HUD Form 50058 data for 36,170 individuals (Exhibit 3-1). KCHA exit reason data were incomplete before 2016, so KCHA exits were restricted to 2016 through 2018, whereas for SHA, exits from 2012 through 2018 were included. Most analyses were restricted to the study period, exits that led to a person leaving PHA support (as opposed to "false exits," when a person transferred programs, joined a different household that was receiving support, or otherwise remained in the housing data within 12 months of the exit date), the most recent exit per person, nondeath exits, and complete demographics (Exhibit 3-1). After applying those restrictions, the basis for many analyses was 8,266 heads of households (1,118 [13.5 percent] positive, 4,538 [54.9 percent] neutral, and 2,610 [31.6 percent] negative) and 16,301 individuals (17.8 percent positive, 49.0 percent neutral, 33.2 percent negative). Exceptions to those restrictions are noted in each chapter.

Exhibit 3-1: Number of People With Exits During the Study Period

Exits total: 36,170

Exits outside study period:
KCHA (<2016, >2018): 5,626
SHA (<2012, >2018): 4,242

Exits in study period: 26,302

False exits (n = 7,176)

True exits: 19,126

Multiple exits per person (n = 357)

One exit per person: 18,769

Exits due to death (n = 2,091) or
missing exit reasons (n = 12)

Nondeath exits: 16,666

Missing demographics (n = 365):
- Household demographics: 189
- Program type: 21
- Age: 161

Complete demographics (primary analysis):
16,301
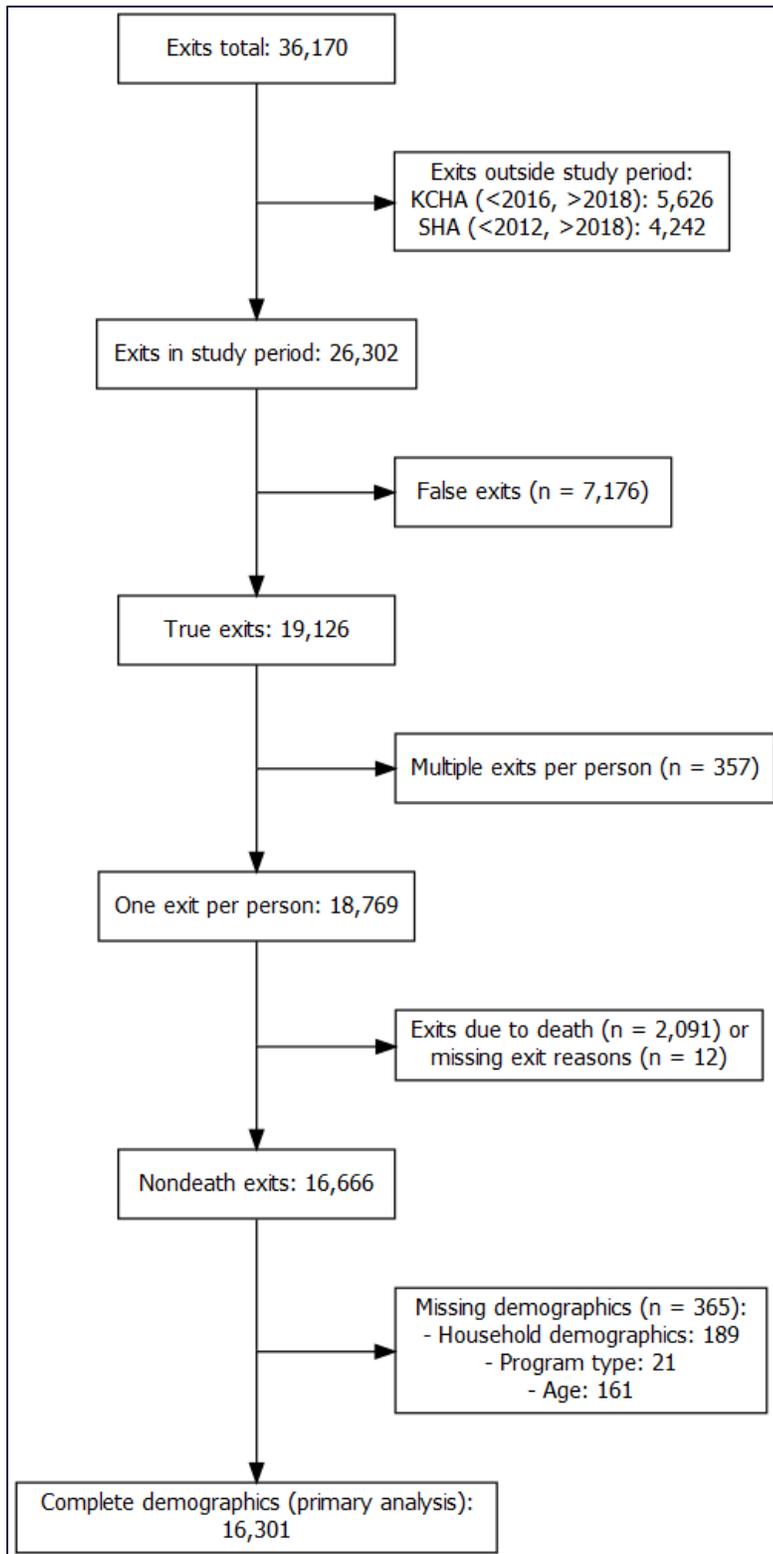
KCHA = King County Housing Authority. SHA = Seattle Housing Authority.
Source: KCHA and SHA data

Chapter 4: Exits and Exit Types

The King County Housing Authority (KCHA) and Seattle Housing Authority (SHA) had already classified their exit reasons into positive, neutral, and negative categories. In consultation with both public housing authorities (PHAs), exit reasons were standardized minor modifications made to the categories. Positive exits consisted of reasons that were perceived as likely to be associated with self-sufficiency—for example, increased income, attaining homeownership, and moving to nonsubsidized rentals. Negative exits—such as eviction, lease violations, criminal activity, or abandoning the property—were those expected to be associated with adverse life events and poorer outcomes. Several exit reasons could not be clearly identified as positive or negative and were classified as neutral; for example, exit for health reasons or moving in with friends and family could be associated with a positive or negative trajectory, depending on the circumstances. A full list of exit reasons and their categories is in Appendix D. To gain a fuller sense of exit time trends, data presented in this chapter are based on all available years of data (2016 through 2020 for KCHA, 2012 through 2020 for SHA).

Deaths, voucher expiration, and moving to nonsubsidized rentals were among the top causes of exit for both PHAs (Exhibit 4-1 and Exhibit 4-2). Most other common exit reasons fell into the neutral category for both PHAs, although KCHA also had two positive reasons—being over income and homeownership—in its top 10.

Exhibit 4-1: Top 10 Reasons for Exits From King County Housing Authority

Exit Reason	Exit Category	N
Deceased	Neutral	467
Moved in w/Family/Friends	Neutral	372
Voucher Expired	Negative	322
Section 8 Over Income	Positive	192
Landlord Eviction	Negative	166
Moved to Nonsubsidized Rental	Positive	133
Section 8 Incoming Portability Move Out	Neutral	131
Client Would not Disclose Reason	Neutral	113
Client Location Unknown/Abandoned Unit	Negative	107
Homeownership	Positive	72

Source: King County Housing Authority data

Exhibit 4-2: Top 10 Reasons for Exits From Seattle Housing Authority

Exit Reason	Exit Category	N
Project-Based/Mod Rehab: Moved Out, Location Unknown	Neutral	1,746
Deceased	Neutral	1,485
Voluntary Self-Termination	Neutral	444
Health	Neutral	406
Project-Based/Mod Rehab: Moved to Hospital/Assisted Living	Neutral	316
Moved to Nonsubsidized Rental	Positive	286
Project-Based/Mod Rehab: Moved to Nontime-Limited Subsidized Housing	Neutral	251
Voucher Expired	Negative	243
Other	Neutral	231
Client Would Not Disclose Reason	Neutral	167

Source: Seattle Housing Authority data

In any given year, approximately 4 to 5 percent of each PHA's residents exited, although the proportion was lower in 2020 due to the COVID-19 pandemic (Exhibit 4-3). At KCHA, the proportion of exits for positive reasons increased over time, and the proportion for negative reasons decreased, regardless of whether or not deaths (neutral) were included (Exhibit 4-4 and Exhibit 4-5). For SHA, the proportion of positive exits increased slightly over time, but the proportion of negative exits did not change.

Exhibit 4-3: Number of Exits by Public Housing Authority and Year
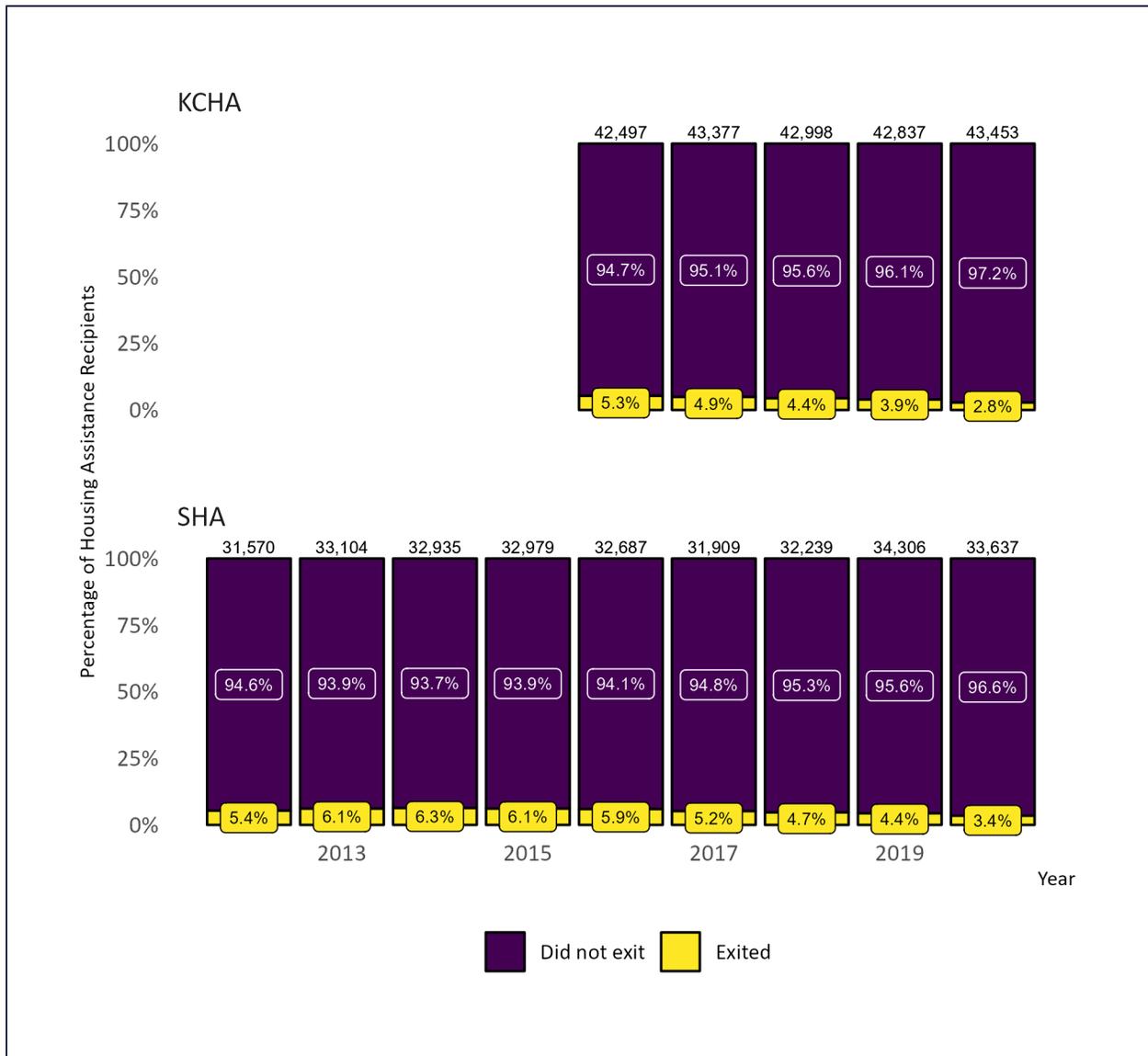
KCHA = King County Housing Authority. SHA = Seattle Housing Authority.
Note: KCHA exit data are incomplete before October 2015.
Source: KCHA and SHA data

Exhibit 4-4: Exit Categories by Public Housing Authority and Year (All Exits)

KCHA

Year	2,245	2,104	1,893	1,672	1,208
Negative	39.6%	35.3%	33%	26%	12.7%
Neutral	39.6%	48.1%	42.8%	43.5%	51.3%
Positive	20.8%	16.5%	24.2%	30.6%	36%

SHA

Year	1,699	2,045	2,092	2,030	1,871	1,628	1,519	1,508	1,162
Negative	24.3%	27.6%	24.4%	25.5%	25.8%	28.2%	26.6%	25.9%	16.3%
Neutral	66.2%	60.7%	61.8%	62.3%	61.7%	57.8%	52.6%	52.3%	65.1%
Positive	9%	11.6%	13.8%	12.2%	12.5%	14%	20.7%	21.1%	17.6%

Years: 2013, 2015, 2017, 2019

Exit Category: Negative, Neutral, Positive

Percent of Exits

KCHA = King County Housing Authority. SHA = Seattle Housing Authority.
Note: KCHA exit data are incomplete before October 2015.
Source: KCHA and SHA data

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Exhibit 4-5: Exit Categories by Public Housing Authority and Year (Excluding Deaths)

KCHA

Year	2,075	1,920	1,693	1,492	1,013
Negative	42.8%	38.7%	36.9%	29.1%	15.1%
Neutral	34.7%	43.2%	36.1%	36.7%	42.0%
Positive	22.5%	18.1%	27.1%	34.2%	42.9%

SHA

	1,539	1,832	1,855	1,805	1,616	1,392	1,294	1,192	870
Negative	26.8%	30.8%	27.5%	28.6%	29.8%	33.0%	31.2%	32.8%	21.7%
Neutral	63.2%	56.2%	56.9%	57.6%	55.7%	50.6%	44.4%	40.5%	54.7%
Positive	9.9%	12.9%	15.6%	13.7%	14.5%	16.4%	24.3%	26.7%	23.6%

Percent of Exits

Year: 2013   2015   2017   2019

Exit Category   ■ Negative   ■ Neutral   ■ Positive

KCHA = King County Housing Authority. SHA = Seattle Housing Authority.
Note: KCHA exit data are incomplete before October 2015.
Source: KCHA and SHA data

Chapter 5: Who Exits From Housing Assistance?

The linked data described in the previous chapters was used to determine the factors associated with exiting from housing assistance in general and each exit type. Exits from King County Housing Authority (KCHA) (2016 through 2018) and Seattle Housing Authority (SHA) (2012 through 2018), were examined, using heads of household as the unit of analysis. For the analysis of exiting versus remaining, each exiting person was randomly matched to four controls who remained in housing for at least 12 months past the exit date, and a binomial logistic regression model was run. For the exit type analysis, neutral exits were set as the reference category as part of a multinomial logistic regression. A subanalysis of Medicaid enrollees was conducted to look at the relationship between health events and exiting. Full details of the data variables and methods are in Appendix E.

After applying the inclusion criteria noted in Chapter 3 and limiting to heads of household, 8,266 exits (2,610 negative, 4,538 neutral, and 1,118 positive) and 25,162 nonexiting controls were analyzed in the regression analysis. Demographics for each group are in Exhibit 5-1. The secondary analysis of public housing authority (PHA) recipients who also had full, nondual Medicaid coverage before exit was limited to 3,001 households. A comparison of demographics for people who are included in the Medicaid analysis versus not is in Appendix E (Exhibit E-1) (this table is not restricted to those younger than age 62 to allow for age group comparisons).

Exhibit 5-1: Demographics of Heads of Household Who Exited Versus Controls Who Did Not and by Exit Type

	Remained (N=25,162)	Exited (N=8,266)	Neutral Exit (N=4,538)	Positive Exit (N=1,118)	Negative Exit (N=2,610)
Age					
Mean (years)	52.4	50.7	53.2	48.9	47.2
Median (years)	52	49	52	47	45
Senior (age 62+)	29.9%	26.9%	33.3%	21.0%	18.3%
Gender					
Another Gender	353 (1.4%)	97 (1.2%)	48 (1.1%)	17 (1.5%)	32 (1.2%)
Female	16,117 (64.1%)	4,869 (58.9%)	2,628 (57.9%)	678 (60.6%)	1,563 (59.9%)
Male	8,692 (34.5%)	3,300 (39.9%)	1,862 (41%)	423 (37.8%)	1,015 (38.9%)
Race/Ethnicity					
AI/AN	329 (1.3%)	158 (1.9%)	81 (1.8%)	<20	65 (2.5%)
Asian	2,464 (9.8%)	689 (8.3%)	421 (9.3%)	118 (10.6%)	150 (5.7%)
Black	8,558 (34%)	2,866 (34.7%)	1,413 (31.1%)	437 (39.1%)	1,016 (38.9%)
Latinx	1,684 (6.7%)	561 (6.8%)	299 (6.6%)	72 (6.4%)	190 (7.3%)
Multiple	2,530 (10.1%)	737 (8.9%)	367 (8.1%)	114 (10.2%)	256 (9.8%)
NH/PI	203 (0.8%)	67 (0.8%)	34 (0.7%)	<10	25 (1%)
White	9,394 (37.3%)	3,188 (38.6%)	1,923 (42.4%)	357 (31.9%)	908 (34.8%)
Time in Housing					
Mean Time (years)	5.9	5	4.5	6.2	5.6
Median Time (years)	5.5	3.7	3	5.6	4.5
Household Characteristics					
Head of Household w/Disability	44.3%	42.0%	45.4%	25.2%	43.3%
Mean Household Size	2.2	2	1.7	2.6	2.1
Median Household Size	1	1	1	2	1
Single Caregiver	19.0%	17.3%	15.0%	14.5%	22.6%
Program Type					
PBV	4,672 (18.6%)	3,586 (43.4%)	2,761 (60.8%)	308 (27.5%)	517 (19.8%)
PH	7,118 (28.3%)	1,840 (22.3%)	912 (20.1%)	331 (29.6%)	597 (22.9%)
TBV	13,372 (53.1%)	2,840 (34.4%)	865 (19.1%)	479 (42.8%)	1,496 (57.3%)

	Remained (N=25,162)	Exited (N=8,266)	Neutral Exit (N=4,538)	Positive Exit (N=1,118)	Negative Exit (N=2,610)
Health and Homelessness Events					
Experienced Recent Homelessness	5,726 (22.8%)	3,256 (39.4%)	1,972 (43.5%)	226 (20.2%)	1,058 (40.5%)
Experienced 1+ Behavioral Health Crisis Events in Year Before Exit (excl. Medicaid ED visits)	408 (1.6%)	570 (6.9%)	339 (7.5%)	18 (1.6%)	213 (8.2%)
Experienced 1+ Behavioral Health Crisis Events in Year Before Exit (inc. ED visits)[1]	313 (0.9%)	240 (2.8%)	122 (8.0%)	<10	82 (7.2%)
Average # ED Visits in Year Before Exit[1]	0.8	1	2	0.8	2.1
Experienced 1+ ED Visits in Year Before Exit[1]	13,435 (36.6%)	3,381 (40.0%)	862 (56.6%)	118 (34.7%)	689 (60.5%)
Average # Hospitalizations in Year Before Exit (per 100 people)[1]	6.1	7.8	17.5	6.8	15.4
Experienced 1+ Hospitalizations in Year Before Exit[1]	1,657 (4.5%)	440 (5.2%)	175 (11.5%)	19 (5.6%)	107 (9.4%)
Average # of Chronic Conditions[1]	1	0.9	1.8	1.5	2

AI/AN = American Indian/Alaska Native. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.

[1] Note: Some health event data available for those age <62 enrolled in Medicaid (Remained: N=36,737; Exited: N=8,448; Neutral: N=1,522; Positive: N=340; Negative: N=1,139).

Source: NO HARMS integrated study dataset

Descriptive Statistics

Heads of household who exited for any reason were more likely than those who remained in housing to have the following attributes (Exhibit 5-1):

- Male (39.9 percent versus 34.5 percent).
- Shorter average tenure in housing assistance (median of 3.7 versus 5.5 years).
- Receiving project-based voucher (PBV) assistance (43.4 percent versus 18.6 percent).
- Experienced recent homelessness (39.4 percent versus 22.8 percent).
- Have had a recent behavioral health crisis (6.9 percent versus 1.6 percent).

Race, household size, having a single caregiver, or having a head of household with a disability did not substantially vary between those exiting and those remaining in housing. In the secondary analysis of Medicaid recipients, people exiting had greater healthcare use in the year before exit for both emergency department (ED) visits (55.6 percent had one or more visits versus 46.9 percent for people remaining) and hospitalizations (10.0 percent versus 8.8 percent).

When comparing exits by type, those with a neutral exit tended to be older than those with positive or negative exits (median age 52 years compared with 47 and 45 years, respectively), were slightly more likely to be male (41.0 percent versus 37.8 and 38.9 percent), were more likely to be White (42.4 percent versus 31.9 and 34.8 percent), and had shorter average tenure in housing assistance (median of 3 years versus 5.6 and 4.5 years) (Exhibit 5-1). Those with a positive exit had larger average household sizes (mean of 2.6 versus 1.7 and 2.1 for neutral and negative exits, respectively), were more likely to be living in public housing (29.6 percent versus 20.1 and 22.9 percent) and were less likely to have experienced recent homelessness (20.2 percent versus 43.5 and 40.5 percent) or a behavioral crisis (1.6 percent versus 7.5 and 8.2 percent). Among Medicaid recipients, those with positive exits had lower levels of recent ED visits (34.7 percent versus 56.6 and 60.5 percent), hospitalizations (5.6 percent versus 11.5 and 9.4 percent), and chronic conditions at the time of exit (average of 1.5 versus 1.8 and 2.0)

Regression Results

After adjusting for other factors, male gender, receiving a project-based voucher, homelessness within the previous 3 years, and having a behavioral health crisis event were all associated with increased odds of exits of any type (Exhibit 5-2). Being older than age 25, increased time in housing (6+ years), larger household size, having a single-caregiver household, and having a disability were all associated with decreased odds of exit. Race/ethnicity was not associated with exiting. For the secondary analysis of housing recipients who also had 7+ months of full Medicaid coverage in the year before exit, experiencing one or more ED visits in the year before exit was positively associated with exit (adjusted odds ratio [aOR]: 1.27, 95-percent confidence interval [CI]: 1.16–1.40, $p < 0.001$), experiencing a hospitalization in the same timeframe was not associated with exit, and having two or more chronic conditions was negatively associated with exits (0.75, 95-percent CI: 0.68–0.83, $p<0.001$) and Exhibit E-3).

Exhibit 5-2: Regression Output for Heads of Household Who Exited Versus Controls Who Did Not

	Odds Ratio	95% CI
Age		
<25	Ref	—
25–44	0.67***	0.58–0.78
45–61	0.48***	0.41–0.55
62+	0.50***	0.43–0.58
Gender		
Female	Ref	—
Male	1.08**	1.02–1.15
Multiple	0.96	0.76–1.21
Race/Ethnicity		
White	Ref	—
AI/AN	1.25*	1.01–1.53
Asian	0.92	0.83–1.01
Black	1.06	1.00–1.13
Latinx	0.97	0.87–1.09
Multiple	1.00	0.90–1.10
NH/PI	1.10	0.81–1.47
Time in Housing		
<3	Ref	—
3–5.99	1.15***	1.07–1.23
6–9.99	0.95	0.89–1.03
10+	1.16***	1.07–1.26
Household Characteristics		
Head of Household w/Disability	0.70***	0.66–0.75
Household Size	0.90***	0.89–0.92
Single Caregiver	0.76***	0.70–0.82
Program Type		
TBV	Ref	—
PBV	2.94***	2.75–3.14
PH	1.20***	1.12–1.29

	Odds Ratio	95% CI
Health and Homelessness Events		
Experienced Recent Homelessness	1.41***	1.32–1.51
Experienced 1+ Behavioral Health Crisis Event in Year Before Exit (excl. ED visits)	2.91***	2.53–3.35
Experienced 1+ Behavioral Health Crisis Event in Year Before Exit (incl. ED visits)[a]	2.12***	1.69–2.66
Experienced 1+ ED Visit in Year Before Exit[a]	1.27***	1.16–1.40
Experienced 1+ Hospitalization in Year Before Exit[a]	0.96	0.82–1.12
2+ Chronic Conditions[a]	0.75***	0.68–0.83

* = $p<0.05$. ** = $p<0.01$. *** = $p<0.001$.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. Ref = Reference group. TBV = tenant-based voucher.

[a] Some health event data available only for those age <62 enrolled in Medicaid (N = 9,234 for controls, 3,001 for exits).

Source: NO HARMS integrated study dataset

Exhibit 5-3: Regression Output for Heads of Household by Exit Type

	Negative/Positive Exits vs. Neutral Exits (neutral N=4,538)			
	Negative Exits (N=2,610)		Positive Exits (N=1,118)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Age				
<25	ref	—	Ref	—
25–44	1.02	0.78–1.33	1.43	0.95–2.16
45–61	0.87	0.66–1.15	1.43	0.94–2.17
62+	0.43***	0.32–0.58	0.59*	0.38–0.91
Gender				
Female	ref	—	Ref	—
Male	1.33***	1.18–1.51	1.34***	1.14–1.56
Multiple	1.00	0.61–1.64	1.16	0.64–2.11
Race/Ethnicity				
White	ref	—	Ref	—
AI/AN	1.86**	1.26–2.74	0.92	0.49–1.76
Asian	0.80	0.64–1.01	0.99	0.77–1.27
Black	1.25***	1.10–1.43	1.20*	1.01–1.43
Latinx	1.30*	1.03–1.63	1.13	0.84–1.52
Multiple	1.10	0.90–1.35	1.14	0.87–1.48
NH/PI	1.27	0.69–2.32	0.85	0.37–1.94
Time in Housing (years)				
<3	ref	—	Ref	—
3–5.99	1.18*	1.01–1.37	1.28*	1.05–1.56
6–9.99	1.14	0.97–1.34	1.36**	1.11–1.68
10+	1.20*	1.00–1.43	1.54***	1.24–1.92
Household Characteristics				
Head of Household w/Disability	1.03	0.90–1.17	0.53***	0.45–0.63
Household Size	0.98	0.94–1.02	1.11***	1.06–1.16
Single Caregiver	1.33***	1.12–1.57	0.62***	0.50–0.77

	Negative/Positive Exits vs. Neutral Exits (neutral N=4,538)			
	Negative Exits (N=2,610)		Positive Exits (N=1,118)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Program Type				
TBV	ref	—	Ref	—
PBV	0.07***	0.06–0.09	0.31***	0.26–0.38
PH	0.45***	0.39–0.52	0.86	0.71–1.03
Health and Homelessness Events				
Experienced Recent Homelessness	1.76***	1.53–2.03	0.63***	0.52–0.76
Experienced 1+ Behavioral Health Crisis Event in Year Before Exit (excl. ED visits)	1.68***	1.36–2.08	0.43***	0.26–0.71
Experienced 1+ Behavioral Health Crisis Event in Year Before Exit (incl. ED visits)[a]	1.50*	1.06–2.12	0.70	0.31–1.56
Experienced 1+ ED Visit in Year Before Exit[a]	1.30**	1.08–1.58	0.62***	0.47–0.82
Experienced 1+ Hospitalization in Year Before Exit[a]	0.79	0.59–1.06	0.74	0.44–1.26
2+ Chronic Conditions[a]	0.91	0.75–1.11	0.96	0.72–1.29

* = $p<0.05$. ** = $p<0.01$. *** = $p<0.001$.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. Ref = Reference group. TBV = tenant-based voucher.

[a]Health event data available only for those age <62 enrolled in Medicaid (N = 1,522/1,139/340 for neutral/negative/positive exits).

Source: NO HARMS integrated study dataset

Among those who exited, some commonality was present between positive and negative exits as compared with neutral exits. Male gender and longer time in housing were positively associated with both positive and negative exits, whereas senior age (62+) and receiving PBV assistance were negatively associated with both positive and negative exits (Exhibit 5-3). Why those factors have similar associations for both positive and negative exits is unclear, and a deeper analysis of specific exit reasons may yield a better understanding of this finding.

Substantial differences emerged in factors associated with positive and negative exits. American Indian/Alaska Natives, Black, or Latinx were more likely to have a negative exit compared with Whites, and Asians were less likely to have a negative exit. The reasons for differences by race/ethnicity are unclear. The study does not assess the systemic factors disproportionately affecting certain racial and ethnic groups to determine sufficient causation links. Race/ethnicity may be a proxy for additional factors that were not included in the model. In the literature review (Chapter 2), one 2014 study (Smith et al.) found disproportionate negative exits for non-Hispanic Black households, with a greater share of these participants reporting problems with landlords as the

reason for exit. Heads of household in single-caregiver households and heads of household who had a disability, experienced a behavioral health crisis event, or had a recent ED visit were more likely to have a negative exit and less likely to have a positive exit when compared with neutral exits. Those associations suggest that single caregivers or those with health problems face barriers to working and may experience other obstacles to stable housing. Those with recent homelessness were less likely to have a positive exit, but no difference arose between negative and neutral exits.

Chapter 6: Outcomes Following Exit: Residential Stability

Residential stability was measured by the time to experiencing homelessness or unstable housing in the year following exit from housing assistance. Because administrative data sources do not always perfectly capture dates of events, individuals with a date of homelessness within 30 days before the exit date from housing assistance were counted as having a time to homelessness of zero days.

This analysis built upon existing work at King County that uses multiple sources in the Integrated Data Hub (IDH) to reduce undercounting of housing instability (Johnson, McHugh, and Reimal, 2021), using data from the Homeless Management Information System (HMIS), King County Behavioral Health and Recovery Division (BHRD), King County Healthcare for the Homeless Network (HCHN), and people in the Medicaid data who listed their address as "homeless."

To compare exit types, a Cox proportional hazards model was fit to the data, with time to homelessness within 1 year of exiting housing as the outcome and exit type (positive, negative, or neutral) as the independent variable. The model was adjusted for several demographic variables using propensity scores, which is a method used to balance comparison groups. To identify the exit factors with the greatest influence on the results, a leave-one-out analyses was conducted in which each exit factor with at least 100 exits was removed in turn and the model was rerun. Full details are in Appendix F.

Among all 16,666 people who exited housing assistance, 2,682 (16.1 percent) experienced homelessness within 1 year of leaving, with a mean time to homelessness of 321 days (Exhibit 6-1). The risk of homelessness was not spread evenly across exit types; only 3.1 percent of people with positive exits had a homelessness event, compared with 14.5 percent for neutral exits and 25.4 percent for negative exits. After adjustment for demographic variables, people with positive exits were 82 percent less likely to experience homelessness than those with neutral exits, and people with negative exits were 74 percent more likely than those with neutral exits.

In the assessment of influential exit reasons, landlord evictions appeared to be the most influential form of negative exit; when this reason was removed, negative and neutral exits looked more similar. Conversely, when "PB/MR [project-based/Mod Rehab] moved out, location unknown," which was classified as neutral, was removed, the hazard ratio between negative and neutral increased from 1.74 to 3.24, indicating that this reason is actually negative (Exhibit F-1). When "PB/MR moved out, location unknown" was removed from the positive versus neutral comparison, the two groups looked more similar, reinforcing the idea that this category is negative. The most influential positive reason was "PB/MR moved to nontime-limited market rate," although none of the positive reasons significantly altered the overall result (Exhibit F-2).

Exhibit 6-1: Kaplan-Meier Curves of Time to Homelessness by Exit Type

Kaplan-Meier Estimates of Time from Exit to Homelessness

Exit Type — Negative ·+· Neutral ·+· Positive
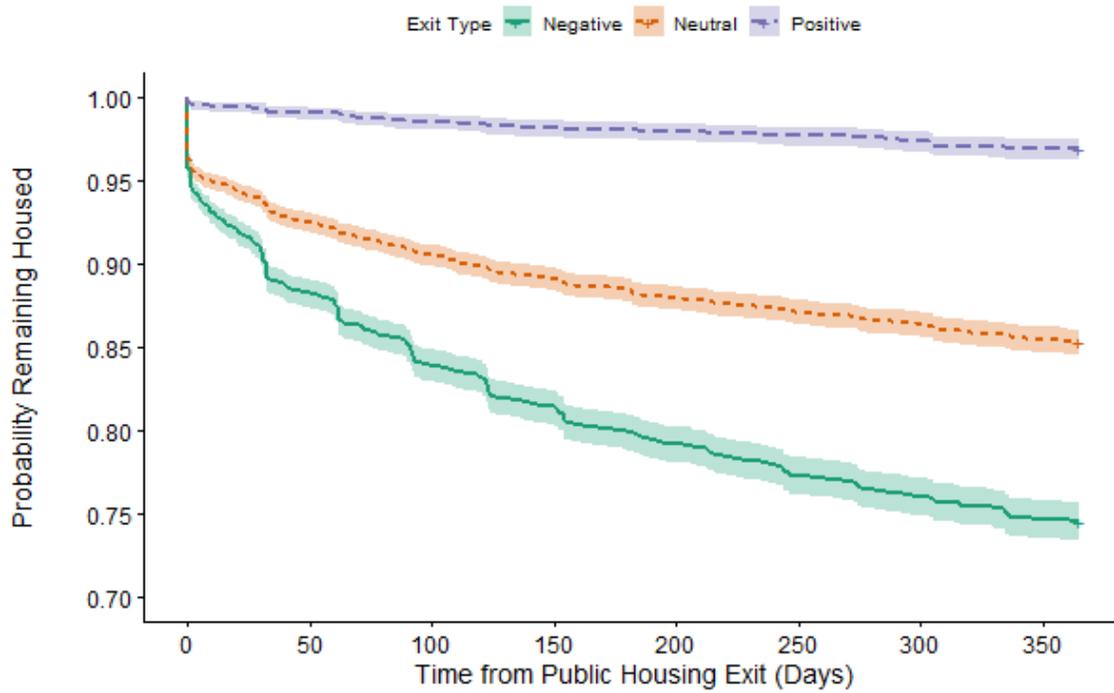
Number at Risk

Exit Type	0	50	100	150	200	250	300	350
Negative	5,531	4,880	4,641	4,503	4,379	4,276	4,206	4,130
Neutral	8,189	7,577	7,412	7,295	7,203	7,131	7,075	6,999
Positive	2,946	2,918	2,903	2,892	2,885	2,878	2,869	2,855

Cumulative Number of Events

Exit Type	0	50	100	150	200	250	300	350
Negative	238	653	891	1,033	1,153	1,256	1,326	1,401
Neutral	313	618	780	895	986	1,058	1,119	1,190
Positive	9	28	43	54	61	68	77	91

Source: NO HARMS integrated study dataset

Chapter 7: Outcomes Following Exit: Physical Health

Medicaid data was used to look at three health outcomes in the year following exit from housing assistance: (1) all-cause emergency department (ED) visits, (2) all-cause hospitalizations, and (3) well-child checkups. Positive exits were expected to be associated with lower levels of ED visits and hospitalizations and greater likelihood of well-child checkups compared with both neutral and negative exits. For well-child checkups, it was hypothesized that a history of previous preventive visits would mitigate some of the impacts of a negative exit. To examine this theory, results were separated by 1+ well-child visits in the year before exit versus no visits.

In addition to the inclusion criteria noted in Chapter 3, the following restrictions were added:
- Medicaid coverage (enrolled in a program that offers full benefits, nondual [i.e., not also enrolled in Medicare], and not concurrently enrolled in other health insurance programs) for at least 7 of the 12 months before and following exit. The 7-month threshold ensures that healthcare events in the claims data would be detected (Washington State Health Care Authority, 2022).
- For ED visits and hospitalizations, the analysis was restricted to ages <62 because this is the cut point for senior housing at the public housing authorities (PHAs), and most people older than 65 are also enrolled in Medicare. Therefore, this would not provide a complete picture of their healthcare use.
- The well-child analysis was restricted to children ages <6 years because this is the age at which at least one visit per year is recommended (Washington State Health Care Authority, 2020).

To account for confounding, models were adjusted for the following variables: gender, age, race/ethnicity, head of household with a self-reported disability, length of time in housing, housing assistance type, household size, and single caregiver (one adult and one or more children in the household). The ED visit and hospitalization analyses were also adjusted for baseline health, as measured by 1+ ED visits or hospitalizations in the year before exit and 2+ chronic conditions. Details of the groups used for each variable are in Appendix G.

For all models, a multinomial logistic regression, with negative exits as the reference group and generalized estimating equations to account for clustering at the household level was used. To evaluate whether the act of moving was detrimental to health, the analysis was repeated, comparing each exit type to randomly selected controls who remained in housing for 12 months following the matched exit date (and met all other criteria).

After applying the Medicaid inclusion requirements to the 16,301 exits in Exhibit 3-1, there were 5,550 exits (2,205 negative, 2,346 neutral, and 999 positive). The secondary analysis included 34,039 nonexiting controls, and the analysis of well-child outcomes included 316 negative exits, 408 neutral exits, 150 positive exits, and 5,823 nonexiting controls.

After adjustment, those with positive exits had 26-percent lower odds (95-percent confidence interval [CI]: 6–39-percent lower, p < 0.01) of having one or more ED visits in the year following exit than those with negative exits (Exhibit 7-1). Neither positive exits nor neutral exits were significantly different from negative exits in terms of hospitalizations. No significant differences were observed in well-child checkups when comparing positive versus negative or neutral versus negative exits across either stratum of previous visit history.

When exit types were compared with those who remained receiving housing assistance, positive exits were again associated with lower odds of ED visits (adjusted odds ratio [aOR]: 0.80, 95-percent CI: 0.69–0.94, p < 0.01) but were no different in terms of hospitalizations or well-child visits (Exhibit 7-2). Children exiting for neutral reasons had approximately 35-percent lower odds of having a well-child checkup than children who remained, regardless of whether they had completed a well-child checkup in the previous year. No significant differences

appeared in ED visits or hospitalizations between neutral exits and people remaining. Finally, people with negative exits had slightly higher but nonsignificant odds of one or more ED visits (aOR: 1.10, 95-percent CI: 1.00–1.21, p = 0.054) and were more likely to be hospitalized (aOR: 1.26, 95-percent CI: 1.03–1.55, p < 0.05) than people who continued to receive housing assistance. Both those with and without previous well-child visits had 33-percent and 43-percent lower odds, respectively, of having a well-child visit following exit than those continuing to receive housing assistance (95-percent CI: 10–51-percent lower odds, p < 0.01 and 95-percent CI: 13–62-percent lower odds, p < 0.01, respectively).

Exhibit 7-1: Regression Results for Health Outcomes by Exit Type
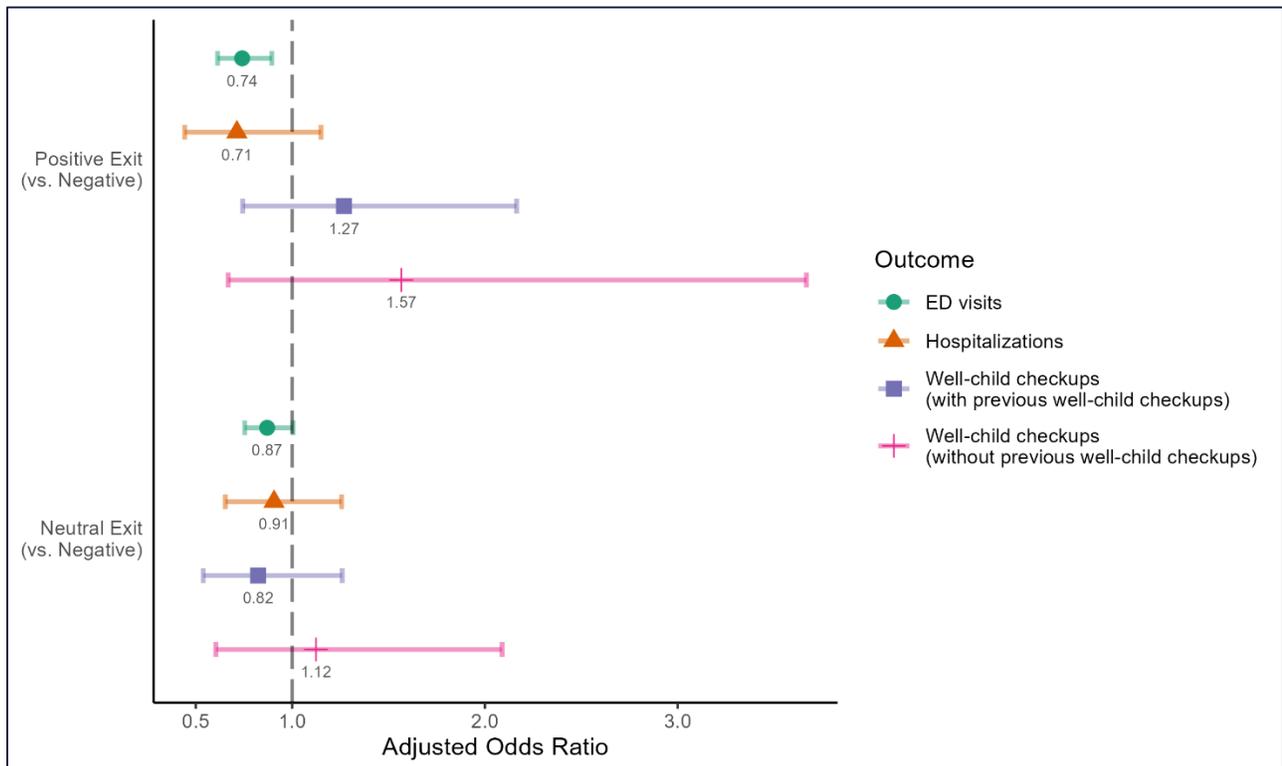
ED = emergency department.
Source: NO HARMS integrated study dataset

Exhibit 7-2: Regression Results for Health Outcomes Comparing Exit Types With People Remaining in Housing Assistance
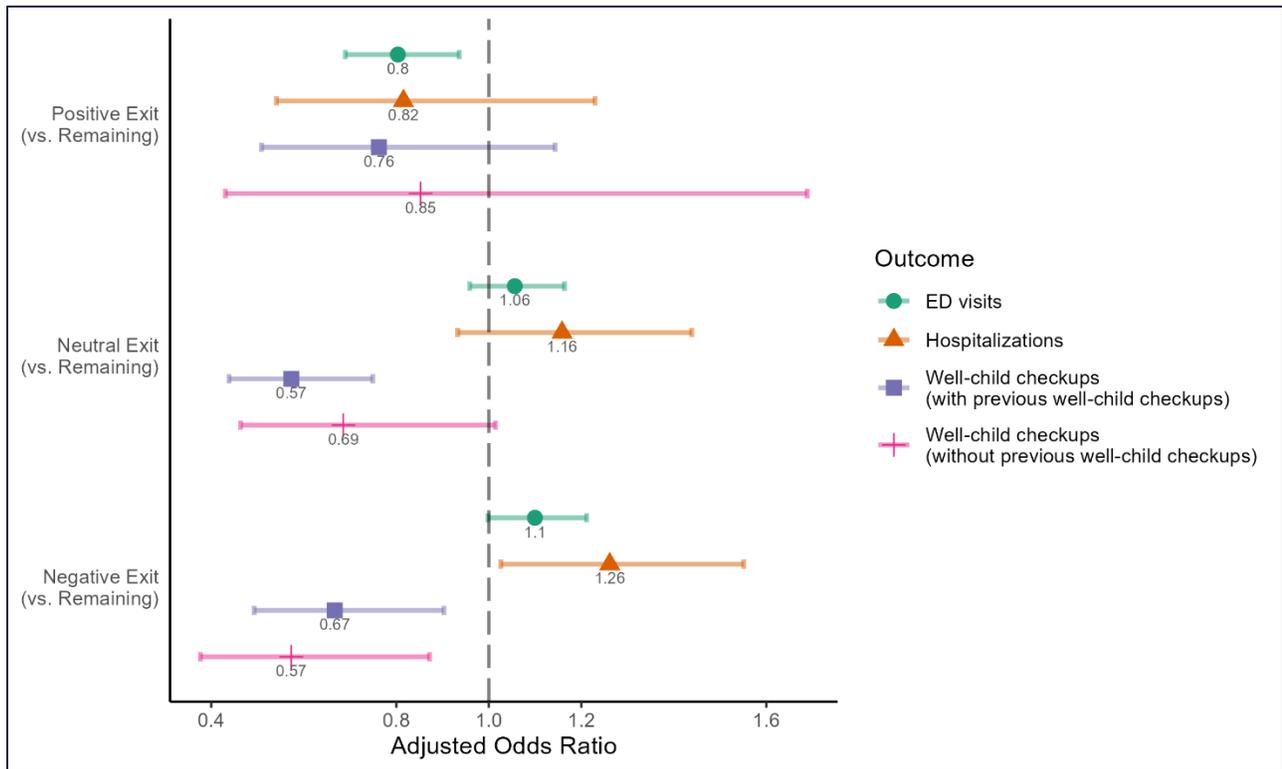
ED = emergency department.
Source: NO HARMS integrated study dataset

Chapter 8: Outcomes Following Exit: Behavioral Health

This analysis examined whether the nature of public housing authority (PHA) exits is associated with acute behavioral health crisis events in the year following exit, using linked data described in Chapter 3, Medicaid data described in Chapter 7, and service delivery data from the King County Behavioral Health and Recovery Division (BHRD). It was hypothesized that, relative to neutral exits, positive exits would be associated with a lower risk of behavioral health crisis events in the year following exit, whereas negative exits would be associated with a higher risk of behavioral health crisis events.

All individuals who exited housing assistance with King County Housing Authority (KCHA) from 2016 through 2018 and Seattle Housing Authority (SHA) from 2012 through 2018 and who had all available covariate information were included. Exit type was categorized as neutral, positive, or negative, as described in Chapter 4. Behavioral health crisis events included acute behavioral health services provided by the Department of Community and Human Services (DCHS) via the King County BHRD and court-ordered mental health treatment required by the Washington State Involuntary Treatment Act. In a secondary analysis, the study population was further limited to individuals <62 years of age and who had full Medicaid coverage for 7 of the 12 calendar months before and 7 of the 12 calendar months after the date of exit from housing. In the Medicaid subset, the outcomes described above were examined, with the addition of emergency department visits due to behavioral health events. See Appendix H for more information.

Confounding variables were selected a priori and reflected participant characteristics at the time of exit. They included gender (male, female, both genders reported at different points in time), age at exit, 1+ behavioral health crisis events in the 12 months before exit, time in housing, single-caregiver household (single adult with 1+ children), household size, race/ethnicity (American Indian/Alaska Native, Asian, Black, Latino, multiple races, Native Hawaiian/Pacific Islander, and White), type of assistance (project-based vouchers, public housing, or tenant-based vouchers), and head of household with a disability. In the Medicaid subset, there was also adjusted for history of treatment for behavioral health conditions (listed in Appendix H). Treatment for behavioral health conditions was based on algorithms applied to the Chronic Conditions Data Warehouse, which uses diagnoses in claims data to identify chronic health conditions (Centers for Medicare and Medicaid Services, 2022).

Summary statistics by exit type for all participants and those in the Medicaid subset were calculated. Next, multivariable logistic regression models, with neutral exit as the referent category, were used. Analyses were repeated for the Medicaid subset. Generalized estimating equations were used to account for clustering at the household level.

The sample included 16,301 participants for whom full covariate data were available; full demographic characteristics, by exit type, can be found in Exhibit E-2. The proportion having one or more behavioral health crisis events in the 12 months following exit was 0.8 percent, 2.8 percent, and 3.5 percent for those with positive, neutral, and negative exits, respectively (Exhibit 8-1). The Medicaid subset included 5,550 participants, of whom 5.0 percent, 13.9 percent, and 15.2 percent had at least one crisis event among those with positive, neutral, and negative exits, respectively.

Results of logistic regression models are shown in Exhibit H-1. Among all study participants, a negative exit was associated with 110-percent higher odds (95-percent confidence interval [CI]: 1.64–2.69, p<0.001) of a behavioral health crisis event in the year following exit, compared with those with a neutral exit type. However, no significant difference existed in the odds of a behavioral health crisis event between those with neutral and positive exits

(adjusted odds ratio [aOR]: 0.95, 95-percent CI: 0.60–1.49). A similar trend was seen in the Medicaid subset, in which, relative to those with neutral exits, those with negative exits had 61-percent higher odds (95-percent CI: 1.29–2.00) of behavioral health crisis events in the year following exit, and no significant difference was present in the odds of a behavioral health crisis among those with positive exits (aOR=0.90, 95-percent CI: 0.62–1.30).

Exhibit 8-1: Behavioral Health Crisis Events, by Exit Type

	Positive	Neutral	Negative
Crisis Events			
n	2,902	7,984	5,415
Proportion With 1+ Crisis Event	0.8%	2.8%	3.5%
Mean Number Crisis Events (Per 100)	3.2	7	9.3
Median Number Events	0	0	0
Range of Crisis Event Numbers	0–32	0–30	0–27
Crisis Events (Medicaid Subpopulation)[a]			
n	999	2,346	2,205
Proportion With 1+ Crisis Event	5.0%	13.9%	15.2%
Mean Number Crisis Events (Per 100)	14.9	59.6	54.7
Median Number Events	0	0	0
Range of Crisis Event Numbers	0–32	0–63	0–49

[a]Includes behavioral-health-related emergency department visits not captured in the full analysis.
Source: NO HARMS integrated study dataset

Chapter 9: Outcomes Following Exit: Economic

The relationship between exit type (positive or negative) and wages for the four quarters after the exit quarter was described. Wages four quarters before the exit quarter and during the exit quarter were also assessed to account for preexisting trends. The data were limited to exits between January 1, 2016, and January 1, 2018, to households with wage earners between 18 and 61 years of age at the time of exit and to households with more than 1 year of tenure in housing assistance.

Summary statistics are reported with statistical significance defined by a p-value less than 0.05 for a Kruskal-Wallis (continuous variables) or chi-square (categorical variables) test. A multilevel/hierarchical regression model was created for the relationship of exit type with wage earnings over time. A model of the relationship of exit type and percentage of Area Median Income (AMI) over time was created as a secondary analysis.

The analysis included 1,355 individuals (positive = 680, negative = 675) in 954 households. When the proportions of positive and negative exits were compared, Asians (11.9 percent versus 7.3 percent) were overrepresented, and Black individuals (43.4 percent versus 49.2 percent) were underrepresented among positive exits (Exhibit I-1). During the quarter of exit, those with positive exits had higher median wage earnings ($7,763 versus $4,823), higher median work hours (480 versus 406), and higher median hourly wages ($18/hour versus $16/hour). Positive exits were more likely to occur in the spring and summer and to have received housing assistance for more years (mean 9 years versus 7 years). Positive exits were less likely to have a head of household with a disability (10.4 percent versus 16.6 percent) and to live in single-caregiver households (9.0 percent versus 26.1 percent). Positive exits also had a higher mean percent AMI (34 percent versus 29 percent). Finally, regarding program type, tenant-based vouchers (TBVs) were more common among negative exits (73.4 percent versus 65.6 percent), whereas project-based vouchers (PBVs) (17.5 percent versus 13.6 percent) and public housing (PH) (16.9 percent versus 12.9 percent) were more common among positive exits.

Substantial variance in wages was present at all points in time, and the mean wages among positive exits were higher than those among negative exits four quarters before exit, during the quarter of exit, and four quarters post exit (Exhibit 9-1). Four quarters post exit, the mean wages among positive and negative exits were $8,495 and $6,146, respectively.

Exhibit 9-1: Observed Quarterly Wages for Those Who Exited Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018
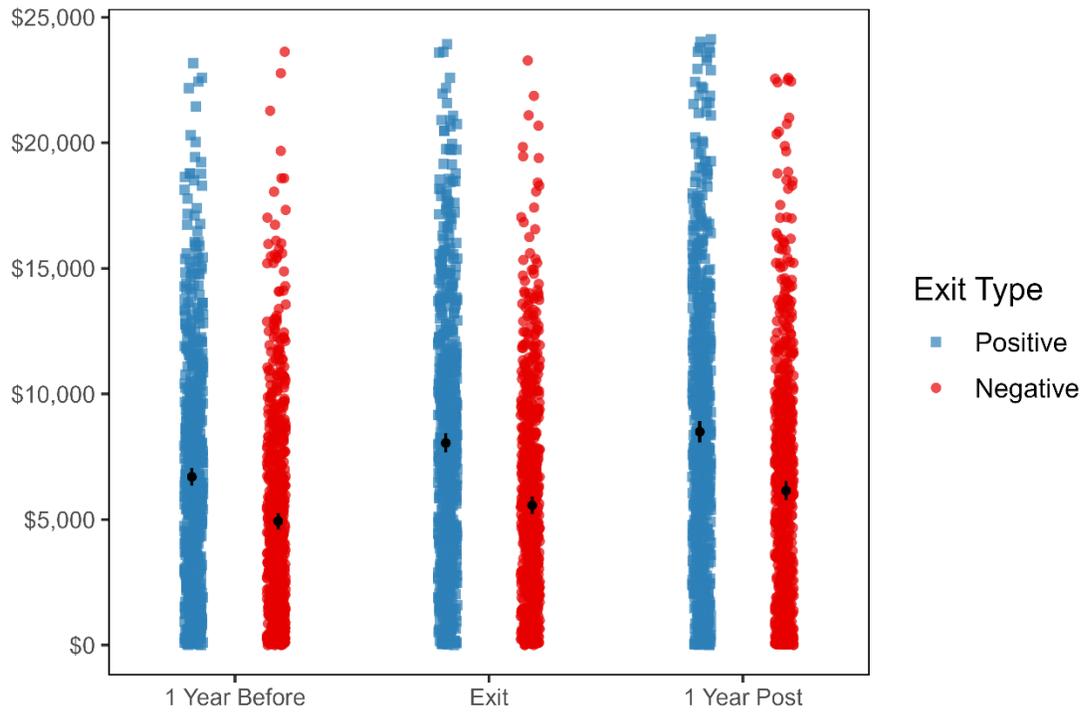
Note: The black points and error bars are the mean and 95-percent confidence interval, respectively.
Source: NO HARMS integrated study dataset

A model was created predicting wages four quarters before exit, during the quarter of exit, and four quarters after exit (Exhibit I-2). It performed well based on a scatterplot of the observed versus predicted wages (not shown), a plot of residuals over time (Exhibit I-5), and a comparison of the mean quarterly observed values to the mean quarterly predicted values (Exhibit I-3). A plot of the mean predicted values by quarter and exit type shows that, in the period before exit, wage increases were greater among positive exits, whereas after exiting, wage increases were greater among negative exits (Exhibit 9-2). The secondary model of exit type and percentage of AMI demonstrated a similar pattern (Exhibit I-4 and Exhibit I-6).

Exhibit 9-2: Predicted Quarterly Wages by Exit Type Show Faster Wage Growth for Positive Exits Before Exiting and Faster Wage Growth for Negative Exits After Exiting
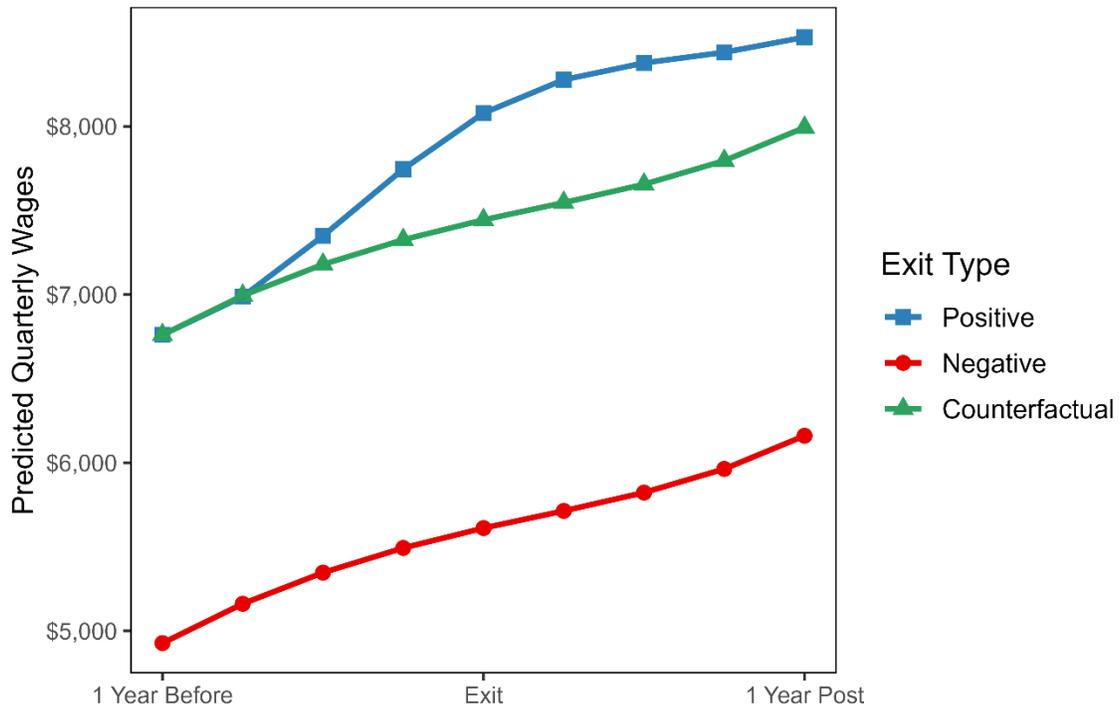
Chapter 10: Conclusion

Linking data across sectors offers a way to comprehensively describe the experience of people receiving housing assistance. It also enables public housing authorities (PHAs) and HUD to understand the trajectories of the people they serve all the way from the circumstances under which they enter housing assistance through to their outcomes following exit from housing.

The Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS) study has shown that who exits from housing assistance was not random. Males, those on project-based vouchers (PBVs), the recently homeless, and people who experienced a behavioral health crisis event or emergency department (ED) visit were more likely to exit. The type of exit is also strongly associated with a range of factors, only some of which are readily identifiable in PHA data. Heads of household in single-caregiver households, heads of household who had a disability, and heads of household who had experienced a behavioral health crisis event or a recent ED visit were more likely to have a negative exit and less likely to have a positive exit, when compared with neutral exits. Conversely, larger household size was associated with positive exits but not negative exits.

The type of exit from housing assistance matters:

- About one in four people who exit for negative reasons experience homelessness or unstable housing in the year following exit, compared with 1 in 32 for positive exits.
- People with positive exits are less likely to have an ED visit than those with negative or neutral exits.
- Those with negative exits are 74 percent more likely to experience a behavioral health crisis than those with neutral exits.
- Positive exits are associated with higher household income, although the gap between positive and negative exits narrows following exit from housing assistance.

Policy and Program Implications

The results from HUD HEARS show that realizing the goal of increased exits from housing assistance due to self-sufficiency has a way to go; positive exits made up only 13.5 percent of all nondeath exits in the study. The findings also reinforce the idea that the goal is a worthy one because negative and neutral exits were associated with worse outcomes than positive exits.

For PHAs that are working to increase positive exits while minimizing negative exits, the findings present some challenges. First, some factors such as gender and type of housing assistance had the same associations for both positive and negative exit types (compared with neutral). Second, some factors are generally fixed (e.g., date of birth, gender, race/ethnicity), and targeting services based solely on those factors would likely violate fair housing and related civil rights laws. Further investigation into why those characteristics are associated with exits and exit types could help services to be adapted accordingly.

Where a more specific association between factors and exit type emerged, policy and program implications are clearer. Although not statistically significant, the relationship between being of working age and positive exits suggests that an emphasis on workforce training and other self-sufficiency programs may be warranted. A longer tenure in housing assistance was associated with increased odds of a positive exit, which suggests that a stabilization period is required before households can get themselves to a position where positive exits are more possible. PHAs may wish to investigate what characteristics of the early years of housing assistance are not conducive to positive exits and determine what can be done to help households through the transition period.

Knowing that recent homelessness is a risk factor for negative exits suggests that efforts to support people transitioning from homelessness into housing are crucial. Indeed, the PHAs in this study are already participants in federal initiatives for specific voucher types such as Emergency Housing Vouchers and Veterans Affairs Supportive Housing vouchers that pair housing with supportive services. They also fund supportive initiatives through their own programming, contract with community-based organizations and local government, and maintain referral partnerships with local providers. Similarly, when negative exits occur, wraparound services or warm handoffs to other social support agencies may help prevent future homelessness and should be studied further. However, not all PHAs are in a position to do so; King County Housing Authority (KCHA) and Seattle Housing Authority (SHA) can undertake those programs through grant funding and because their Moving to Work (MTW) authority offers flexibility in how funds are used. Other PHAs without MTW authority are less able to resource those kinds of supports.

The associations between ED visits and crisis events with negative exits highlight that housing is interconnected with other aspects of a person's life. ED visits and crisis events were associated with the increased likelihood of a negative exit, and a negative exit was associated with an increased likelihood of subsequent ED visits and crisis events, even after controlling for baseline events. The exact direction of causation is unclear and may be circular in nature (healthcare events trigger a series of events that increase the chance of a negative exit, and the reason for exiting has flow-on effects for future health needs). Holistic interventions that encompass health and housing elements will require collaborations between PHAs and healthcare organizations that have mutual interests in avoiding ED visits, behavioral health crises, and negative exits.

Finally, even though those with positive exits had higher postexit median wage earnings than those with negative exits (annualized wages of $33,980 versus $24,584), the amount is still far less than what is required to afford to live in the Seattle/King County area, where 80 percent of the Area Median Income is $95,300 for a family of four (King County Housing Authority, 2022). That finding suggests that, even after exit, households will continue to require safety net services, and positive exits should not be assumed to equate to economic self-sufficiency.

Reproducibility and Sustainability

Although the confluence of datasets used in this analysis is unique to the King County setting, the component datasets are either used nationally or have equivalents in other states. All MTW PHAs use the 50058 MTW form, HUD sets data standards for the Homeless Management Information System (HMIS), and Medicaid claims look similar across states. Other jurisdictions are likely to have wage and behavioral health service data that could be linked for an equivalent initiative. Data from other sectors, such as education and social services, would add to the completeness of data on the experience of a person receiving housing assistance.

As noted in Chapter 3, some datasets were already being regularly linked, whereas others were brought together specifically for the HUD HEARS project. The project work focused on exit and postexit factors, but the linked data have vast potential for population assessments, program evaluations, and informing policies. The goal of the partners involved in HUD HEARS is to provide regular updates on the results presented in this report and make them available to interested parties, in a manner to the existing Health and Housing Data Dashboard: https://kingcounty.gov/depts/health/data/health-housing.aspx. To that end, PHA data is in the process of being added to the integrated data hub, which will facilitate routine analyses of linked data.

Recommendations for Future Work

The findings from this project have specific implications for PHAs as they consider programs and policies that might affect exit type. However, HUD HEARS is not the final word on work related to exits from assisted housing, and several areas remain for future work:

Consider how to build a standardized, comprehensive process for collecting exit information. Consistency around when and how PHAs gather data on exits from housing assistance would allow for comparisons both across PHAs and over time, though lists of exit reasons should be flexible enough to address specific PHA needs. A standard way of mapping exit reasons to categories may be an appropriate middle ground. In addition, collecting information on when and why nonheads of household exit may yield additional insights about how to increase opportunities for positive exits.

Collect qualitative information about exit circumstances. The scope of the HUD HEARS project did not allow for engaging with those who have exited from housing assistance. Gathering stories and other qualitative information from people exiting would add valuable context to the statistics and should be prioritized in future work.

Engage with current PHA housing recipients on linked data. The consent process used by KCHA and SHA allows for the sort of work undertaken for HUD HEARS, and an institutional ethics review board approved the project. However, meaningful engagement with current housing recipients around data linkage and use offers several benefits. It provides a path to truly informed consent about how a person's data are collected, linked, and used. Adding community voices and sharing power around the decision making process is an important element of increasing equity. Finally, the people who use the various services that collect their data are best placed to offer ideas for how the data could best be used to improve well-being.

Appendix A: Acronyms

AI/AN	American Indian/Alaska Native
AMI	area median income
aOR	adjusted odds ratio
BHRD	Behavioral Health and Recovery Division
CI	95% confidence interval
DCHS	Department of Community and Human Services
ED	emergency department
ESD	Washington Employment Security Department
FSS	Family Self-Sufficiency
HCHN	Healthcare for the Homeless Network
HCV	housing choice voucher
HMIS	Homeless Management Information System
HUD	U.S. Department of Housing and Urban Development
HUD HEARS	Housing and Urban Development Health, Economic, and Residential Stability Study
IDH	integrated data hub
KCHA	King County Housing Authority
MTCS	Multifamily Tenant Characteristics System
MTW	Moving to Work
NH/PI	Native Hawaiian/Pacific Islander
OR	odds ratio
PB/MR	project-based/Mod Rehab
PBV	project-based voucher
PH	public housing
PHA	public housing authority
PHSKC	Public Health—Seattle & King County
S8	Section 8
SHA	Seattle Housing Authority
TBV	tenant-based voucher
TRACS	Tenant Rental Assistance Certification System
VASH	Veterans Affairs Supportive Housing

Appendix B: Literature Review

Detailed Methodology

Inclusion Criteria

The following inclusion criteria were applied to both the published and gray literature searches:

- Published in English.
- A central focus on populations receiving federal housing assistance in the United States. For the purposes of this review, federal housing assistance refers to living in public housing, receiving a housing choice voucher (HCV), or receiving a project-based subsidy. Other forms of housing assistance (e.g., permanent supportive housing) were not included as they are not directly relevant to the larger Housing and Urban Development Health, Economic, and Residential Stability (HUD HEARS)project.
- Reports on special populations (e.g., veterans, elderly) were included, but limitations on generalizability were noted.
- Reports since 1990.
- All study types, including descriptive analyses of exits and subsequent outcomes. Quantitative and qualitative approaches were included.

Search Terms

The following search terms were used:

- "HUD" OR "Housing and Urban Development" OR "housing assistance" OR "housing program" OR "public housing" OR "housing voucher" OR "tenant-based voucher" OR "housing choice voucher" OR "Section 8" OR "subsidized housing."
  AND
- "leave" OR "leaver" OR "exit" OR "exiting" OR "termination" OR "terminate" OR "completion" OR "complete."

Published Literature Strategy

The following databases were used for the published literature search (number of results is also shown):

- Campbell Collaboration (n = 5).
- EconLit (n = 31).
- Google Scholar (first 15 pages) (n = 150).
- PubMed (n = 33).
- ScienceDirect (note, due to limitations on search terms, the following search string was used for ScienceDirect: ("Housing and Urban Development" OR "housing assistance" OR "public housing" OR "housing voucher" OR "subsidized housing") AND ("leave" OR "exit" OR "terminate" OR "completion") (n = 5,060).
- Web of Science (n = 109).

Gray Literature Strategy

The following search engines for gray literature databases were used to search for publications, reports, or other relevant documents (number of results are also shown):

- Google (first 10 pages) (n = 100).
- National Bureau of Economic Research Working Papers (https://www.nber.org/papers.html).

- Results were restricted to papers under the following topics: "Health, Education, and Welfare" and "Poverty and Well-being" (n = 687).
- PAIS Index (n = 1,968).

Specific Websites

The following websites for relevant publications (number of results are also shown) were searched:

- HUD Office of Policy Development and Research (the first 250 results under a search for "exit" were reviewed).
- Urban Institute (the 399 papers under the Federal Programs and Policies subject, under the Housing and Housing Finance category were searched).
- HousingIs.org (n = 9).
- National Low Income Housing Coalition (n = 43).
- Center on Budget and Policy Priorities (n = 273).

Relevant References

The references cited in articles that were selected for analysis to identify other relevant articles.

Processing Results

First, the titles, abstracts, or executive summaries of documents were reviewed to screen for relevancy. The full-text versions of documents that were initially deemed relevant were reviewed for a deeper assessment. No quantitative meta-analysis was conducted. Relevant documents were summarized across the domains below, and a qualitative synthesis was conducted:

- Year of study/report and authors.
- Years of data included.
- Population included (location, demographics, housing and voucher types).
- Number of people included.
- Question to which the results pertain.
- Domain of any results that focused on outcomes following exit (physical health, mental health, economic, residential stability, crime, etc.).
- Comparison groups.
- Primary findings.
- Any major limitations.

Full List of Papers Examined

Exhibit B-1: Summary of Relevant Literature

Authors	Years Examined	Locations and Special Populations	Assistance Type	No. of People Included and Comparison Groups	Research Q (outcome category)	Primary Findings	Limitations
Ambrose, B.W. (2005)	1994–2002	National	PH, HCV, and project-based vouchers	25,336 households None. The study used a survival analysis with several covariates.	Factors associated with exit	- Across all assistance types, having a head of household who was elderly, female, Black, Asian, Hispanic, or disabled was associated with decreased exits from housing support. - Having children in the household was associated with increased exits, but only for project-based vouchers. - Larger households were associated with increased exits among those in public housing, decreased exits among those with project-based vouchers, and no association among those with tenant-based vouchers. - An increased percentage of people in the census tract who were linguistically isolated (a proxy for proportion with recent immigration) was strongly associated with decreased exits among all assistance types. - Households are more likely to leave assisted housing during periods of economic expansion and less likely to leave during periods of economic uncertainty. Households residing in public housing units are significantly less sensitive to changes in local economic conditions than households receiving tenant-based housing assistance.	
Andersson, F. et al. (2016)	Baseline was 2000, followup was 2010	Non-MTW counties Youth ages 13–18 in 2000 living with 1+ sibling	PH and HCV	~1.172m Time spent in subsidized housing. Did not live in subsidized housing.	Outcomes following exits (Income, incarceration)	Each additional year spent in subsidized housing is associated with increased earnings at age 26 and reduced incarceration. The effects are greatest for non-Hispanic Black and Hispanic individuals.	Some censoring of time spent in housing (only used 1997–2005) but used imputation to correct.
Anthony, J (2005)	1994–2003	Rockford, IL People who signed up for FSS	PH and HCV	135 (69 who graduated from FSS and 66 who did not) Graduated from FSS vs. did not	Exit type	Completion of the FSS program was associated with higher income at program exit (median of $22,938 vs. $13,964)	Small sample size, the Rockford HA FSS program may not be generalizable to other areas.
					Factors associated with exit	- Young adults (25–40 years) were 3.6 times as likely to complete FSS as mature adults (>40 years old). - Unmarried participants with or without children were almost three times as likely to succeed as those	

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						who were married or divorced (almost all the participants were female). - Participants who did not have a high school diploma were only 27 percent as likely to succeed as those who did. - Compared with those who acquired three or more skills in the program, those who acquired one or two skills or no skills had virtually no chance of success.	
					Outcomes following exits (Employment; Residential stability)	Fifty-seven of the successful participants became homeowners within 2 years of graduation; 36 of the homeowners were living in their own homes in 2003, several years after acquiring them.	
Aratani, Y (2010)	Baseline was 1979–1981, followup was 1987 and 1997/1998	National Age 19 or younger in 1981	PH only	200–400 (varied by outcome) Lived in PH vs. did not	Outcomes following exits (Educational attainment; Economic self-sufficiency; Wealth)	- No significant differences in high school graduation or college attendance. - Marginally more likely to be receiving a housing subsidy in the short term (by 1987) but no difference in the longer term (by 1997). - No significant differences in receiving other welfare, being employed, owning an automobile, or owning a car.	- Only considered living in PH as of 1981 but people could have lived in PH in the past (29% non-PH people had). - Multiple testing problem (looked at 12 outcomes by total and then White and Black). - Propensity score matching might have missed important confounders.
Brisson, D., and Covert, J. (2015)	2010–2012	18 states Mercy Housing residents	HCV, project-based, LIHTC	15,328 households Those evicted vs. those not	Factors associated with exit	- Increased age, being Asian (vs. White), and living in senior or supported housing (vs. family housing) were associated with reduced risk of a lease violation. - Being female; Black or other race (vs. White); having a larger household; or increased income were associated with increased risk of a lease violation. - Increases in work income, variable benefits income, and other income are related to a slightly higher likelihood of experiencing a lease violation. An increase in stable benefits is related to a slightly lower likelihood of experiencing a lease violation.	No adjustment for length of time in housing.
Chetty, R., Hendren, N.,	MTO was 1994–1998,	Baltimore, Boston, Chicago,	PH and HCV	7,340	Outcomes following exits	- Median income was $1,624 higher for the intervention group compared with the control group	MTO took place in five larger cities, so findings

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and Katz, L.F. (2016)	followup ranged from 2000 to 2014	Los Angeles, New York City Age 21 by 2012 (divided into groups >13 at random assignment and 13-18 at random assignment)		Offered a voucher and required to move to a low-income area; offered a voucher; and not offered a voucher (but could remain in PH)	(Educational attainment; Income; Marriage and fertility)	among the younger age groups (statistically significant). Income was $1,109 higher when comparing the HCV-only group to control group, but this was not significant. Among the older age group, the intervention group and HCV-only group had lower median income than controls, but this was not significant. - Among the younger age group, children in the intervention group were 2.5 percentage points more likely to attend college than the control group (19% vs. 16.5%). There was a smaller, nonsignificant increase for the HCV-only group. Among the older age group, children in the intervention group were 4.3 percentage points less likely to attend college than the control group (11.3% vs. 15.6%). Similarly, the HCV-only group were significantly less likely to attend college. - Among younger children, those in the experimental group were more likely to be married (5.3% vs. 3.4%) and more likely to have the father listed on the birth certificate (50.9% vs. 44.1%) than those in the control group. Among older children, there was no significant difference in the percent married and fathers were less likely to be listed on the birth certificate (38.4% vs. 46.7%).	may not be generalizable to other settings.
Cortes, A., Lam, K., and Fein, D. (2008)	1997 to 2005	National	HCV only	759,557 household records Nonelderly heads of household with children; nonelderly, disabled heads of household with children; and nonelderly heads of household with at least one disabled child	Factors associated with exit	- Non-Whites, females, and households with children (especially younger children) were less likely to exit housing support. - Households that exited had lower median income. The average vacancy rate was higher for exiters, and the average poverty rate was slightly lower.	
Dantzler, P.A., and Rivera, J.D. (2019)	Those who entered PH after 1986 through to 2013	National	PH only	3,066 Those who expressed an expectation of	Factors associated with exit	- An expectation of moving, being married, having some college education, having a disability, and living in an area with a higher unemployment rate were positively associated with exiting public housing.	The paper was framed as examining an intention to move, but the question asks more about an expectation

				moving in the 2 years subsequent to being interviewed vs. those who did not		- Increased tenure in housing and being older were negatively associated with exiting public housing.	of moving, which could be for positive or negative reasons. It was not clear if people who moved out of PH were supported by an HCV or not.
Freeman, L. (2005)	1995–2002	National	PH and HCV	~7.5m None. The study used a survival analysis with several covariates.	Factors associated with exit	- Non-Whites, older people, females, people with a disability, those with children, those receiving HCV support (vs. PH), and those living in the Northeast were less likely to exit housing assistance. - A higher local vacancy rate was strongly associated with exiting housing assistance. - The pattern for tenure in housing assistance was not clear.	
Geyer, J., Dastrup, S., and Finkel, M. (2019)	1995–2017	145 PHAs	HCV only	~1m households 7 Small-Area Fair Market Rent PHAs vs. 138 comparison PHAs using metropolitan-area fair market rents	Factors associated with exit	Introduction of SAFMR increased the probability of exit by 27% and shortened the median time to exit.	
Gubits, D., Khadduri, J., and Turnham, J. (2009)	Baseline was 2000, followup was 2004	CA (Los Angeles and Fresno), GA (Atlanta and Augusta), TX (Houston), and WA (Spokane)	Welfare to Work voucher holders only	3,167 People who leased up but relinquished their voucher, people who leased up and continued to use their voucher, and people who did not lease up	Exit type	"Those who relinquish vouchers may lose them inadvertently through inability to navigate housing authority rules and the housing market, or they may have comparatively high earnings and desire to let others take advantage of the voucher."	
					Factors associated with exit	- Families are more likely to relinquish the voucher and also are more likely to have relatively older children (the youngest member of household was age 6–17 when the voucher was issued), are more likely to be White or Hispanic, have had a driver's license at baseline, and have been receiving Medicaid at baseline. - Families are less likely to relinquish the voucher and also are more likely to have a high reservation wage ($13–15), more likely to have been enrolled in a training program at baseline, more likely to have been living in public or assisted housing at baseline, and more likely to have received TANF at baseline.	
					Outcomes following exits (Income;	"Compared to those who still hold vouchers, those who relinquished a voucher report that they: have more earnings, receive less TANF and Food Stamps, have larger	

					Residential stability; Welfare)	households, live in similar neighborhoods (slightly poorer), are more likely to have experienced homelessness in the past year, are more likely to be in poverty when both cash and near cash income are considered and have less monthly food per person. Even though relinquishers have more earnings than those who still hold vouchers, they seem to be somewhat worse off at the point of follow-up. Based on comments from the in-depth interviews, families value being able to live independently from their extended family. Therefore, we interpret the larger households of relinquishers as less desirable than the smaller households of voucher holders."	
Hungerford, T.L. (1996)	1986–1989	National	PH and HCV	1,226 households Exited housing vs. did not	Factors associated with exit	- Females and elderly were more likely to remain with housing support. - When removing households with left censoring, females, Black, and elderly were more likely to remain in public housing, and greater education was associated with leaving. Those with a disability were more likely to continue to receive an HCV.	
Kang, S. (2020)	1999–2009	National	PH and HCV	3,751 Left housing assistance vs. did not	Outcomes following exits (Residential stability)	- PH leavers are approximately 5.2x as likely to experience housing instability compared with those who remain in public housing. - HCV leavers are approximately 5.8x as likely to experience housing instability compared with those who remain in public housing.	
Kasprow, W.J., Rosenheck, R.A., Frisman, L., DiLella, and D. (2000)	1991–1999	National VASH	HCV only	1,649 Still in housing after one year vs. not	Factors associated with exit	Women were significantly more likely than men to still be housed after 1 year (OR=2.49, CI=1.81 to 3.18).	
Lubell, Jeffrey M; Shroder, Mark; Steffen, Barry (2003)	1999–2000	National	PH and HCV	92,397 PH and 131,467 HCV Household type (elderly, disabled, nonelderly and nondisabled with children, nonelderly and nondisabled without children	Factors associated with exit	- Among both PH and HCV recipients, those with an elderly head of household had longer lengths of stay than other groups. Households with children also had longer lengths of stay.	Only a descriptive study. No testing was done to examine statistical significance of differences.
McClure, K. (2018)	1995–2015	National	PH, HCV, and project-	~81m records	Factors associated with exit	- Length of stay has increased over time, more so for non-White households.	

			based vouchers	None. Survival analyses by covariates		- Households that exited assisted housing had similar median income compared with households that remained in assisted housing. - Income was negatively correlated with length of stay. - Higher area poverty levels and vacancy rates were associated with shorter lengths of stay. - Higher area rent levels were associated with longer lengths of stay.	
McInnis, D. et al. (2007)	2001–2005	Atlantic City, Chicago, Durham, Richmond, Washington, D.C. HOPE VI households	PH and HCV	715 households Those who were no longer receiving assistance and those who were	Exit type	"About one in five of the other unassisted renters cited a 'positive reason' such as marriage or higher incomes as the reason they were no longer eligible to receive assistance. But far more—nearly half (46 percent) of unassisted renters—cited a negative reason for why they no longer received assistance, including breaking program rules, being evicted, being relocated from public housing and unable to move back, and rent and utility costs that were too high."	
					Outcomes following exits (Residential stability; Economic attainment)	- Roughly 23 percent of unassisted renters reported that they have moved three or more times since 2001, compared with 8.7 percent of voucher holders and 1.9 percent of other public housing residents. - Unassisted renters and voucher holders had similar levels of being late paying utilities (43–44%), but the proportion was much lower among PH residents. - Unassisted renters were much more likely to report being late paying their rent and most likely to report being evicted for nonpayment of rent.	
Montgomery, A.E. et al. (2017)	2011–2014	National VASH	HCV only	7,383 Exited VASH vs. stayed in the program	Exit type	- Almost one-half (42.5%) of leased-up exiters did so because they had accomplished their goals. Other main reasons were being evicted (9.1%), death (8.7%), and finding other housing (8.1%). - One in five (21.9%) nonleased-up exiters were no longer interested in participating in VASH, 16.6% could not be located, 14.2% had found other housing, and 10.1% had noncompliance with VASH case management.	- Exit from VASH did not equate to exiting subsidized housing; 1/3 continued receiving housing support. - Veterans may have accessed other community-based homelessness assistance programs to which the research team did not have access (e.g., local HMIS)
					Factors associated with exit	- Among those who had leased up, having a service-connected disability was associated with exiting. - Among exiters, having PTSD was positively associated with not being leased up.	
					Outcomes following exits (Residential stability)	- Almost 93 percent of leased-up exiters and 90 percent of nonleased-up exiters did not return to VA homeless programs during the observation period. - Having a service-connected disability and being female were associated with reduced homelessness	

						after exit. Having a drug use disorder was associated with increased homelessness.	
Montgomery, A.E., and Cusack, M. (2017)	2008–2016	National Those who had exited VASH	HCV only	20,146 Exited VASH due to eviction vs. exited due to accomplishing goals	Exit type	Veterans who exited HUD-VASH during the observation period and had either been evicted (N = 4684; 10.2%) or left the program because they had accomplished their case management goals (N = 15,462; 33.7%). The leading reasons for exiting for the remaining 25,688 veterans who were excluded from the study were finding other housing (N = 4,641; 10.1%) and no longer being financially eligible (N = 3,741; 8.2%) or interested (N = 2,878; 6.3%); a further 3,795 (8.3%) veterans died while in HUD-VASH housing.	
					Factors associated with exit	- Males were about 50% more likely to be evicted than females, and younger veterans were somewhat more likely to be evicted than older veterans. - Veterans receiving compensation for a service-connected disability and veterans with chronic medical conditions had lower odds of eviction, whereas those with psychosis, history of self-injury, and alcohol use disorders were more than 50% more likely to be evicted. - Drug use disorders raised the odds of eviction by about 150%. - Use of acute care was generally associated with eviction with the largest effects observed in acute care related to substance use. - Primary care and outpatient medical care were largely protective.	
Newman, S.J., and Harkness, J.M. (2002)	Baseline was 1968–1982, followup was at ages 20–27 (1978–1993)	National Youth ages 10–16 at baseline	PH only	1,183 Public housing during youth vs. unassisted	Outcomes following exits (Income; Welfare receipt)	- Every year of public housing residence between ages 10 and 16 is estimated to increase the probability of working between ages 25 and 27 by 7 percentage points. - Less significant, but still notable, every year of public housing residence is also estimated to reduce years of welfare dependence between ages 20 and 27 by 0.71 of a year and to increase annual earnings between ages 25 and 27 by $1,861	
O'Connell, M.J., Kasprow, W., and Rosenheck, R.A. (2008)	Baseline was 1992–1995, followup was for up to 5 years	Cleveland, New Orleans, San Diego, San Francisco VASH	HCV only	392 VASH vs. intensive case management vs. standard care	Outcomes following exits (Residential stability)	Approximately 40% of the VASH group experienced 1+ day of homelessness within 4.5 years of being housed.	
Olsen, E. et al. (2005)	1992–2002	National	HCV only	~1.1m households	Factors associated with exit	- Disabled, elderly, Black, and White heads of household (compared with non-Black, non-White) were less likely to exit.	- Assumes that participants only leave the HCV

				None. Survival analyses with covariates		- Increased family size was associated with increased likelihood of exiting. - A $100-per-month decrease in the local payment standard was associated with a 3% increase in the rate of program exit, and an increase of $100 per month in the minimum tenant contribution to rent was associated with a 12.6% increase in program attrition.	program when there is a net benefit to them. - Used the most recent certification data, not any EOP data (because it is not checked), but that data may inaccurately state income levels if people left for an income-based reason.
Richter, F.G-C et al. (2021)	2011–2017, evictions between 2013 and 2016	Cleveland	PH and possibly HCV	19,748 People who received an eviction order vs. people who had an eviction filing but no eviction order	Factors associated with exit	- Among all those with an eviction filing (not just those in PH), being White (vs. Black), being male, having more children, and having had a filing in the past year were associated with receiving an eviction order. - Having an eviction filing by a public housing entity or nonprofit organization carries a lower risk of getting an eviction order, relative to a filing by a private entity.	- Could only identify PH landlord, not HCV recipients. - Most analyses were for all landlords combined, although PH and nonprofit landlords made up only 28% of the total.
					Outcomes following exits (Residential stability; School attendance; Health)	- Among all those in the study, receiving an eviction order was associated with increased mobility in the three quarters following eviction compared with those who received an eviction filing but no eviction order. - Households in public housing who are not evicted do not have an increase in shelter use relative to the baseline year. However, those who are evicted from public housing increase shelter use by 3.3 days in the following year and by almost 2 days (1.97) the subsequent year. - In the school year of the eviction filing, children in 7th to 12th grade in households with an eviction move-out order have a share of absent days 2.3 percentage points higher relative to those in households without an eviction move-out order. For kindergarten to 6th grade, there is no significant difference in the share of absent days for children of households with an eviction order relative to those without an eviction move-out order. - Children in households with an eviction filing had lower rates of lead testing compared with the	

						Cleveland average, and the rate for children in households with an eviction order was lower than that of households with a filing but no order. The proportion of children with elevated blood lead levels was higher for children in households with an eviction filing than for Cleveland overall, but there was not a great difference between children in households with an eviction order and those with only a filing.	
Rohe, W.M., and Kleit, R.G. (1997)	1989–1995	Charlotte, NC People who applied for the FSS program	PH only	224 People who participated in the FSS program vs. those who applied but did not complete the application process or declined once accepted	Outcomes following exits (Income; Welfare)	- All groups had a higher monthly mean wage compared to baseline, but graduates had the largest increase ($792 compared with $660 for dropouts and $245 for the comparison group). - All groups experienced decreases in the proportions receiving Aid to Families with Dependent Children benefits, but graduates had the largest decrease (23% points compared with 21 for dropouts and 3 for the comparison group). - All groups experienced decreases in the proportions receiving food stamps, but graduates had the largest decrease (26% points compared with 8 for dropouts and 9 for the comparison group). - Graduates were more likely to own their own home at followup.	- Small sample size, the Gateway FSS program may not be generalizable to other areas. - People dropped out of the program for different reasons so are a heterogeneous group.
Rohe, W.M., Webb, M.D., and Frescoln, K.P. (2016)	2011–2014	Charlotte, NC	PH only	550 Work requirement sites with a history of FSS programs, work requirement sites with newly introduced case managers, and nonwork requirement sites	Exit type	Positive move-outs were defined as moving to private-market housing. Negative move-outs (i.e., evictions) were defined by failure to pay rent, violating lease terms, or moving without notice.	
					Factors associated with exit	Some evidence indicates that work requirements increased positive move outs, but the numbers were very small.	
Smith, R.E. et al. (2014)	MTO was 1994–1998, followup ranged from 2008–2011	Baltimore, Boston, Chicago, Los Angeles, New York City	HCV only	1,149 households - Receiving housing assistance vs. not at final followup	Exit type	- Positive exits were defined as homeownership or exceeding the income limit. Negative exits included lease violations, evictions, or inability to lease up during the period. - After using a hierarchy of information sources to fill in gaps (a reason for exit was provided by only 40.6% of leavers), 53% were classified as having a positive exit and 47% as having a negative exit.	

| | | | | | - Positive vs. negative exits | Factors associated with exit | - No difference was seen between positive and negative exits in terms of age, gender, or household size.
- Those with positive exits were more likely to be married at the end of the study, had ever been married, and were Hispanic. Those with negative exits were more likely to be non-Hispanic Black.
- Those with positive exits were less likely to have ever been homeless, less likely to live in overcrowded housing, and less likely to have a high housing cost burden. Median income at study end was substantially higher, but given that income formed part of the definition of a positive exit, this finding is not surprising.
- Those with positive exits had similar demographics to those who remained receiving housing assistance. |
| | | | | | | Outcomes following exits (Neighborhood characteristics; Health) | - Those with positive exits were more likely to rate their housing as excellent or good, have a higher neighborhood satisfaction rating, and feel safe in their neighborhood than people with negative exits and those still receiving assistance. Those with negative exits were similar to those receiving assistance but were slightly more likely to feel safe in their neighborhood and less likely to say it had alcohol problems; loitering problems; or trash, graffiti, and abandoned buildings.
- Those with positive exits were also more likely to rate their health as good or better and less likely to take medicines for blood pressure or have depression than those with negative exits and those still receiving assistance.
- Those with positive exits were less likely to be receiving other forms of welfare than those still receiving assistance. Those with negative exits also were less likely to receive other forms of welfare, despite having a similar median income to those still receiving assistance.
- Perhaps as a consequence, those with a negative exit were more likely to report food insecurity. |

EOP = end of participation. FSS = Family Self-Sufficiency. HA = Housing Authority. HCV = housing choice voucher. LIHTC = Low-Income Housing Tax Credit. MTO = Moving to Opportunity. PH = public housing. PTSD = post-traumatic stress disorder. SAFMR = Small-Area Fair Market Rent. TANF = Temporary Assistance for Needy Families.

Appendix C: Data Sources and Linkage

Exhibit C-1: Data Sources Used for HUD HEARS

Data Source	Years Used	Existing Linkages
BHRD	2012–2019	HCHN, HMIS, and Medicaid
ESD	2012–2019	
HCHN		BHRD, HMIS, and Medicaid
HMIS	2012–2019	BHRD, HCHN, and Medicaid
Medicaid Claims Data	2012–2019	• 50058 Data • HMIS and BHRD
PHA Administrative Data (including 50058)	2012–2019	Medicaid
PHA Exit Data	2012–2019	

BHRD = Behavioral Health and Recovery Division. ESD = Employment Security Department. HCHN = Healthcare for the Homeless Network. HMIS = Homeless Management Information System. PHA = public housing authority.

An existing multisector data system was used to link data sources. The King County Integrated Data Hub (IDH) combines identities across several datasets, including Behavioral Health and Recovery Division (BHRD), Healthcare for the Homeless Network (HCHN), Homeless Management Information System (HMIS), and Medicaid. The IDH uses a mix of probabilistic and deterministic methods to match individuals across data systems via a proprietary tool (Informatica, Redwood City, CA). Public housing authority (PHA) data (50058 and exit data from King County Housing Authority [KCHA] and Seattle Housing Authority [SHA]) were probabilistically linked on name, Social Security number, date of birth, and gender using the RecordLinkage package in R v4.2.0 and RStudio v2022.2.3.492 (R Core Team, 2022; RStudio Team, 2022; Sariyar and Borg, 2020). IDH, Employment Security Department (ESD), and PHA data were then linked using the same RecordLinkage approach (Exhibit C-2).

Exhibit C-2: Identity Linkage Between HUD HEARS Data Sources
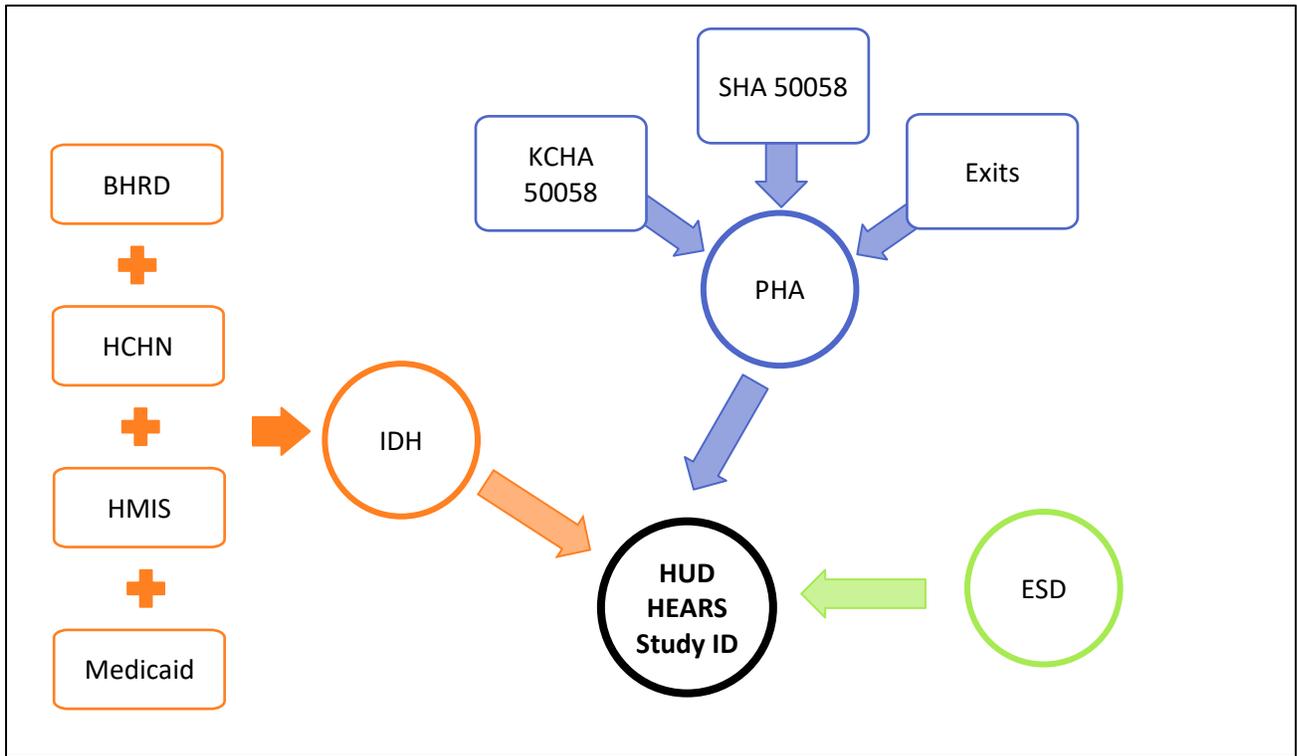
BHRD = Behavioral Health and Recovery Division. ESD = Employment Security Department. HCHN = Healthcare for the Homeless Network. HMIS = Homeless Management Information System. HUD HEARS = Housing and Urban Development Health, Economic, and Residential Stability. IDH = Integrated Data Hub. KCHA = King County Housing Authority. PHA = public housing authority. SHA = Seattle Housing Authority.

Appendix D: Exit Definitions

Exhibit D-1: Exit Reasons and Categories

PHA	Exit Reason	Category
KCHA	Section 8 Cross Absorption	Neutral
KCHA	Section 8 Absorption	Neutral
KCHA	Homeownership	Positive
KCHA	Moved to Nonsubsidized Rental	Positive
KCHA	Section 8 Over Income	Positive
KCHA	Moved—Needed a Higher Level of Services	Neutral
KCHA	Transitional Housing Graduate to KCHA Managed Units	Neutral
KCHA	Transitional Housing Graduate to Any Section 8 Voucher	Neutral
KCHA	Transitional Housing Graduate to KCHA PBA	Neutral
KCHA	Transitional Housing Graduate to Nonsubsidized Rental	Positive
KCHA	Transitional Housing Graduate to Other Subsidized Rental	Neutral
KCHA	Transitional Housing Nongraduate Early Program Exit	Neutral
KCHA	Deceased	Neutral
KCHA	Moved—Changed Subsidy Program Type	Neutral
KCHA	Section 8 Incoming Portability Move Out	Neutral
KCHA	Moved In w/Family or Friends	Neutral
KCHA	Subsidy in Jeopardy Client Choice	Negative
KCHA	Landlord Eviction	Negative
KCHA	Noncompliance—Paperwork Violation	Negative
KCHA	Inspection/Damages	Negative
KCHA	Fraud—Household Income	Negative
KCHA	Noncompliance—Criminal Activity	Negative
KCHA	Fraud—Household Composition	Negative
KCHA	Client Location Unknown/Abandoned Unit	Negative
KCHA	Absence—Incarceration	Negative
KCHA	Absence Treatment/Hospital	Negative
KCHA	Port Out Termination	Neutral
KCHA	Nonpayment of Rent	Negative
KCHA	Section 8 PB Failed Social Services Program	Negative
KCHA	Expired—Term Limit Program	Neutral
KCHA	Moved to Non-KCHA Subsidized Rental	Neutral
KCHA	Voucher Expired	Negative
KCHA	Expired—Ported Out	Negative
KCHA	Nonpayment of Retroactive Rent	Negative
KCHA	Section 8 Sponsor-Based Provider-Based Move Out	Neutral
KCHA	Client Would Not Disclose Reason	Neutral
KCHA	Failed to Provide Information	Negative

KCHA	PM Move to KCHA Section 8 Voucher	Neutral
SHA	180 Days $50 or Less HAP	Positive
SHA	180 Days Away from Assisted Unit	Negative
SHA	180 Days Zero HAP	Positive
SHA	Client Location Unknown/Abandoned Unit	Negative
SHA	Absence—Extended Leave	Negative
SHA	Absence—Incarceration	Negative
SHA	Absence—Treatment/Hospital	Negative
SHA	Criminal Activity	Negative
SHA	Deceased	Neutral
SHA	Client Would Not Disclose Reason	Neutral
SHA	Domestic Violence	Negative
SHA	Eviction—Abandonment	Negative
SHA	Eviction—Nonpayment	Negative
SHA	Eviction—Judgment/Physical	Negative
SHA	Eviction—Judgment/Physical - Criminal	Negative
SHA	Eviction—Judgment/Physical - Other	Negative
SHA	Expired—Ported Out	Neutral
SHA	Expired—Term Limit Program	Neutral
SHA	Voucher Expired	Negative
SHA	Failure to Complete HQS Inspection	Negative
SHA	Failure to Complete Reexamination	Negative
SHA	Failed to Provide Information	Negative
SHA	Fraud—Household Composition	Negative
SHA	Fraud—Household Income	Negative
SHA	Fraud—Other	Negative
SHA	FUP Youth 18-Month Expiration	Neutral
SHA	Graduated—180 Days $50 or Less HAP	Positive
SHA	Health	Neutral
SHA	HQS Breach	Negative
SHA	Ineligible—Citizenship/Immigration	Neutral
SHA	Lease Enforcement	Negative
SHA	Lease Violation—Criminal	Negative
SHA	Landlord Eviction	Negative
SHA	Lease Violation—Noncriminal	Negative
SHA	Location	Negative
SHA	More than 60 Days Absent from the Unit	Negative
SHA	Moved—Changed Subsidy Program Type	Neutral
SHA	Homeownership	Positive
SHA	Moved—Needed a Higher Level of Services	Neutral
SHA	Moved to Nonsubsidized Rental	Positive

SHA	Moved—Shelter	Negative
SHA	Moved—Transitional Housing Program	Negative
SHA	Moved in w/Family or Friends	Neutral
SHA	Mutual Termination	Neutral
SHA	Neighborhood Quality	Negative
SHA	No Longer Used as of 9/14/16 (Other)	Neutral
SHA	Noncompliance—Citizenship/Immigration	Negative
SHA	Noncompliance—Criminal Activity	Negative
SHA	Noncompliance—HQS	Negative
SHA	Noncompliance—Paperwork Violation	Negative
SHA	Noncompliance—Payment Plan/Debt to SHA	Negative
SHA	Noncompliance—Program Partnership	Negative
SHA	Other	Neutral
SHA	Other Subsidized Housing/HCV	Neutral
SHA	Other Violation of Participant Obligations	Negative
SHA	Noncompliance—Payment Plan/Debt to SHA	Negative
SHA	PB/MR Moved Due to Incarceration	Negative
SHA	PB/MR Moved Out, Location Unknown	Neutral
SHA	PB/MR Moved to Hospital/Assisted Living	Neutral
SHA	PB/MR Moved to Nontime-Limited Market-Rate Home	Positive
SHA	PB/MR Moved to Nontime-Limited Subsidized Housing	Neutral
SHA	PB/MR Moved to Shelter	Negative
SHA	PB/MR Moved to Temporary Housing (family, friends)	Neutral
SHA	PB/MR Moved to Transitional Housing Program	Neutral
SHA	Homeownership	Positive
SHA	Rent Too High	Negative
SHA	Moved to Nonsubsidized Rental	Positive
SHA	Serious/Repeated Lease Violations (Criminal)	Negative
SHA	Serious/Repeated Lease Violations (Noncriminal)	Negative
SHA	Unit/Property Quality	Negative
SHA	Client Would Not Disclose Reason	Neutral
SHA	Port Out Termination	Neutral
SHA	PB/MR Moved Out, Location Unknown	Neutral
SHA	Voluntary Self-Termination	Neutral
SHA	Voucher Expired	Negative

FUP = Family Unification Program. HAP = Housing Assistance Payments. HCV = housing choice voucher. HQS = Housing Quality Standards. KCHA = King County Housing Authority. Mod Rehab = moderate rehabilitation. MR = Mod Rehab. PB = project-based. PBA = project-based assistance. PHA = public housing authority. PM = private market. SHA = Seattle Housing Authority.
Sources: KCHA and SHA

Appendix E: Factors Associated With Exit

Detailed Methodology

Data Sources and Variables

The following variables from HUD Form 50058 Moving to Work (MTW) data were used in the exit analyses: (1) head of household demographics: gender (male, female, or both male and female reported over time, which was termed *multiple*), age (<25, 25–44, 45–61, 62+ [senior housing eligibility begins at age 62]), race/ethnicity (American Indian/Alaska Native, Asian, Black, Latinx, multiple races, Native Hawaiian/Pacific Islander, White), self-reported disability, length of time in housing; and (2) household characteristics: household size, single caregiver (one adult and one or more children in the household), and assistance type (project-based vouchers [PBVs], public housing [PH], or tenant-based vouchers [TBVs]).

Exits were restricted to those with at least a 12-month gap between the exit date and any subsequent housing (termed "true exits") and nondeath exits. If a head of household had multiple exits during the study period, the most recent exit was used. If multiple exit categories were recorded for a single event, the reason that belonged to the smallest group (positive, then negative, then neutral) was prioritized.

On the basis of existing literature and public housing authority (PHA) expertise, it was hypothesized that health status and previous housing instability would influence exits from housing and exit type. In addition to the demographic factors listed above, Behavioral Health and Recovery Division (BHRD) data was used to identify people who had experienced an acute behavioral health crisis event in the 12 months before housing exit. Homelessness was defined as one or more of the following circumstances in the 3 years before exit: appearing in Homeless Management Information System (HMIS) or Healthcare for the Homeless Network (HCHN) data, having a housing status in BHRD data that indicated housing instability, or having an address listed as "Homeless" in the Medicaid data (Johnson, McHugh, and Reimal, 2021). Medicaid data was used to identify those who had experienced emergency department (ED) visits or hospitalizations for any reason in the 12 months before housing exit and those with one or more chronic conditions, as defined by the Chronic Condition Warehouse (Centers for Medicare and Medicaid Services, 2022). An enhanced definition of *behavioral health crisis event* that added behavioral health-related ED visits from Medicaid to the BHRD data was created. Collectively, the Medicaid-derived all-cause ED visit, hospitalization, and chronic condition measures are a proxy for a person's health status.

Statistical Analysis

The primary analysis aimed to answer two questions: (1) What factors are associated with exiting from housing assistance? and (2) What factors are associated with each exit type? For both analyses, the unit of analysis was the head of household. Although some exit reasons may apply to the entire household, others focus on the individual, and other household members may continue to receive housing assistance.

To look at the first question, four controls (heads of household who remained in housing) were randomly matched for each exit without replacement and assigned the controls a pseudo-exit date that matched the exit date to assess the demographic and other variables noted above. A 4:1 ratio was used because greater ratios yield minimal gain in power to detect differences, and a limited number of controls were available for matching (Breslow, 2005). Controls were eligible to be matched if they

remained in housing for at least 12 months following the case exit date. Controls were not matched on any other characteristics to allow examination of how each variable was associated with exits. If they had been matched on a factor (e.g., age), the distribution of that factor would have been artificially balanced between those who exited and controls, meaning that no relationship between the factor and exiting would be found.

First, descriptive statistics were examined for programmatically meaningful differences in characteristics, as defined by subject matter experts who work with the PHA population. A binomial logistic regression was used to evaluate the relationship between each variable and exiting from housing. To examine factors associated with exit type, a multinomial logistic regression with neutral exits as the reference category was used. The DHARMa R package was used to conduct model checking (Hartig, 2022).

Secondary Analysis
Healthcare use data (ED visits, hospitalizations, and diagnosed chronic conditions) were available only for those who were enrolled in Medicaid before exiting. Therefore, a secondary analysis with the subset of participants (both those exiting and controls) who had full, non-dual (i.e., they were not also enrolled in Medicare) Medicaid coverage for at least 7 of the 12 months before the exit or pseudo-exit date. That minimum coverage requirement ensured that if a person visited the ED, was hospitalized, or was diagnosed with a chronic condition, the event would likely be detected in the claims data (Washington State Health Care Authority, 2022). Because Medicaid members with dual Medicare coverage were excluded, secondary analyses were also restricted to those ages <62; most older Medicaid recipients also have Medicare and Medicaid claims may be incomplete.

Detailed Results
For both those who remained and those who exited, people with 7 or more months of full Medicaid coverage in the year before exit were younger (median of 44/41 years for remained/exited and had Medicaid versus 59/56 years for those without Medicaid), more likely to be female (70.2 percent/64.6 percent versus 60.0 percent/55.3 percent), be Black (43.8 percent/43.5 percent versus 27.6 percent/29.1 percent), have a larger household (mean 2.8/2.4 versus 1.8/1.7), and have a single caregiver (30.1 percent/28.4 percent versus 11.8 percent /10.4 percent), but less likely to have a disability (35.4 percent/37.0 percent versus 50.1 percent/45.2 percent) (Exhibit E-1). Among those with Medicaid coverage, those exiting were more likely to be receiving a project-based voucher (PBV) than those who remained (49.4 percent versus 22.2 percent).

Although analyses were at the head-of-household level, a demographic profile of all those who exited is in Exhibit E-2. The pattern of differences between each exit type was largely the same as for heads of households (shown in Exhibit 5-1).

Exhibit E-1: Demographics of Heads of Households Who Exited Versus Those Who Did Not, by Medicaid Enrollment Status

	Remained, No Medicaid (N=15,214)	Remained, Medicaid (N=9,948)	Exited, No Medicaid (N=5,083)	Exited, Medicaid (N=3,183)
Age				
Mean (years)	58	44	56.5	41.4
Median (years)	59	44	56	41
Senior (age 62+)	44.8%	7.2%	40.1%	5.7%
Gender				
Another Gender	208 (1.4%)	145 (1.5%)	61 (1.2%)	36 (1.1%)
Female	9,131 (60.0%)	6,986 (70.2%)	2,813 (55.3%)	2,056 (64.6%)
Male	5,875 (38.6%)	2,817 (28.3%)	2,209 (43.5%)	1,091 (34.3%)
Race/Ethnicity				
AI/AN	171 (1.1%)	158 (1.6%)	75 (1.5%)	83 (2.6%)
Asian	1,763 (11.6%)	701 (7.0%)	522 (10.3%)	167 (5.2%)
Black	4,202 (27.6%)	4,356 (43.8%)	1,481 (29.1%)	1,385 (43.5%)
Latinx	1,011 (6.6%)	673 (6.8%)	339 (6.7%)	222 (7.0%)
Multiple	1,539 (10.1%)	991 (10.0%)	468 (9.2%)	269 (8.5%)
NH/PI	119 (0.8%)	84 (0.8%)	45 (0.9%)	22 (0.7%)
White	6,409 (42.1%)	2,985 (30.0%)	2,153 (42.4%)	1,035 (32.5%)
Time in Housing				
Mean Time (years)	6.2	5.5	5.4	4.4
Median Time (years)	6.2	4.5	4.3	3.0
Household Characteristics				
Head of Household w/ a Disability	50.1%	35.4%	45.2%	37.0%
Mean Household Size	1.8	2.8	1.7	2.4
Median Household Size	1	2	1	2
Single Caregiver	11.8%	30.1%	10.4%	28.4%
Program Type				
PBV	2,462 (16.2%)	2,210 (22.2%)	2,013 (39.6%)	1,573 (49.4%)
PH	4,985 (32.8%)	2,133 (21.4%)	1,330 (26.2%)	510 (16.0%)
TBV	7,767 (51.1%)	5,605 (56.3%)	1,740 (34.2%)	1,100 (34.6%)

	Remained, No Medicaid (N=15,214)	Remained, Medicaid (N=9,948)	Exited, No Medicaid (N=5,083)	Exited, Medicaid (N=3,183)
Health and Homelessness Events				
Experienced Recent Homelessness	2,373 (15.6%)	3,353 (33.7%)	1,448 (28.5%)	1,808 (56.8%)
Experienced 1+ Behavioral Health Crisis Events in Year Before Exit (excl. Medicaid ED visits)	220 (1.4%)	188 (1.9%)	343 (6.7%)	227 (7.1%)

AI/AN = American Indian/Alaska Native. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.

Source: NO HARMS integrated study dataset

Exhibit E-2: Demographics of All Those Who Exited, by Exit Type (Individual Level)

	All Exits (N=16,301)	Neutral Exit (N=7,984)	Positive Exit (N=2,902)	Negative Exit (N=5,415)
Age				
Mean (years)	33.9	37.1	31.1	30.8
Median (years)	31	35	27	27
Senior (age 62+)	14.8%	20.3%	9.2%	9.7%
Gender				
Another Gender	221 (1.4%)	99 (1.2%)	41 (1.4%)	81 (1.5%)
Female	8,793 (53.9%)	4,293 (53.8%)	1,572 (54.2%)	2,928 (54.1%)
Male	7,287 (44.7%)	3,592 (45.0%)	1,289 (44.4%)	2,406 (44.4%)
Race/Ethnicity				
AI/AN	262 (1.6%)	120 (1.5%)	20 (0.7%)	122 (2.3%)
Asian	1,422 (8.7%)	782 (9.8%)	317 (10.9%)	323 (6.0%)
Black	6,983 (42.8%)	3,245 (40.6%)	1,348 (46.5%)	2,390 (44.1%)
Latinx	1,303 (8.0%)	583 (7.3%)	188 (6.5%)	532 (9.8%)
Multiple	1,341 (8.2%)	585 (7.3%)	265 (9.1%)	491 (9.1%)
NH/PI	227 (1.4%)	103 (1.3%)	36 (1.2%)	88 (1.6%)
White	4,763 (29.2%)	2,566 (32.1%)	728 (25.1%)	1,469 (27.1%)
Time in Housing				
Mean Time (years)	5.5	4.7	7.0	5.9
Median Time (years)	4.4	3.2	7.1	5.0
Household Characteristics				
Head of Household Disability	27.3%	30.9%	14.7%	28.7%
Mean Household Size	3.2	2.9	3.9	3.2
Median Household Size	3	2	4	3
Single Caregiver	25.7%	24.7%	15.7%	32.6%
Program type				
PBV	6,152 (37.7%)	4,436 (55.6%)	755 (26.0%)	961 (17.7%)
PH	3,239 (19.9%)	1,418 (17.8%)	743 (25.6%)	1,078 (19.9%)
TBV	6,910 (42.4%)	2,130 (26.7%)	1,404 (48.4%)	3,376 (62.3%)
Health and Homelessness Events				
Experienced Recent Homelessness	5,015 (30.8%)	2,857 (35.8%)	401 (13.8%)	1,757 (32.4%)
Experienced 1+ Behavioral Health Crisis Events in Year Before Exit (excl. Medicaid ED visits)	608 (3.7%)	356 (4.5%)	23 (0.8%)	229 (4.2%)

	All Exits (N=16,301)	Neutral Exit (N=7,984)	Positive Exit (N=2,902)	Negative Exit (N=5,415)
Experienced 1+ Behavioral Health Crisis Events in Year Before Exit (inc. ED visits)[a]	173 (3.1%)	97 (4.1%)	<10	70 (3.2%)
Average # ED Visits in Year Before Exit[a]	1.1	1.2	0.5	1.1
Experienced 1+ ED Visits in Year Before Exit[a]	2,265 (40.8%)	1,048 (44.7%)	286 (28.6%)	931 (42.2%)
Average # Hospitalizations in Year Before Exit (per 100 people)[a]	7.5	8.7	3.9	7.9
Experienced 1+ Hospitalizations in Year Before Exit[a]	287 (5.2%)	148 (6.3%)	30 (3.0%)	109 (4.9%)
Average # of Chronic Conditions[a]	1	1	0.7	1.1

AI/AN = American Indian/Alaska Native. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.

[a] Health event data available for those age <62 enrolled in Medicaid (All exits N=5,550; Negative N=2,205; Neutral N=2,346; Positive N=999).

Source: NO HARMS integrated study dataset

Exhibit E-3: Regression Output for Heads of Household Who Exited Versus Controls Who Did Not (Medicaid Population)

	Odds Ratio	95% CI
Age		
<25	ref	—
25–44	0.67***	0.56–0.81
45–61	0.50***	0.41–0.61
Gender		
Female	ref	—
Male	1.05	0.94–1.17
Multiple	0.97	0.65–1.43
Race/Ethnicity		
White	ref	—
AI/AN	1.23	0.90–1.67
Asian	0.94	0.77–1.15
Black	1.03	0.93–1.15
Latinx	0.92	0.76–1.10
Multiple	0.90	0.76–1.07
NH/PI	0.89	0.52–1.45
Time in Housing		
<3	ref	—
3–5.99	1.18**	1.05–1.32
6–9.99	1.16*	1.01–1.32
10+	1.22**	1.05–1.42
Household Characteristics		
Head of Household w/Disability	0.81***	0.72–0.90
Household Size	0.93***	0.90–0.96
Single Caregiver	0.82***	0.73–0.92
Program Type		
TBV	ref	—
PBV	2.80***	2.52–3.11
PH	1.26***	1.11–1.43
Health and Homelessness Events		
Experienced Recent Homelessness	1.74***	1.57–1.94
Experienced 1+ Behavioral Health Crisis Event in Year Before exit (incl. ED visits)[a]	2.12***	1.69–2.66

	Odds Ratio	95% CI
Experienced 1+ ED Visit in Year Before Exit[a]	1.27***	1.16–1.40
Experienced 1+ Hospitalization in Year Before Exit[a]	0.96	0.82–1.12
2+ Chronic Conditions[a]	0.75***	0.68–0.83

* = p<0.05. ** = p<0.01. *** = p<0.001.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. Ref = Reference group. TBV = tenant-based voucher.

[a] Health event data available for those age <62 enrolled in Medicaid (N = 9,234 for controls, 3,001 for exits).

Source: NO HARMS integrated study dataset

Exhibit E-4: Regression Output for Heads of Household by Exit Type (Medicaid Population)

| | Negative/Positive Exits Versus Neutral Exits (neutral N=1,522) | | | |
| | Negative Exits (N=1,139) | | Positive Exits (N=340) | |
	Odds Ratio	95% CI	Odds Ratio	95% CI
Age				
<25	ref	—	ref	—
25–44	0.97	0.70–1.35	0.99	0.58–1.67
45–61	0.86	0.60–1.22	0.92	0.53–1.61
Gender				
Female	ref	—	ref	—
Male	1.08	0.88–1.34	1.21	0.90–1.63
Multiple	0.77	0.33–1.82	2.14	0.85–5.37
Race/Ethnicity				
White	ref	—	ref	—
AI/AN	1.67	0.98–2.85	0.56	0.17–1.92
Asian	0.85	0.54–1.33	1.35	0.82–2.22
Black	1.14	0.93–1.40	1.00	0.74–1.36
Latinx	1.24	0.87–1.79	1.26	0.74–2.14
Multiple	0.95	0.68–1.33	0.93	0.57–1.54
NH/PI	2.58	0.90–7.36	1.19	0.23–6.12
Time in Housing (years)				
<3	ref	—	ref	—
3–5.99	1.41**	1.12–1.78	1.36	0.96–1.93
6–9.99	1.55**	1.18–2.02	1.61*	1.10–2.36
10+	1.85***	1.35–2.53	2.49***	1.63–3.82
Household Characteristics				
Head of Household w/Disability	0.90	0.72–1.13	0.48***	0.33–0.68
Household Size	0.93*	0.88–0.99	1.10*	1.02–1.18
Single Caregiver	1.12	0.89–1.40	0.56***	0.40–0.78
Program Type				
TBV	ref	—	ref	—
PBV	0.11***	0.09–0.14	0.59**	0.42–0.82

	Negative/Positive Exits Versus Neutral Exits (neutral N=1,522)			
	Negative Exits (N=1,139)		Positive Exits (N=340)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
PH	0.82	0.63–1.07	2.08***	1.45–2.98
Health and Homelessness Events				
Experienced Recent Homelessness	2.12***	1.69–2.65	0.87	0.63–1.20
Experienced 1+ Behavioral Health Crisis Event in Year Before Exit (incl. ED visits)	1.50*	1.06–2.12	0.70	0.31–1.56
Experienced 1+ ED Visit in Year Before Exit	1.30**	1.08–1.58	0.62***	0.47–0.82
Experienced 1+ Hospitalization in Year Before Exit	0.79	0.59–1.06	0.74	0.44–1.26
2+ Chronic Conditions	0.91	0.75–1.11	0.96	0.72–1.29

* = p<0.05. ** = p<0.01. *** = p<0.001.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. HCV = Housing Choice Voucher. NH/PI = Native Hawaiian/Pacific Islander. PH = public housing. Ref = reference group.

Source: NO HARMS integrated study dataset

Code

https://github.com/PHSKC-APDE/hud_hears/tree/main/analyses/exit_factors

Appendix F: Housing Outcomes Following Exit

Detailed Methodology

To control for factors that might distort the relationship between exit type and subsequent homelessness, the model was adjusted for individual-level confounders (age at exit date, gender, race, and homelessness within 3 years before the exit date) and household-level confounders (agency (Seattle Housing Authority [SHA] or King County Housing Authority [KCHA]), assistance program type (grouped into major categories of public housing, project-based vouchers, or tenant-based vouchers), length of time in housing (years from entrance to exit date), household size, an indicator for the head of household having a disability, and an indicator for the household having a single caregiver). Propensity scores were calculated for each exit type using a multinomial regression model that contained the confounding variables above and accounted for household clustering.

Inverse probability treatment weighting (IPTW) was used to weight the observations in the Cox proportional hazards model using the propensity scores. Household clustering was accounted by using sandwich estimators.

For the leave-one-out analyses, the primary analysis was re-run with each exit factor with at least 100 exits omitted in turn. The resulting distributions were visualized with forest plots comparing them with the hazard ratio estimates from the primary analysis. The exit reasons that resulted in the estimate changing the most when omitted were considered the most influential exit reasons in the primary analysis.

Detailed Results

The two figures below show the results of the leave-one-out analyses, first focusing on the negative-versus-neutral comparison (Exhibit F-1) and then positive versus neutral (Exhibit F-2).

Exhibit F-1: Sensitivity Analysis of Time to Homeless, by Exit Reason, Negative Versus Neutral

Negative Versus Neutral Exit

Exit Reason Omitted	Number Omitted	Exit Category
PB/MR Moved Out, Location Unknown	2,598	Neutral
Voluntary Self-Termination	831	Neutral
Moved In W/Family or Friends	715	Neutral
Client Would Not Disclose Reason	592	Neutral
PB/MR Moved To Non-Time-Limited, Subsidized Housing	445	Neutral
Other	438	Neutral
Health	424	Neutral
Section 8 Incoming Portability Move Out	391	Neutral
PB/MR Moved To Hospital or Assisted Living	311	Neutral
PB/MR Moved To Temporary Housing (Family,Friends)	181	Neutral
Other Subsidized Housing/HCV	173	Neutral
Section 8 Absorption	129	Neutral
Moved To Non-KCHA Subsidized Rental	114	Neutral
Moved—Needed A Higher Level Of Services	112	Neutral
Voucher Expired	1,254	Negative
Landlord Eviction	416	Negative
Failure To Complete Reexamination	332	Negative
Client Location Unknown/Abandoned Unit	292	Negative
Location	269	Negative
Eviction—Judgment/Physical - Other	208	Negative
Serious/Repeated Lease Violations (noncriminal)	189	Negative
Noncompliance—Paperwork Violation	188	Negative
Other Violation Of Participant Obligations	184	Negative
Subsidy In Jeopardy Client Choice	176	Negative
More Than 60 Days Absent From The Unit	161	Negative
180 Days Away From Assisted Unit	150	Negative
Noncompliance—Payment Plan/Debt To SHA	131	Negative
Failure To Complete HQS Inspection	122	Negative
Eviction—Judgment/Physical	113	Negative
Noncompliance—Criminal Activity	110	Negative
Inspection/Damages	108	Negative
Full Data	**0**	**Full Data**

Hazard Ratio of Experiencing Homelessness (x-axis: 1.5, 1.75, 2, 2.25, 2.5, 2.75, 3)

HCV = housing choice voucher. HQS = Housing Quality Standards. KCHA = King County Housing Authority. MR = Mod Rehab. PB = project-based. SHA = Seattle Housing Authority.
Source: NO HARMS integrated study dataset

Exhibit F-2: Sensitivity Analysis of Time to Homeless, by Exit Reason, Positive Versus Neutral

Positive Versus Neutral Exit

Exit Reason Omitted	Number Omitted	Exit Category
PB/MR Moved Out, Location Unknown	2,598	Neutral
Voluntary Self-Termination	831	Neutral
Moved In W/Family or Friends	715	Neutral
Client Would Not Disclose Reason	592	Neutral
PB/MR Moved To Non-Time-Limited, Subsidized Housing	445	Neutral
Other	438	Neutral
Health	424	Neutral
Section 8 Incoming Portability Move Out	391	Neutral
PB/MR Moved To Hospital or Assisted Living	311	Neutral
PB/MR Moved To Temporary Housing (Family or Friends)	181	Neutral
Other Subsidized Housing/HCV	173	Neutral
Section 8 Absorption	129	Neutral
Moved To Non-KCHA Subsidized Rental	114	Neutral
Moved—Needed A Higher Level Of Services	112	Neutral
Moved To Non-Subsidized Rental	807	Positive
Section 8 Over Income	663	Positive
Homeownership	468	Positive
180 Days $50 Or Less Hap	371	Positive
PB/MR Moved To Non-Time-Limited, Market Rate	311	Positive
180 Days Zero Hap	217	Positive
Full Data	**0**	**Full Data**

Hazard Ratio of Experiencing Homelessness
0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4

Source: NO HARMS integrated study dataset

Code

https://github.com/PHSKC-APDE/hud_hears/tree/main/analyses/capstone

Appendix G: Physical Health Outcomes Following Exit

Detailed Methodology

Models were adjusted for the following variables:

- Gender (male, female, or another gender).
- Age (<25, 25–44, 45–62).
- Race/ethnicity (American Indian/Alaska Native, Asian, Black, Latinx, multiple races, Native Hawaiian/Pacific Islander, White).
- Head of household with a self-reported disability.
- Length of time in housing (<3, 3–<6, 6–<10, 10+ years).
- Housing assistance type (housing choice voucher or public housing).
- Household size.
- Single caregiver (one adult and one or more children in the household).
- 1+ emergency department (ED) visit/hospitalization in the year before exit.
- 2+ chronic conditions (as defined by the Chronic Condition Warehouse [Centers for Medicare and Medicaid Services, 2022]).

Detailed Results

Among exits, those who exited for positive reasons were more likely to be Asian and less likely to be Latinx or multiple races (Exhibit G-1). At the household level and compared with other exit types, those with positive exits tended to have received housing assistance longer, were in larger households, were less likely to have or be single caregivers, were less likely to have a head of household with a disability, and were more likely to live in public housing. People with positive exits also tended to be healthier, with fewer chronic conditions, ED visits, and hospitalizations in both the year before and the year after exit. Among ages <6, those with positive exits were more likely to have well-child checkups before and following exit.

When compared with people who continued to receive housing assistance, those exiting for any reason were similar in terms of age, gender, and race/ethnicity but tended to have shorter times in housing assistance, have smaller households, be more likely to have a head of household with a disability, and be less likely to live in public housing (Exhibit G-1). Those exiting also were slightly more likely to have an ED visit or hospitalization in the year before and after exit but less likely to have a well-child visit after exit.

Exhibit G-1: Demographics of Those Included in the Analysis of Physical Health Outcomes

	Remained (N=34,039)	Exited (N=5,550)	Negative Exit (N=2,205)	Neutral Exit (N=2,346)	Positive Exit (N=999)
Age					
Mean (years)	21.7	22.2	22.2	23.0	20.0
Median (years)	15	16	16	17	15
Gender					
Another Gender	603 (1.8%)	75 (1.4%)	30 (1.4%)	33 (1.4%)	12 (1.2%)
Female	18,952 (55.7%)	3,051 (55.0%)	1,277 (57.9%)	1,235 (52.6%)	539 (54.0%)
Male	14,484 (42.6%)	2,424 (43.7%)	898 (40.7%)	1,078 (46.0%)	448 (44.8%)
Race/Ethnicity					
AI/AN	396 (1.2%)	111 (2.0%)	63 (2.9%)	41 (1.7%)	<10
Asian	2,307 (6.8%)	384 (6.9%)	92 (4.2%)	172 (7.3%)	120 (12.0%)
Black	17,743 (52.1%)	2,792 (50.3%)	1,096 (49.7%)	1,184 (50.5%)	512 (51.3%)
Latinx	2,798 (8.2%)	497 (9.0%)	254 (11.5%)	176 (7.5%)	67 (6.7%)
Multiple	3,087 (9.1%)	431 (7.8%)	194 (8.8%)	179 (7.6%)	58 (5.8%)
NH/PI	495 (1.5%)	91 (1.6%)	41 (1.9%)	39 (1.7%)	<20
White	7,213 (21.2%)	1,244 (22.4%)	465 (21.1%)	555 (23.7%)	224 (22.4%)
Time in Housing[a]					
Mean Time (years)	5.8	4.9	5.5	3.8	6.7
Median Time (years)	5.2	3.5	4.4	2.3	6.4
Household Characteristics[a]					
Mean Household Size	4.3	2.8	2.8	2.5	3.8
Median Household Size	4	2	2	2	4
Single Caregiver	35.8%	30.9%	36.2%	29.7%	20.8%
Head of Household w/Disability	19.4%	31.4%	31.2%	37.3%	14.1%
Program Type[a]					
PBV	6,299 (18.7%)	1,245 (44.3%)	255 (22.8%)	865 (67.9%)	125 (29.8%)
PH	6,788 (20.1%)	430 (15.3%)	210 (18.8%)	120 (9.4%)	100 (23.9%)
TBV	20,650 (61.2%)	1,135 (40.4%)	652 (58.4%)	289 (22.7%)	194 (46.3%)

	Remained (N=34,039)	Exited (N=5,550)	Negative Exit (N=2,205)	Neutral Exit (N=2,346)	Positive Exit (N=999)
Health and Homelessness Events					
Average # of Chronic Conditions	1.0	1.0	1.1	1.0	0.7
Average # ED Visits in Year Before Exit	0.8	1.1	1.1	1.2	0.5
Average # Hospitalizations in Year Before Exit (per 100 people)	6.0	7.5	7.9	8.7	3.9
Experienced 1+ ED Visits in Year Before Exit	12,529 (36.8%)	2,265 (40.8%)	931 (42.2%)	1,048 (44.7%)	286 (28.6%)
Experienced 1+ Hospitalizations in Year Before Exit	1,516 (4.5%)	287 (5.2%)	109 (4.9%)	148 (6.3%)	30 (3.0%)
Completed 1+ Well-Child Visits in the Year Before Exit (ages <6)	4,285 (73.6%)	614 (70.3%)	215 (68.0%)	287 (70.3%)	112 (74.7%)
Average # ED Visits in Year After Exit	0.7	1.2	1.2	1.4	0.5
Average # Hospitalizations in Year After Exit (per 100 people)	5.2	6.9	8.2	7.4	3
Experienced 1+ ED Visits in Year After Exit	12,116 (35.6%)	2,149 (38.7%)	920 (41.7%)	964 (41.1%)	265 (26.5%)
Experienced 1+ Hospitalizations in Year After Exit	1,271 (3.7%)	260 (4.7%)	115 (5.2%)	121 (5.2%)	24 (2.4%)
Completed 1+ Well-Child Visits in the Year After Exit (ages <6)[b]	3,836 (65.9%)	486 (55.6%)	168 (53.2%)	228 (55.9%)	90 (60.0%)

AI/AN = American Indian/Alaska Native. ED = emergency department. HCV = housing choice voucher. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.

[a] At household level (Remained N=33,737; Exited N=2,810; Negative N=1,117; Neutral N=1,274; Positive N=419).

[b] Ages <6 (Remained N=5,823; Exited N=874; Negative N=316; Neutral N=408; Positive N=150).

Source: NO HARMS integrated study dataset

Exhibit G-2: Regression Output from the Physical Health Outcomes Model, by Exit Type

	ED Visits		Hospitalizations		Well-Child Checkups (with previous visit)		Well-Child Checkups (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Exit Category								
Negative	ref	—	ref	—	ref	—	ref	—
Positive	0.74**	0.61–0.89	0.71	0.44–1.15	1.27	0.74–2.16	1.57	0.67–3.67
Neutral	0.87	0.75–1.00	0.91	0.65–1.26	0.82	0.54–1.26	1.12	0.60–2.09
Age								
<25	ref	—	ref	—	—	—	—	—
25–44	1.26**	1.07–1.49	2.75***	1.89–3.99	—	—	—	—
45–<62	0.94	0.75–1.17	1.84*	1.15–2.95	—	—	—	—
Age at Exit (years)	—	—	—	—	0.82***	0.74–0.92	1.03	0.83–1.27
Gender[a]								
Female	ref	—	ref	—	ref	—	ref	—
Male	0.88*	0.77–0.99	0.53***	0.39–0.71	0.93	0.66–1.30	0.97	0.59–1.61
Multiple	1.21	0.74–1.99	1.21	0.46–3.17	—	—	—	—
Race/Ethnicity								
White	ref	—	ref	—	ref	—	ref	—
AI/AN	1.87*	1.15–3.05	1.26	0.58–2.75	10.50*	1.24–89.05	0.00***	0.00–0.00
Asian	0.56***	0.42–0.74	0.58	0.27–1.24	1.94	0.78–4.85	0.70	0.18–2.76
Black	0.99	0.85–1.16	0.91	0.67–1.24	1.15	0.68–1.93	0.63	0.29–1.36
Latinx	1.08	0.85–1.36	0.58	0.31–1.07	0.95	0.45–1.98	0.68	0.26–1.82
Multiple	1.16	0.91–1.48	0.89	0.53–1.49	0.85	0.35–2.04	0.93	0.29–3.03

	ED Visits		Hospitalizations		Well-Child Checkups (with previous visit)		Well-Child Checkups (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
NH/PI	1.35	0.83–2.19	2.17	0.91–5.19	0.17	0.03–1.06	0.26	0.03–2.12
Time in Housing (years)								
<3	ref	—	ref	—	ref	—	ref	—
3–5.99	0.92	0.78–1.08	0.68*	0.47–0.98	0.71	0.47–1.09	0.69	0.35–1.35
6–9.99	0.88	0.74–1.06	0.74	0.49–1.11	1.00	0.56–1.78	0.63	0.30–1.35
10+	0.80*	0.66–0.97	0.76	0.49–1.19	2.52*	1.22–5.19	0.81	0.33–1.96

	ED Visits		Hospitalizations		Well-Child Checkups (with previous visit)		Well-Child Checkups (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Household Characteristics								
Household Size	0.91***	0.88–0.95	0.92	0.84–1.01	0.87*	0.76–0.99	1.05	0.89–1.24
Single Caregiver	0.93	0.81–1.07	0.89	0.64–1.24	0.91	0.59–1.40	0.97	0.52–1.82
Head of Household Disability	1.01	0.85–1.20	1.27	0.93–1.74	1.09	0.56–2.13	1.91	0.75–4.86
Program Type								
HCV	ref	—	ref	—	ref	—	ref	—
PH	0.74**	0.61–0.90	0.89	0.56–1.42	0.66	0.40–1.08	0.81	0.34–1.89
TBV	0.87	0.74–1.02	1.07	0.74–1.54	0.73	0.47–1.15	1.04	0.56–1.95
Health								
No. ED Visits in Year Before Exit	1.53***	1.44–1.62	—	—	—	—	—	—
No. Hospitalizations in Year Before Exit	—	—	2.05***	1.68–2.50	—	—	—	—
2+ Chronic Conditions	2.28***	1.91–2.72	2.47***	1.78–3.43	—	—	—	—

* = p<0.05. ** = p<0.01. *** = p<0.001.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. HCV = Housing Choice Voucher. NH/PI = Native Hawaiian/Pacific Islander. PH = public housing. Ref = reference group. TBV = tenant-based voucher.

[a] Too few with multiple gender to include in model for well-child checkups.

Source: NO HARMS integrated study dataset

Exhibit G-3: Regression Output from the Physical Health Outcomes Model, by Exit Type Versus Remaining

	ED Visits		Hospitalizations		Well-Child Checks (with previous visit)		Well-Child Checks (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Exit Category								
Remained	ref	—	ref	—	ref	—	ref	—
Positive	0.80**	0.69–0.94	0.82	0.54–1.23	0.76	0.51–1.14	0.85	0.43–1.69
Neutral	1.06	0.96–1.16	1.16	0.93–1.44	0.57***	0.44–0.75	0.69	0.46–1.01
Negative	1.10	1.00–1.21	1.26*	1.03–1.55	0.67**	0.49–0.90	0.57**	0.38–0.87
Age								
<25	ref	—	ref	—	—	—	—	—
25–44	1.24***	1.17–1.32	2.67***	2.29–3.11	—	—	—	—
45–<62	0.88**	0.81–0.95	1.64***	1.35–2.00	—	—	—	—
Age at Exit (years)	—	—	—	—	0.74***	0.71–0.77	1.00	0.92–1.08
Gender[a]								
Female	ref	—	ref	—	ref	—	ref	—
Male	0.89***	0.85–0.93	0.51***	0.45–0.58	0.94	0.83–1.07	1.17	0.97–1.42
Multiple	1.11	0.94–1.30	0.92	0.62–1.38	—	—	—	—
Race/Ethnicity								
White	ref	—	ref	—	ref	—	ref	—
AI/AN	1.11	0.90–1.36	0.98	0.64–1.52	0.93	0.46–1.85	0.91	0.37–2.24
Asian	0.55***	0.50–0.62	0.75*	0.57–0.98	1.46*	1.03–2.07	0.69	0.39–1.20
Black	1.12***	1.05–1.18	1.08	0.95–1.24	1.18	0.98–1.44	1.04	0.78–1.38
Latinx	1.09	1.00–1.20	0.91	0.72–1.15	1.10	0.84–1.44	0.96	0.64–1.44

	ED Visits		Hospitalizations		Well-Child Checks (with previous visit)		Well-Child Checks (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Multiple	1.02	0.94–1.12	0.90	0.73–1.11	0.98	0.73–1.33	0.91	0.59–1.40
NH/PI	1.09	0.91–1.32	1.58*	1.05–2.39	0.79	0.49–1.27	0.43*	0.23–0.83
Time in Housing (years)								
<3	ref	—	ref	—	ref	—	ref	—
3–5.99	1.00	0.94–1.07	0.82**	0.71–0.95	1.00	0.85–1.17	1.05	0.81–1.35
6–9.99	0.97	0.92–1.04	0.77***	0.66–0.89	0.99	0.84–1.18	0.85	0.65–1.11
10+	0.90***	0.84–0.96	0.66***	0.56–0.77	0.95	0.77–1.18	0.63**	0.46–0.87

	ED Visits		Hospitalizations		Well-Child Checks (with previous visit)		Well-Child Checks (without previous visit)	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Household Characteristics								
Household Size	0.96***	0.94–0.97	0.95**	0.92–0.98	0.93***	0.90–0.97	1.03	0.97–1.09
Single Caregiver	1.02	0.97–1.08	0.83**	0.73–0.95	0.78**	0.67–0.90	0.86	0.68–1.08
Head of Household w/Disability	1.08*	1.02–1.15	1.03	0.90–1.18	1.05	0.84–1.32	1.28	0.92–1.80
Program Type								
HCV	ref	—	ref	—	ref	—	ref	—
PH	0.98	0.91–1.06	0.89	0.75–1.06	0.94	0.77–1.15	1.60**	1.16–2.22
TBV	1.02	0.96–1.08	1.02	0.89–1.17	0.82*	0.69–0.97	1.22	0.95–1.57
Health								
No. ED Visits in Year Before Exit	1.69***	1.65–1.73	—	—	—	—	—	—
No. Hospitalizations in Year Before Exit	—	—	2.13***	1.93–2.34	—	—	—	—
2+ Chronic Conditions	1.86***	1.74–1.99	2.54***	2.22–2.92	—	—	—	—

* = p<0.05. ** = p<0.01. *** = p<0.001.

AI/AN = American Indian/Alaska Native. CI = confidence interval. ED = emergency department. NH/PI = Native Hawaiian/Pacific Islander. PH = public housing. TBV = tenant-based voucher.

[a] Too few with multiple gender to include in model for well-child checks.

Source: NO HARMS integrated study dataset

Code

https://github.com/PHSKC-APDE/hud_hears/tree/main/analyses/health

Appendix H: Behavioral Health Outcomes Following Exit

Behavioral health conditions identified in Medicaid claims data based on algorithms provided by the Chronic Conditions Data Warehouse:

1. Attention deficit hyperactivity disorder (ADHD).
2. Adjustment disorders.
3. Alcohol use disorders.
4. Anxiety disorder.
5. Cannabis use disorder.
6. Cocaine use disorder.
7. Depression.
8. Disruption/impulse/conduct disorders.
9. Mania/bipolar disorder.
10. Opioid use disorders.
11. Other stimulant use disorders.
12. Other substance use disorders.
13. Psychotic disorder.
14. Sedative use disorder.

Exhibit H-1: Adjusted Odds Ratios for the Association Between Exit Type and Behavioral Health Crisis Events for All Types of Housing Assistance

	All Exits		Medicaid Subset	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Exit Category				
Neutral	ref	—	ref	—
Negative	2.10***	1.64–2.69	1.61***	1.29–2.00
Positive	0.95	0.60–1.49	0.90	0.62–1.30
Age				
Age at Exit (years)	0.99***	0.98–0.99	1.03***	1.02–1.03
Gender				
Female	ref	—	ref	—
Male	0.84	0.68–1.04	0.91	0.74–1.12
Multiple	0.71	0.23–2.17	1.24	0.54–2.83
Race/Ethnicity				
White	ref	—	ref	—
AI/AN	0.92	0.44–1.95	1.67	0.91–3.08
Asian	0.77	0.44–1.35	0.37**	0.20–0.70
Black	0.86	0.66–1.10	0.82	0.65–1.04
Latinx	1.28	0.86–1.92	0.76	0.52–1.11
Multiple	1.21	0.84–1.73	1.36	0.97–1.91
NH/PI	1.25	0.46–3.38	0.68	0.18–2.53
Time in Housing				
Years in Housing	0.95**	0.92–0.98	0.97*	0.94–0.99
Household Characteristics				
Household Size	0.61***	0.53–0.71	0.89**	0.83–0.96
Single Caregiver	0.72	0.49–1.07	1.01	0.78–1.29
Head of Household w/Disability	1.86***	1.43–2.41	1.43**	1.13–1.80
Program Type				
TBV	ref	—	ref	—
PBV	1.77***	1.31–2.39	1.49**	1.17–1.90
PH	1.12	0.78–1.60	0.79	0.57–1.10

	All Exits		Medicaid Subset	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Existing Behavioral Health				
Previous Crisis Events	9.53***	7.39–12.28	8.45***	6.81–10.49

* = p<0.05. ** = p<0.01. *** = p<0.001.

AI/AN = American Indian/Alaskan Native. CI = confidence interval. NH/PI = Native Hawaiian/Pacific Islander. PBV = project-based voucher. PH = public housing. Ref = reference group. TBV = tenant-based voucher.

Source: NO HARMS integrated study dataset

Code

https://github.com/PHSKC-APDE/hud_hears/tree/main/analyses/behavioral

Appendix I: Wage Outcomes Following Exit

Study Population

King County Housing Authority (KCHA, 2016–2018) and Seattle Housing Authority (SHA, 2012–2018) clients constituted the cohort. The cohort was limited to those who exited federally supported housing between 2016 and 2018 to prevent the introduction of temporal biases. The cohort was further limited KCHA and SHA clients with a final exit on record who did not reenter public housing within 1 year (i.e., "true exits") and to those with a recorded positive or negative exit, as defined in Chapter 4 . Those who were public housing authority (PHA) clients for less than 1 year were also excluded. Finally, observations were limited to wage earners between 18 and 61 years of age and excluded households with a wage earner 62 years old or older because senior housing and pension eligibility begin at age 62.

Data Sources and Variables

Foundational demographic data (age, gender, race/ethnicity, single-caregiver household, and head of household with a disability) were extracted from HUD Form 50058. Wage data was obtained from the Washington State Employment Security Department (ESD). Wage data are available for most Washington State employees except independent contractors and specific exempt employees (Employment Security Department, Washington State, n.d.). Wages greater than three standard deviations from the mean wage were excluded, as were hourly wages below the legal minimum wage (King County Procurement and Payables Section, 2021; Washington State Department of Labor and Industries, n.d.). The quarter of exit was defined as quarter zero. The quarters before were coded as -4, -3, -2, -1 and the quarters after exit as 1, 2, 3, 4.

HUD Neighborhood Stabilization Program tables provided data for calculation of the percentage of Area Median Income (AMI), which was limited to households in Washington State with fewer than nine members (HUD PD&R, n.d.).

Analytic individual-level characteristics included client age, gender (female, male, or multiple [those with records indicating both male and female at different times]), race (with Hispanic as a race), quarterly wage earnings, quarterly hours worked, and quarterly hourly wages. Household-level characteristics included exit year (2016, 2017, or 2018), exit season (winter, spring, summer, or fall), number of years receiving housing assistance (continuous), head of household with a disability (binary), single-caregiver household (binary), housing agency (KCHA or SHA), and PHA program type (tenant-based voucher [TBV], project-based voucher [PBV], and public housing [PH]).

Data Linkage

The foundational data linkage process was described in Chapter 3. In addition, wage data were linked to housing data by Social Security number.

Statistical Analysis

Chi-square (categorical variables) and Kruskal-Wallis (continuous variables) tests were used to assess statistically significant differences in client characteristics by exit type. Variables that were associated with the exit type in univariate analyses were designated as potential confounders. When potential confounders were also associated with quarterly wages (assessed using Kruskal-Wallis or Spearman's Rank Correlation tests), they were designated as confounders and were included in the final model.

The relationship between exit type and quarterly wages was modeled using linear regression, with random effects to account for repeated measures (persons and households) and nesting (persons within households) (equation 1). Time (quarters -4 to 4) was modeled as cubic spline with a knot at the time of exit (quarter 0) and included an interaction with exit type. A likelihood ratio test was used to determine whether to keep the interaction term. All previously identified confounders were included in the model without data transformations. Model quality was assessed by creating plots of observed versus predicted wages and plots of residuals over time.

$$\text{Equation 1.} \quad quarterly.wage = \beta_0 + \beta_1 * exit\_type + \beta_2 * spline(time) + \beta_3 * exit\_type * spline(time) + \beta_4 * confounder\_1 + \beta_5 * confounder\_2 + \dots + \beta_{n+3} * confounder\_n + e + u, \text{ where } \dots$$

e is the random intercept for the individual
u is the random intercept and slope for the household

The mean predicted quarterly wage was calculated by averaging 10,000 samples from the normal distribution defined by the estimate and standard error predicted for each row of the original dataset. A counterfactual was created by ascribing the mean quarterly change in wages among negative exits to the starting positive exit mean quarterly wage. Quarterly positive, negative, and counterfactual predicted wages were plotted for descriptive analyses.

Statistical significance was based on a two-sided p-value of < 0.05 and regression uncertainty was expressed as 95-percent confidence intervals (CIs). R and Rstudio were used for all analyses, with the lmerTest package for regression and the marginaleffects package for predictions (Arel-Bundock, 2022; Kuznetsova, Brockhoff, and Christensen, 2017; R Core Team, 2022; RStudio Team, 2022).

Secondary Analysis

In a secondary analysis, wages were replaced with the percentage of AMI. Percentage of AMI was of interest because it accounts for overall household wages and household size and is the metric used to define eligibility for federally subsidized housing.

Detailed Results

Exhibit I-1: Demographics During the Quarter of Exit for Those Who Exited Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018

	Negative (N=675)	Positive (N=680)	Total (N=1,355)	p-value
Age				**0.293**
Mean (SD)	34 (11)	35 (13)	35 (12)	
Gender				**0.076**
Female	449 (66.5%)	412 (60.6%)	861 (63.5%)	
Male	220 (32.6%)	261 (38.4%)	481 (35.5%)	
Race/Ethnicity				**0.006**
AI/AN	15 (2.2%)	<10	21 (1.5%)	
Asian	49 (7.3%)	81 (11.9%)	130 (9.6%)	
Black	332 (49.2%)	295 (43.4%)	627 (46.3%)	
Latinx	50 (7.4%)	54 (7.9%)	104 (7.7%)	
Multiple	56 (8.3%)	67 (9.9%)	123 (9.1%)	
NH/PI	16 (2.4%)	<10	24 (1.8%)	
White	157 (23.3%)	169 (24.9%)	326 (24.1%)	
Wages				**< 0.001**
Mean (SD)	5,568 (4,425)	8,048 (5,059)	6,812 (4,911)	
Median	4,823	7,673	6,356	
Hours				**< 0.001**
Mean (SD)	363 (210)	448 (186)	408 (202)	
Median	406	480	452	
Missing[a]	225	160	385	
Wages Hourly				**< 0.001**
Mean (SD)	18 (8)	20 (8)	19 (8)	
Median	16	18	17	
Missing	225	160	385	
Exit Year				**< 0.001**
2016	189 (28.0%)	206 (30.3%)	395 (29.2%)	
2017	267 (39.6%)	199 (29.3%)	466 (34.4%)	
2018	219 (32.4%)	275 (40.4%)	494 (36.5%)	
Season				**0.012**
Winter	149 (22.1%)	121 (17.8%)	270 (19.9%)	
Spring	183 (27.1%)	212 (31.2%)	395 (29.2%)	
Summer	160 (23.7%)	194 (28.5%)	354 (26.1%)	
Fall	183 (27.1%)	153 (22.5%)	336 (24.8%)	

Years in Public Housing				**< 0.001**
Mean (SD)	7 (4)	9 (4)	8 (4)	
Household Characteristics				
Head of Household w/Disability	112 (16.6%)	71 (10.4%)	183 (13.5%)	< 0.001
Single-Caregiver Household	176 (26.1%)	61 (9.0%)	237 (17.5%)	< 0.001
Percentage of AMI				**< 0.001**
Mean (SD)	37 (29)	66 (34)	51 (35)	
Missing	7	17	24	
Agency				**0.675**
KCHA	450 (66.7%)	446 (65.6%)	896 (66.1%)	
SHA	225 (33.3%)	234 (34.4%)	459 (33.9%)	
Program Type				**0.007**
TBV	92 (13.6%)	119 (17.5%)	211 (15.6%)	
PBV	87 (12.9%)	115 (16.9%)	202 (14.9%)	
PH	495 (73.4%)	446 (65.6%)	941 (69.5%)	
Missing	1	0	1	

AI/AN = American Indian/Alaska Native. AMI = Area Median Income. KCHA = King County Housing Authority. NH/PI = Native Hawaiian/ Pacific Islander. PBV = project-based voucher. PH = public housing. SD = standard deviation. SHA = Seattle Housing Authority. TBV = tenant-based voucher.

[a] When "Missing" is not shown, there are no missing values for the given variable.

Source: NO HARMS integrated study dataset

Exhibit I-2: Regression Fixed Effect Coefficients Describing the Relationship Between Exit Type and Wages for Those Who Exited Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018

Term	Estimate (95% CI)	p-value
(Intercept)	$4,873 ($4,184, $5,563)	<0.001
Positive exit	$1,589 ($1,067, $2,111)	<0.001
spline(time, knots = c(0))1	$349 (− $43, $740)	0.081
spline(time, knots = c(0))2	$733 ($300, $1,166)	0.001
spline(time, knots = c(0))3	$921 ($559, $1,283)	<0.001
spline(time, knots = c(0))4	$1,233 ($1,000, $1,466)	<0.001
Exit year: 2016	Referent	
Exit year: 2017	− $797 (− $1,379, − $216)	0.007
Exit year: 2018	$29 (− $545, $603)	0.922
Head of household with disability	− $1,087 (− $1,756, − $418)	0.001
Project type		
TBV	Referent	
PBV	− $874 (− $1,547, − $201)	0.011
PH	$23 (− $646, $692)	0.947
Years in public housing	$90 ($33, $147)	0.002
exit:spline(time, knots = c(0))1	− $179 (− $732, $374)	0.526
exit:spline(time, knots = c(0))2	$1,017 ($407, $1,628)	0.001
exit:spline(time, knots = c(0))3	$684 ($173, $1,194)	0.009
exit:spline(time, knots = c(0))4	$537 ($208, $866)	0.001

CI = confidence interval. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.
Source: NO HARMS integrated study dataset

Exhibit I-3: Mean Predicted Wages Are Similar to Mean Observed Wages for Each Exit Type and Quarter, Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018

Quarter	Exit Type	Predicted	Observed
− 4	Positive	$6,706	$6,701
− 3	Positive	$6,933	$6,933
− 2	Positive	$7,294	$7,337
− 1	Positive	$7,691	$7,621
Exit	Positive	$8,024	$8,048
1	Positive	$8,223	$8,217
2	Positive	$8,322	$8,380
3	Positive	$8,386	$8,322
4	Positive	$8,475	$8,495
− 4	Negative	$4,927	$4,934
− 3	Negative	$5,161	$5,139
− 2	Negative	$5,346	$5,369
− 1	Negative	$5,493	$5,500
Exit	Negative	$5,611	$5,570
1	Negative	$5,714	$5,771
2	Negative	$5,822	$5,772
3	Negative	$5,963	$5,988
4	Negative	$6,160	$6,155

Source: NO HARMS integrated study dataset

Exhibit I-4: Regression Fixed Effect Coefficients Describing the Relationship Between Exit Type and Percentage of Area Median Income for Those Who Exited Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018

| Term	Estimate (95% CI)	*p*-value
(Intercept)	21% (13%, 29%)	<0.001
Positive exit	24% (16%, 32%)	<0.001
spline(time, knots = c(0))1	4% (− 1%, 9%)	0.101
spline(time, knots = c(0))2	2% (− 3%, 8%)	0.396
spline(time, knots = c(0))3	5% (0%, 10%)	0.03
spline(time, knots = c(0))4	5% (2%, 8%)	<0.001
Exit year: 2016	Referent	
Exit year: 2017	− 2% (− 9%, 5%)	0.563
Exit year: 2018	− 4% (− 12%, 3%)	0.264
Head of Household with disability	− 3% (− 12%, 7%)	0.59
Project type		
TBV	Referent	
PBV	− 2% (− 11%, 8%)	0.741
PH	− 8% (− 17%, 0%)	0.06
Years in public housing	2% (1%, 3%)	<0.001
exit:spline(time, knots = c(0))1	− 7% (− 16%, 2%)	0.152
exit:spline(time, knots = c(0))2	12% (2%, 22%)	0.02
exit:spline(time, knots = c(0))3	− 1% (− 10%, 7%)	0.728
exit:spline(time, knots = c(0))4	8% (2%, 13%)	0.005

CI = confidence interval. PBV = project-based voucher. PH = public housing. TBV = tenant-based voucher.
Source: NO HARMS integrated study dataset

Exhibit I-5: Residual Plot of Model Estimates Over Time Shows No Evidence of Autocorrelation
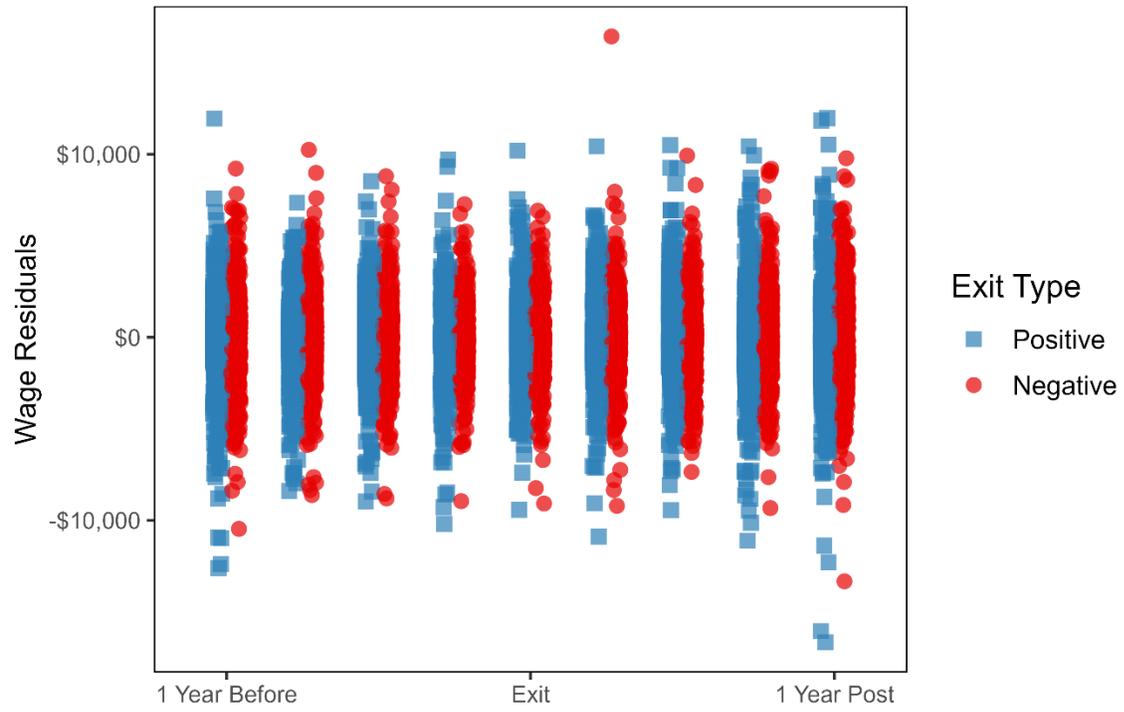
Source: NO HARMS integrated study dataset

Exhibit I-6: Mean Predictions of Percentage of Area Median Income for Those Who Exited Seattle and King County Public Housing Authority Programs Between January 1, 2016, and January 1, 2018
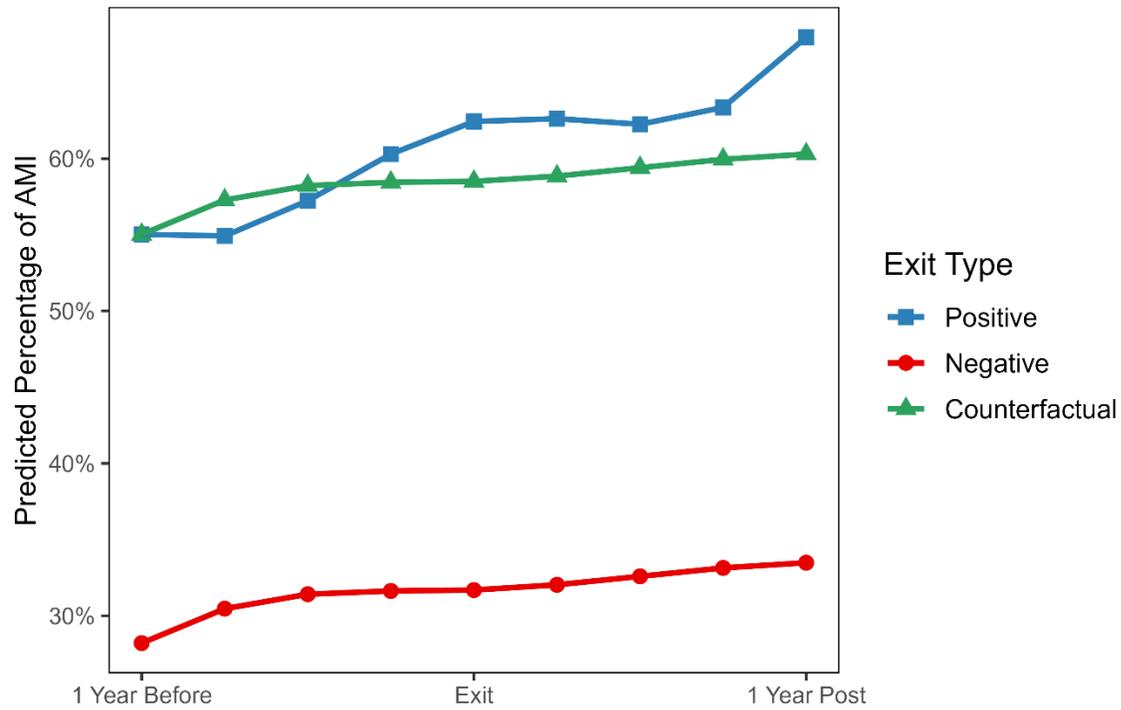
AMI = Area Median Income.
Source: NO HARMS integrated study dataset

Code

https://github.com/PHSKC-APDE/hud_hears/tree/main/analyses/wages/final_report

Appendix J: References

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