

# Public Service Use and Costs Associated with NY/NY III's Supportive Housing for Active Substance Users

The fourth paper from CASAHOPE<sup>SM</sup>



The National Center on  
Addiction and Substance Abuse  
at Columbia University

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## Executive Summary

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Finding a way to stably house homeless persons with substance use disorders is critical to solving the overall problem of homelessness. However, there is considerable debate regarding the best way to accomplish this goal. In past decades the dominant approach has been a continuum of care model in which homeless persons with substance use disorders pass through a series of substance use and housing programs based on their progress towards sobriety. More recently, cities across the United States have been adopting a form of supportive housing, broadly defined as housing linked with social services, that moves tenants directly from the streets or shelters into housing, with no requirements regarding concurrent mental health or substance use treatment. This model is called ‘Housing First’. Whereas the ability of Housing First to effectively house the chronically homeless has been established by multiple studies, more research is needed on the impact of this housing approach on tenants without serious mental illness (SMI) as well as tenants who use substances other than or in addition to alcohol. The Conrad N. Hilton Foundation funded CASAHOPE<sup>SM</sup> (Housing Opportunities Program Evaluation) to address some of these gaps in the Housing First literature by evaluating a set of unique harm reduction supportive housing units created under the New York/New York III (NY/NY III) agreement.

In November 2005, Mayor Bloomberg and Governor Pataki announced the NY/NY III agreement, a \$1 billion commitment between the City and State to develop 9,000 new units of supportive housing in New York City. This agreement funded housing for nine target populations, one of which, often referred to as ‘Population E’, is defined as chronically homeless individuals for whom substance use is a primary barrier to independent living. For the purposes of this paper ‘Population E’ will also be used to refer to the specific programs providing supportive housing to this group. Local housing providers received funding to offer over 500 units of scattered-site housing (i.e., housing units dispersed in apartment buildings throughout the area rather than highly concentrated in one building, which is called congregate housing) for Population E. An additional 250 units of congregate housing for Population E are being developed, but these are not being evaluated by CASAHOPE.

Tenants of the nine scattered-site Population E housing programs are not required to be abstinent from alcohol and drugs or to participate in addiction treatment prior to or during housing. The primary objective of these programs is not to decrease tenant substance use, but to stably house tenants while motivating them to make better mental and physical health choices, including choices that reduce substance-related harm in their lives. Accordingly, CASAHOPE is an evaluation of housing stability in the context of tenant substance use.

The CASAHOPE evaluation uses data from multiple sources: tenants, program staff, key stakeholders, and government administrative databases. All CASAHOPE papers are available on the CASAColumbia® website ([www.casacolumbia.org](http://www.casacolumbia.org)). Our first paper, *Characteristics of Persons Housed by NY/NY III’s Supportive Housing for Active Substance Users*, provides a baseline description of tenants who entered housing between 2007 and 2009. Our second

paper, *Unlocking the Door: An Implementation Evaluation of Supportive Housing for Active Substance Users in New York City*, presents findings from our implementation evaluation conducted in partnership with the Corporation for Supportive Housing. The third paper, *Twelve-Month Tenant Outcomes for Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*, describes results from the 12-month follow-up interview with tenants conducted by CASAHOPE research staff in 2008 and 2009 and from logs completed by case managers every month for the first year tenants were housed. This final paper describes changes in tenant utilization of government services and associated economic impacts as well as service and cost outcomes compared to a group of similar individuals who did not receive supportive housing services.

The current report, *Public Service Use and Costs Associated with NY/NY III's Supportive Housing for Active Substance Users*, presents results from CASAHOPE's service utilization and cost analysis of NY/NY III's Housing First for individuals whose substance use is a primary barrier to housing. Using administrative data collected between 2007 and 2010 for both (1) those who received housing and (2) a comparison group of similar individuals who were eligible for housing but were not placed due to unavailability of units, we examined service use and cost across multiple publicly-funded systems.

Detailed findings are presented herein. In sum, we found the following outcomes for service utilization and associated costs:

### **Service Utilization Analysis**

#### **Single Shelter Use**

- Compared to unplaced study participants, participants placed in NY/NY III housing were less likely to use any shelter services and stayed fewer days when shelters were used.

#### **Jail Use**

- Compared to unplaced participants, placed clients were less likely to go to jail and spent half the number of days in jail.

#### **Medicaid Use**

- Placed participants were less likely to have any hospitalizations and spent fewer days as an inpatient when hospitalized. Housing placement was not found to have an impact on the number of outpatient Medicaid claims.
- The number of participants with any visits to hospital emergency departments and the average number of visits per client were significantly reduced for participants placed in housing.
- Placed participants were less likely to initiate inpatient substance abuse treatment and had fewer days in treatment than unplaced participants.
- There was no significant difference in the number of participants who initiated outpatient substance abuse treatment or the number of related Medicaid claims filed between placed versus unplaced participants.

- Study subjects placed in housing were significantly less likely to initiate drug or alcohol detoxification.

### **Cost Analysis**

- Placed participants incurred substantially fewer costs in single shelter residency. The expected shelter cost savings due to housing placement is \$8,030 per placed person per year.
- Total welfare costs increased for placed participants. The difference in welfare cost associated with housing placement was \$658 per placed person per year.
- There was a decrease in jail cost associated with placement in NY/NY III housing. On average, the decrease in jail cost was \$1,488 per placed person per year.
- Medicaid costs decreased by about one-third for placed participants compared to unplaced participants. The expected Medicaid savings due to placement in NY/NY III housing is \$3,983 per placed person per year.
- Taking into account spending for Medicaid, jail, welfare, single shelter, and the NY/NY III housing subsidy, there was no significant difference in public service costs between placed and unplaced study subjects.

### **Conclusions**

Overall, study analyses found that the NY/NY III program was successful in reducing placed participant utilization of shelters, jail, and medical services as well as linking clients to public benefits. When public assistance, shelter, jail, NY/NY III housing and Medicaid costs are summed prior to analysis, we found no significant difference in costs between placed and unplaced study participants.

Although some well-known evaluations of Housing First programs for chronically homeless persons with alcohol problems have reported a savings in total costs for participants placed in supportive housing compared to those on the housing waiting list, the savings may be attributed to selection of individuals with the highest pre-housing costs for alcohol-related hospital, detoxification, and jail services. Individuals who are heavy users of these crisis services while homeless are likely to experience a substantial decline in service use (and associated incurred costs) after being housed. For moderate service users, one would expect moderate savings. In order to fully offset the cost of the housing subsidy, it may be necessary for supportive housing programs to primarily target those individuals with the highest utilization of crisis services.

In CASAHOPE's previous report, *Twelve-Month Tenant Outcomes for Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*, we presented the results of in-depth interviews conducted with a subsample of individuals placed in Population E housing at the beginning of their housing tenure and 12 months later. Interview participants reported no increase in substance use, physical health or mental health problems, or criminal justice involvement over the first year of housing. Though actively substance using homeless individuals have historically been viewed as not 'housing-ready', we found no association

between type or amount of substance use and housing retention. Only case manager report of substance use consequences during the first year of housing was related to a significant increase in the risk of housing discharge. In general, tenants reported receiving the services they needed as well as high levels of satisfaction with their case management and housing. These findings suggest that individuals who actively use drugs or alcohol can be stably housed without a precondition of treatment involvement. Moreover, the provision of housing to these individuals was not associated with significantly greater public expenditure than chronically homeless individuals who did not receive supportive housing.



# CHAPTER I

## INTRODUCTION

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In November 2005, Mayor Bloomberg and Governor Pataki announced the New York/New York III (NY/NY III) agreement, a \$1 billion commitment between the City and State to develop 9,000 new units of housing linked with supportive services, known as supportive housing. NY/NY III is larger in scope than the previous two NY/NY agreements and is the first to include housing for people *without* serious mental illness (SMI). While the expanded target populations of NY/NY III signal the City and State's belief in supportive housing as an effective intervention, the optimism behind supportive housing is most clearly demonstrated by the inclusion of units for actively substance using homeless individuals without SMI, often referred to as NY/NY III's 'Population E'. For the purposes of this paper, 'Population E' will also be used to refer to the specific programs providing supportive housing to these individuals. This housing was included in NY/NY III in response to the overcrowding of city shelters by individuals who are homeless and had substance use problems, a group that was typically seen as having difficulty completing substance abuse treatment and maintaining housing (CASAHOPE, 2012a).

Local housing providers received funding to offer over 500 units of scattered-site housing (i.e., housing units dispersed in apartment buildings throughout the City) and 250 units of single site housing (i.e., housing units in one building) in New York City for Population E. Importantly, housing for Population E uses a Housing First approach and does not require tenants to enter substance use disorder treatment or stop using alcohol or drugs. Whereas there are a number of programs in the country that have moved away from sobriety as a prerequisite for housing, this is one of the first large-scale, urban investments in supportive housing for this population.

The Conrad N. Hilton Foundation has funded CASAHOPE (Housing Opportunities Program Evaluation) to evaluate the scattered-site supportive housing for Population E. This paper is the fourth and last in a series from CASAHOPE. All CASAHOPE papers are available on the CASAColumbia website ([www.casacolumbia.org](http://www.casacolumbia.org)). Our first paper, *Characteristics of Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*, provides a baseline description of tenants entering housing (CASAHOPE, 2011). Our second paper, *Unlocking the Door: An Implementation Evaluation of Supportive Housing for Active Substance Users in New York City*, presents findings from our implementation evaluation conducted in partnership with the Corporation for Supportive Housing (CASAHOPE, 2012a). The third paper, *Twelve-Month Tenant Outcomes for Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*, describes results from the 12-month follow-up interview with tenants conducted by CASAHOPE research staff in 2008 and 2009 and logs completed by case managers every month for the first year tenants were housed (CASAHOPE, 2012b). This final paper will describe changes in tenant utilization of government services and associated economic impacts as well as service and cost outcomes compared to a group of similar individuals whom did not receive supportive housing services.

## Background

Finding a way to stably house homeless persons with substance use disorders is critical to solving the overall problem of homelessness. There is, however, considerable debate regarding the best way to accomplish this goal. In past decades the dominant approach has been a continuum of care model in which homeless persons with substance use disorders pass through a series of programs based on their progress towards sobriety (Kertesz, Crouch, Milby, Cusimano, & Schumacher, 2009). Under this model, the typical path to housing requires clients to (1) be willing and able to be abstinent from drugs and/or alcohol, (2) access services through a shelter or street-outreach team, (3) attend abstinence-based treatment, including detox and long-term residential programs, (4) complete treatment and move into transitional housing, and then, (5) locate permanent housing. More recently, cities across the country have been adopting a different form of supportive housing that moves tenants directly from the streets or shelters into housing, with no requirements regarding mental health or substance use treatment. This model is called 'Housing First', and as mentioned above, it is the approach used by the NY/NY III supportive housing for Population E.

Housing First programs have demonstrated generally promising outcomes in the areas of housing stability, health, and well-being. Perhaps the most studied Housing First program is the originator of the model, Pathways to Housing. Pathways to Housing offers immediate housing for persons with serious mental illness (SMI) with no requirements around sobriety or treatment. Under the Pathways to Housing model, support services are provided by a multidisciplinary approach such as Assertive Community Treatment (ACT) available 24 hours a day, 7 days a week. Studies comparing outcomes for those entering Pathways To Housing verses usual care (i.e., a multi-stepped abstinence-based approach), have found that those in Housing First programs obtained housing earlier, remained more stably housed, and reported higher perceived choice than the control group (Gulcur, Stefancic, Shinn, Tsemberis, & Fischer, 2003; Padgett, Gulcur, & Tsemberis, 2006; Tsemberis & Eisenberg, 2000; Tsemberis, Gulcur, & Nakae, 2004). No differences were found in substance use or psychiatric symptoms between the groups, leading investigators to conclude that Housing First programs offer tenants a chance at stable housing without worsening psychiatric or substance misuse symptoms. Similarly, studies of other Housing First programs that do not strictly adhere to the Pathways model have suggested that Housing First is a viable approach for housing chronically homeless persons with substance use disorders (Mares & Rosenheck, 2009; Pearson, Locke, Montgomery, & Buron, 2007).

As reported in the third paper from CASAHOPE, *Twelve-Month Tenant Outcomes for Persons Housed by NY/NY III's Supportive Housing for Active Substance Users* (CASAHOPE, 2012b), findings from our evaluation of New York/New York III's housing for Population E indicate that this population can be stably housed without a precondition of substance use treatment attendance. CASAHOPE found no evidence of worsening substance use, physical health, mental health, or criminal justice involvement over the first year of housing. In general, tenants

reported high levels of satisfaction with their case management and housing. After one year, 88% of tenants remained in the program.

### ***Supportive Housing, Service Utilization, and Cost***

In addition to being linked with neutral or positive tenant-reported outcomes, proponents of Housing First argue that the model could lead to decreased use of avoidable crisis services and increased cost savings to the public. High rates of chronic medical illnesses including diabetes, hypertension, respiratory and sexually transmitted infections, skin and foot problems, and exposure to the elements have been well documented among the chronically homeless (Hwang, 2000; Robertson & Cousineau, 1986). Homeless individuals with these and other illnesses often face barriers to receiving appropriate preventive or primary outpatient care and become frequent users of expensive emergency department and hospital services (Culhane, Metraux, Hadley, 2002; Kushel, Perry, Bangsberg, Clark, & Moss, 2002; Kushel, Vittinghoff, & Haas, 2001). A review of New York City hospital discharge data found that homeless individuals stayed 4.1 days longer in the hospital than other low-income patients (Salit, Kuhn, Hartz, Vu, & Moss, 1998). These expensive acute care services are often publicly funded, and rising costs have created a strong incentive for communities to identify effective strategies for meeting the healthcare needs of this group.

The barriers that homeless individuals face in attaining appropriate healthcare are also associated with avoidable use of other high cost services. Chronically homeless individuals are at increased risk for criminal justice involvement compared to those in stable housing. This is particularly true for homeless individuals with substance use disorders. Substance related offenses make up 50% of all arrests of homeless individuals, and are largely for minor offenses such as trespassing in abandoned buildings or public intoxication (Snow, Baker, & Anderson, 1989). In addition, the primary intervention for housing individuals who are homeless is often to provide expensive shelter services, which offer temporary beds but generally fail to address the more long-term needs of chronically homeless persons (Culhane & Metraux, 2008).

Studies have demonstrated that individuals placed in supportive housing experience reductions in hospitalizations, incarceration, and shelter use (Edens, Mares, Tsai, & Rosenheck, 2011; Martinez & Burt, 2006; O'Connell, Kaspro, & Rosenheck, 2009). Notably, O'Connell, Kaspro, and Rosenheck (2009) found that those placed directly in HUD-VASH units accrued more outpatient costs, while those who received treatment prior to housing accrued more in inpatient costs, suggesting that supportive housing is able to direct those in need of medical care away from expensive crisis services and into more appropriate and cost-effective outpatient treatment.

To investigate the cost effectiveness of supportive housing, studies have also compared housing program costs with the savings from housing individuals with patterns of high levels of service utilization. One particularly well-known study of chronically homeless individuals with SMI in New York City found that the cost of providing supportive housing to study participants was almost completely offset by savings related to participants' reduced use of health, criminal

justice, and shelter services (Culhane, Metraux, & Hadley, 2002). In slight contrast, Rosenheck, Kaspro, Frisman, and Liu-Mares (2003) found that despite reductions in service use, housing subsidies with case management services was 15% more costly than standard care for homeless veterans with mental illness.

### ***Housing First, Service Utilization, and Cost***

More recently, studies have begun to investigate service utilization and costs associated with housing tenants in programs using a Housing First approach. Researchers have reported decreases in the use of many crisis services, including expensive emergency room visits, inpatient hospital stays, incarcerations, and increases in the use of desirable primary care services, including outpatient mental health and substance use services (Gilmer et al., 2009; Martinez & Burt, 2006; Tsai, Mares & Rosenheck, 2010; Tsemberis, Gulcur, & Nakae, 2004). In Chicago, a randomized controlled trial of housing for homeless persons with chronic medical illness discharged from area hospitals found that those offered housing based on a Housing First model had fewer hospital days and emergency department visits than those who received usual care (e.g., discharge planning), resulting in an average annual cost savings of \$6,307 per person (Sadowski, Kee, VanderWeele, & Buchanan, 2009).

A number of city and state Housing First initiatives have been the subject of small, observational studies and have reported promising findings related to service use and cost. An investigation of Denver's Housing First Collaboration found that utilization of emergency room care, inpatient medical and psychiatric care, detox services, incarceration, and emergency shelter were greatly reduced by participation in the program (Perlman & Parvensky, 2006). Only outpatient health costs increased. Similar results were reported by studies of Housing First initiatives in Maine and Connecticut (Anderson, Sherwood, & TWR Consulting, 2000; Mondello, et al., 2007). Additionally, a study of Rhode Island's pilot Housing First Program in 2008 estimated high cost savings due to a dramatic decline in the use of government-funded services by those housed (Hirsch, Glasser, D'Addabbo, & Cigna, 2008).

While these studies have demonstrated the potential of Housing First to lower expensive crisis service utilization for homeless individuals with a range of mental and physical health disorders, little is known about how Housing First might affect service utilization for persons whose primary barrier to independent living is substance use. A study of Seattle's 1811 Eastlake, a single-site program, is the first to investigate Housing First targeted for chronically homeless persons with severe alcohol problems and high utilization of costly health care services (Larimer et al., 2010). Researchers found significant cost savings to the public after 6 months relative to the wait-list control group. After accounting for housing program costs, total cost offsets for Housing First participants relative to controls averaged \$2,449 per person per month.

More research is needed to understand Housing First's impact on service utilization for tenants without SMI, those who use substances other than or in addition to alcohol, and those who are moderate users of substances or services. These groups may require a different type of program and respond differently to a Housing First approach. The current report presents

results from CASAHOPE's service utilization and cost analysis of NY/NY III's Housing First for individuals whose substance use is a primary barrier to housing. Using administrative data collected between 2007 and 2010 for both (1) those who received housing and (2) a comparison group of similar individuals who were eligible for housing but were not placed due to availability of units, we examined service use and cost across multiple publicly-funded systems.

# CHAPTER II

## METHODS

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### **The New York/New York III Evaluation**

New York City's Department of Health and Mental Hygiene (DOHMH) is conducting an evaluation of all 9,000 units of NY/NY III supportive housing created by 2016. As a result, DOHMH has executed Memoranda of Understanding (MOUs) with a number of city and state agencies in order to acquire administrative data. CASAColumbia and DOHMH have also created an MOU so that data related to NY/NY III's Population E can be shared between the organizations for the CASAHOPE study. DOHMH centrally houses a linked data warehouse created for the NY/NY III evaluation. Administrative data include the use of Medicaid, food stamps, cash assistance, inpatient state psychiatric facilities, hospitals and emergency departments (ED), jails, family shelters, single adult shelters, and various types of non-NY/NY III housing.

### **Data Sources**

Information regarding study subject demographics, self-reported physical and mental health characteristics, and enrollment in public benefit programs was obtained from the NY/NY III Human Resources Administration (HRA) application. Administrative data regarding the use of public services were provided by HRA, the NYC Department of Correction, and the NYC Department of Homeless Services, the New York State Office of Mental Health, and DOHMH.

### **The Study Sample**

The original eligibility criteria for Population E required that tenants be chronically homeless single adults with an active substance use disorder that was a primary barrier to independent living and who also had a disabling clinical condition. Chronic homelessness was defined as living in a shelter or on the street for at least 12 out of the last 24 months or 2 out of the last 4 years, not necessarily consecutively. The disabling clinical condition was defined as any clinical condition serious enough to be a barrier to independent living, such as a physical illness (e.g., heart problems, Hepatitis C, and diabetes), mental health issues (including depression, mood, and anxiety disorders but not severe and mental health issues), cognitive impairments or developmental disabilities. On April 13, 2009, the Population E eligibility requirements were amended to include individuals without a disabling clinical condition and homeless only 6 of the previous 12 months. HRA processed all applications from potential Population E tenants.

The final sample of 456 tenants, or 'placed participants', were derived from a pool of 686 individuals placed in Population E housing between 2007 and 2009. Persons were excluded from the treated group if they did not have 1 year of follow-up data (167) or a person's NY/NY

III move-in date did not correspond to their program eligibility dates, the recorded date of NY/NY III move-in was before move-out from other housing, or the person lived in NY/NY III housing less than 7 days (63).

The comparison group (n=335) of 'unplaced participants' consisted of individuals who were deemed eligible for Population E housing between 2007 and 2009, but were not placed due to housing unit availability. Persons were excluded from the comparison group if they lacked 1 year of follow-up data (211); they became deceased during the 1 year follow-up period (7); or they were placed in another category of government-subsidized housing during the follow-up period for at least 7 days, or placed continuously in another category of government-subsidized housing from the pre-eligibility to the follow-up period (90).

## **Explanatory Variables**

Explanatory variables used in the statistical modeling of public service utilization and costs were taken from the NY/NY III application and administrative databases. Demographic variables included age, education, gender, and race. Benefit program enrollment variables included current (i.e., at the time of NY/NY III application) receipt of supplemental social security income, current receipt of veteran's benefits, current receipt of Medicare, and any Medicaid coverage in the year after housing placement or application. Self-reported physical health variables included severe physical diagnosis as characterized by the Charlson index (Charlson et al. 1987) and the presence of a medical disorder that limit a person's activities of daily living. Self-reported mental health covariates included history of a mental health disorder (cognitive impairment, hallucinations, delusions, thought disorders, clinical depression, and suicidal ideation), history of violent behavior (homicidal ideation, violent behavior, disruptive behavior, criminal activity, and arson), current mental illness diagnosis (excluding mental retardation), and current substance abuse. Medicaid-derived variables included taking prescription drugs with abuse potential in the year before placement or application, diagnosis with chronic pain condition; diagnosis with HIV; diagnosis with viral hepatitis; diagnosis with coronary heart disease; diagnosis with asthma; Medicaid costs; number of methadone claims; number of alcohol or drug (AOD) detoxification claims; number of inpatient rehabilitation claims; number of outpatient AOD treatment claims; number of inpatient hospitalizations related to substance use, injury, an ambulatory care sensitive condition, or a mental health condition; and ED visits related to substance use, injury, an ambulatory care sensitive condition, or a mental health condition. Additional variables selected from administrative databases included costs of food stamps, costs of cash assistance, costs of jail visits, and costs of single shelter use. Data from administrative data sets were measured 1 year prior to placement or application.

## **Outcome Variables**

This study modeled the effect of placement in supportive housing on public service use and the attendant costs during the 1 year follow-up period. Service utilization outcomes measured were number of days eligible for food stamps and cash assistance, days spent in jail, days spent in

single shelter, days as inpatient in the hospital, number of ED visits, total days in inpatient or outpatient alcohol or drug detoxification, and total days receiving substance use treatment (sum of inpatient rehabilitation, outpatient, and detoxification). Public expenditure outcomes were Medicaid costs, total welfare costs (sum of food stamps and cash assistance), and total costs (sum of jail costs, Medicaid costs, single shelter costs, and welfare costs). Data regarding health care encounters for Medicaid managed care patients were not available for analysis. Thus, participants may have received some services through Medicaid that cannot be accounted for in the present study. Our analysis of Medicaid costs include payments to managed care companies to cover healthcare benefits.

## **Propensity Score Analysis**

Individuals placed in NY/NY III housing were not randomly selected from all eligible individuals who applied to the program. To rigorously study the program outcomes, we employed a quasi-experimental design that used administrative data to statistically match those placed with individuals who applied but were not placed. That is, we used a variant of a research method called propensity score matching. First, logistic regression was used to estimate the probability (i.e., propensity score) of placement in housing for each study subject given a group of factors that may have influenced tenant selection. Explanatory variables included in the logistic regression model are listed above. Propensity scores were used to calculate sampling weights for placed and unplaced individuals. After statistical adjustments using the propensity score weights, there were no statistically significant or clinically meaningful differences between placed and unplaced groups. All variables were entered as covariates in the statistical models to further account for potential confounding. Thus, the regression models were doubly robust. Double robustness protects against bias in the regression model estimates if there is error in specification of the propensity score model or predictive model (Bang & Robins, 2005; Kang & Shafer, 2007).

## **Statistical Modeling of Public Service Utilization**

Poisson regression models were used to evaluate differences in service use among placed and unplaced individuals during the 1 year follow-up period. Model covariates were housing placement (yes, no), prior-year values for the service domain under analysis, and the explanatory variables listed above—except public service costs and utilization variables. Weights derived from the propensity scores were included as sampling weights in the model using methods pioneered by Robins and others (Hernan, Brumback, & Robins, 2001; Robins, Hernan, & Brumback, 2000). For a given service domain, a substantial proportion of clients had no utilization during the follow-up period. To determine if the condition of no service utilization was associated with housing placement we implemented zero-inflated Poisson models. The fitted model was used to estimate the average marginal effect (AME). The AME measures the change in service utilization due to placement in housing.



## Statistical Modeling of Public Service Costs

Multivariable regression models specifying a generalized gamma distribution were used to analyze the cost of public services used one year after placement or application. Generalized gamma models allow analysis of highly skewed data (e.g., cases with extreme costs) without requiring special adjustments (i.e., statistical transformations of the expenditures to other scales that are difficult to interpret; Manning & Mullahy, 2001; Manning, Basu, & Mullahy, 2005). Covariates included in the model were housing placement, prior-year values for the given outcome, and the explanatory variables listed above—except the variables from the administrative databases. The AME for cost was calculated from the fitted model with two exceptions. To calculate the average cost per day for single shelter and jail services, we divided the sum of the service costs by the sum of the days of service utilization for all study participants. The result was multiplied by the AME for days of shelter or jail utilization. It was necessary to use this procedure because the distribution of shelter and jail costs did not allow for individual modeling.

## CHAPTER III

### RESULTS—Study Population Demographics

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The following is a general description of the demographic, physical health, and mental health characteristics of study participants measured prior to housing placement or housing application (all data taken from Table 1).

In general, placed participants were black (63%), male (87%) and between the ages of 45-54 (41%). The majority (54%) of placed participants graduated from high school or had equivalent educational attainment. All but 2% of placed participants reported having some Medicaid coverage in the year after being housed and 20% were receiving supplemental social security income. Some placed participants were receiving Medicare benefits (7%) or Veteran's benefits (2%). Eighty-five percent of placed participants were actively using substances at the time of housing application and two-thirds reported a mental illness diagnosis. Over one-third of placed participants reported a severe physical health diagnosis (Charlson, 1987). However, according to Medicaid records treatment rates for asthma (6%), coronary heart disease (4%), HIV (0.2%), and viral hepatitis (5%) were low. Medicaid records show that nearly two-thirds of placed participants had a history of treatment for a chronic pain condition and one-third had been prescribed medication with abuse potential in the year prior to placement. Over one-third of placed participants (38%) received any substance use disorder (SUD) treatment in the year prior to housing.

The majority of unplaced participants were African-American (55%) and male (85%). A strong plurality of unplaced participants were age 45-54 (40%) and the majority (56%) had a high school diploma or the equivalent. Very few had no Medicaid coverage in the year after housing application (2%) and nearly one-third were receiving supplemental social security income. One-third of unplaced participants reported a severe physical health diagnoses. Medicaid records show low treatment rates for chronic diseases such as asthma (10%), coronary heart disease (3%), HIV (2%), and viral hepatitis (5%). In contrast, nearly two-thirds of unplaced participants were treated for a chronic pain condition. Nearly half (48%) of unplaced participants received any SUD treatment services in the year prior to housing application.

Table 1 also presents propensity score weighted comparisons between placed and unplaced participants. After propensity score weighting there we detected no statistically significant differences between the placed and unplaced groups, demonstrating that the propensity score procedure was successful in balancing the two groups on observed characteristics.

Table 1. Pre-treatment demographic and clinical characteristics of study participants placed in NY/NY III housing or found to be eligible but not placed.

	Unplaced (n = 335)	Placed (n = 456)
	% or mean (SD)	% or mean (SD)
<b>Demographics</b>		
Ages 18-34	12	14
Ages 35-44	26	23
Ages 45-54	40	41
Ages > 54	22	22
Female	15	13
African American	55	63
Latino	22	22
Other race	1	0.9
White	22	14
High school diploma or GED	56	54
<b>Enrollment in public benefit programs</b>		
Medicare	6	7
Supplemental security income	27	20
Veteran's benefits	5	2
No Medicaid coverage 1 yr after placement or application	2	2
<b>Mental health characteristics</b>		
History of cognitive impairment, hallucinations, delusions, thought disorders, clinical depression, or suicidal ideation behavior	40	30
History of homicidal ideation, violent behavior, disruptive behavior, criminal activity, or arson behavior	70	64
Self-reported current mental illness diagnosis	68	64
Currently using substances	90	85
<b>Physical health characteristics</b>		
Medical disorder that limits activities of daily living	20	32
Severe physical diagnosis <sup>a</sup>	34	38
<b>Variables from administrative databases</b>		
History of diagnosis with asthma	10	6
History of coronary heart disease	3	4
History of HIV	2	0.2
History of viral hepatitis	5	5
History of diagnosis with pain condition	59	58
Taking prescription drugs with abuse potential in the past year	33	35
Cost of food stamps issued 1 yr before placement or application	\$1,195 (\$967)	\$1,282 (\$725)
Cost of cash assistance issued 1 yr before placement or application	\$1,121 (\$4,585)	\$831 (\$1,034)

Cost of single shelter during 1 yr before placement or application	\$8,855 (\$9,555)	\$10,941 (\$10,765)
Cost of jail stays 1 yr before placement or application	\$2,125 (\$7,361)	\$1,415 (\$6,069)
Medicaid cost 1 yr before placement or application	\$20,604 (\$33,459)	\$14,755 (\$23,802)
Number of substance abuse related days as inpatient in the hospital 1 yr before placement or application	6.4 (15.5)	3.5 (10.9)
Number of ambulatory care sensitive related days as inpatient in the hospital 1 yr before placement or application	1.2 (5)	0.8 (3.5)
Number of injury related days as inpatient in the hospital 1 yr before placement or application	0.6 (4)	0.2 (1)
Number of mental health related days as inpatient in the hospital 1 yr before placement or application	2.1 (10)	0.2 (1)
Number of substance abuse related ED visits 1 yr before placement or application	1.5 (6)	0.4 (2)
Number of ambulatory care sensitive ED visits 1 yr before placement or application	0.7 (3)	0.4 (2)
Number of injury related ED visits 1 yr before placement or application	0.3 (0.8)	0.2 (0.6)
Number of mental health related ED visits 1 yr before placement or application	0.2 (1)	0.1 (0.2)
Number of claims for outpatient addiction treatment 1 yr before placement or application	8.9 (26)	14.2 (35)
Number of claims for inpatient rehabilitation 1 yr before placement or application	0.3 (0.9)	0.3 (2)
Number of claims for alcohol and drug detoxification 1 yr before placement or application	1.2 (4)	0.5 (1)
Number of methadone claims 1 yr before placement or application	5.1 (14)	7.0 (17)

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<sup>a</sup>According to Charlson Index

## CHAPTER IV

### RESULTS—Service Utilization Analysis

Table 2. Per client change in service utilization or costs due to placement in NY/NY III housing one year after housing placement or application.

	AME <sup>a</sup>	95% CI
<b>Service Utilization</b>		
Single shelter days	-128	-142, -115
Jail days	-6	-10, -2
Medicaid all cause use		
Emergency department visits	-0.9	-1, -0.4
Outpatient clinic claims	-3	-10, 3
Inpatient days	-6	-8, -3
Medicaid for substance use		
Emergency department visits	-0.3	-0.6, -0.1
Outpatient claims	-4	-10, 2
Inpatient days	-2	-4, -1
Detoxification days	-0.4	-0.7, 0.07
<b>Service Costs</b>		
Single shelter <sup>b</sup>	-\$9,344	-\$10,366, -\$8,395
Public Assistance <sup>c</sup>	\$658	\$318, \$998
Jail <sup>d</sup>	-\$1,488	-\$2,480, -\$496
Medicaid	-\$3,983	-\$5,797, -\$2,168
Total costs including the cost of NY/NYIII housing <sup>e</sup>	\$972	-\$2,566, \$4,590

<sup>a</sup>Average marginal effect = change in the outcome one would expect if an unplaced person were to be placed in NY/NY III housing

<sup>b</sup>Calculated from the AME for shelter utilization and \$73 estimated single shelter cost per day

<sup>c</sup>Sum of cash assistance and food stamp costs

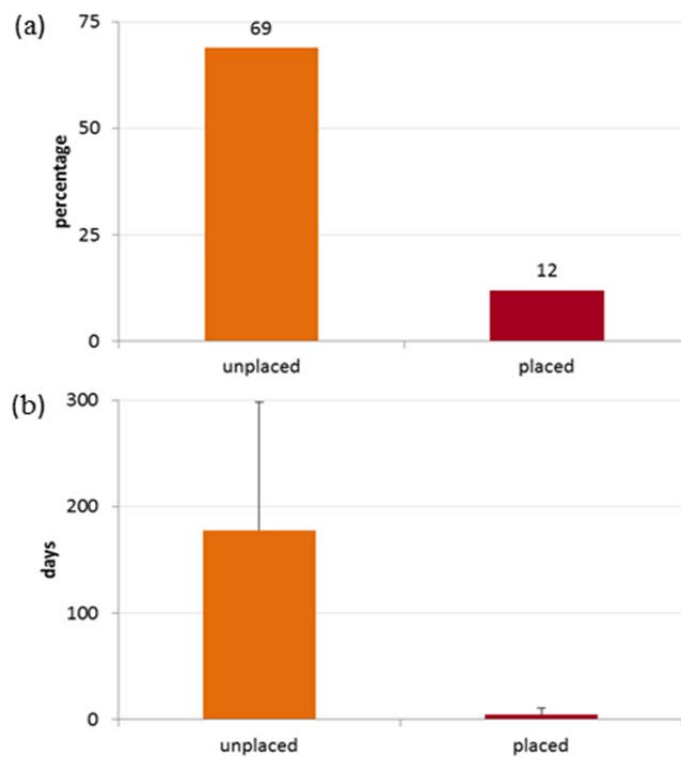
<sup>d</sup>Calculated from the AME for jail utilization and \$248 estimated jail cost per day

<sup>e</sup>Sum of NY/NY III housing, shelter, welfare, jail, and Medicaid costs

## Single Shelter Use

- Compared to unplaced study participants, participants placed in NY/NY III housing were less likely to use any shelter services (Fig. 1a) and stayed fewer days if shelters were used (Fig 1b).
- On average, placed participants had a 128 day decrease in shelter stays compared to unplaced participants (95% confidence interval [CI] = -123, -93; Table 2).

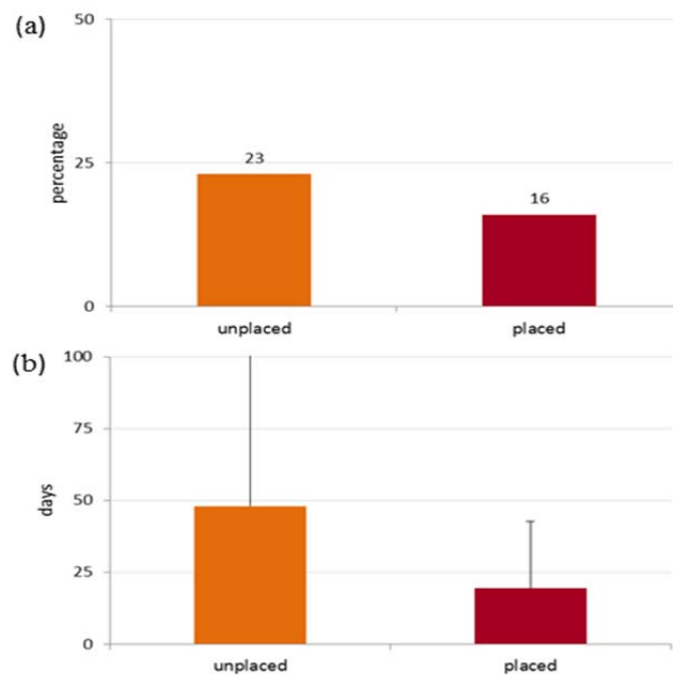
Fig. 1. Use of single shelters one year after NY/NY III placement (placed) or application (unplaced). Panel (a) shows the percentage of study participants who used shelters. Panel (b) shows the average number of shelter days used among those who used shelters.



## Jail Use

- Compared to unplaced participants, placed clients were less likely to go to jail (Fig. 2a) and if incarcerated, spent half the number of days in jail (Fig. 2b).
- Taken together, housing placement resulted in a 6 day decrease in jail utilization (95% CI = -10,-2; Table 2).

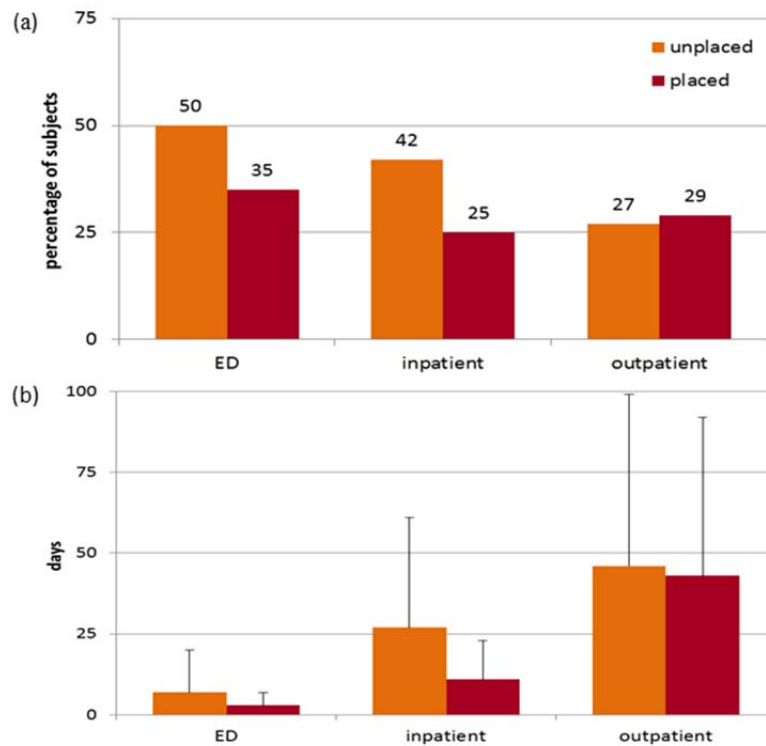
Fig. 2. Incarceration one year after NY/NY III placement (placed) or application (unplaced). Panel (a) shows the percentage of clients who were incarcerated. Panel (b) shows the average number of days participants were incarcerated among those participants who went to jail.



## Medicaid Use

- Emergency department (ED) utilization significantly decreased for placed participants (Fig 3b). There was an average decrease of one visit for placed participants (95% CI = -1, -0.40; Table 2, Fig. 3b).
- Placed participants were less likely to have any hospitalizations (Fig. 3a) and spent fewer days as an inpatient if hospitalized (Fig. 3b). On average, housing placement led to a 2-day decrease in inpatient hospitalizations (95% CI = -4, -1; Table 2, Fig. 3b).
- Housing placement was not found to have an impact on the number of outpatient claims (95% CI = -10, 2; Table 2).

Fig. 3. All-cause Medicaid use one year after NY/NYIII placement (placed) or application (unplaced). Panel (a) shows the percentage of clients with a given claim type. For clients with any claims, the average number of days (inpatient), visits (emergency department), and claims (outpatient) is given in panel (b).

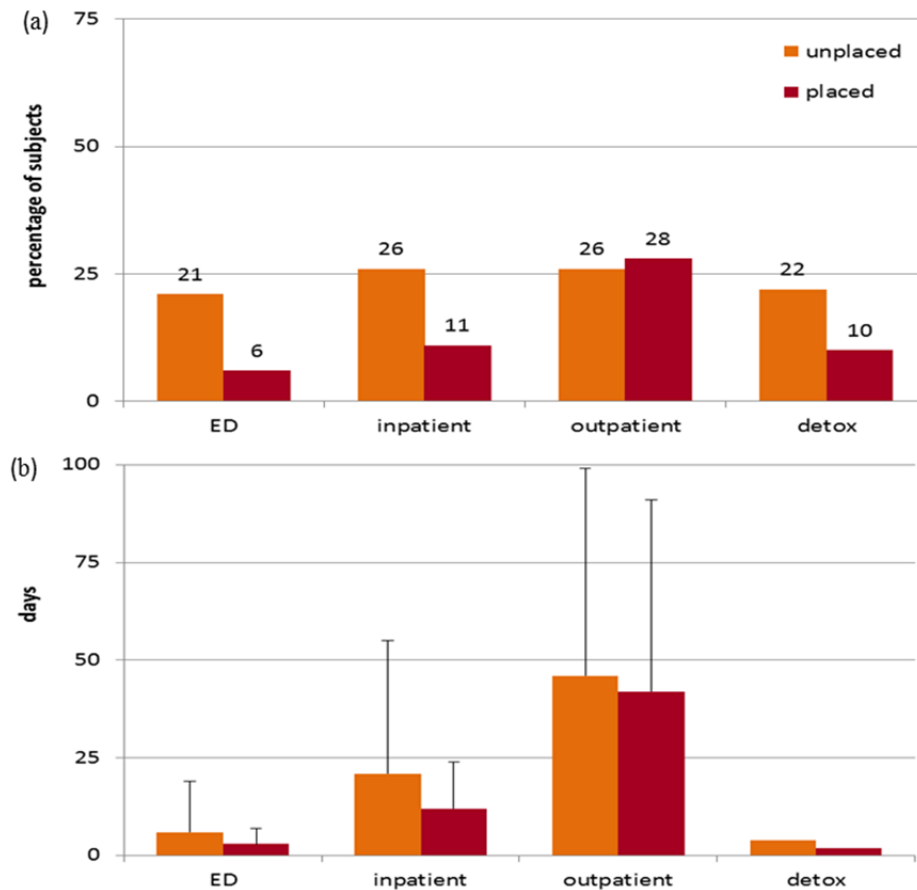


- The number of participants with any visits to the ED for substance use related causes (Fig. 4a) and the average number of visits per client (Fig. 4b) were significantly reduced for participants placed in housing. On average, placed participants had 0.3 fewer emergency department visits than unplaced (95% CI = -0.6, -0.1; Table 2).



- Placed participants were less likely to initiate inpatient substance abuse treatment (Fig. 4a) and had fewer treatment days (Fig. 4b) than unplaced participants. On average, inpatient treatment was reduced by 2 days for placed participants (95% CI = -4, -1; Table 2).
- Housing placement did not have an impact on the number of participants who initiated outpatient substance abuse treatment or the number of claims filed (AME = -4; 95% CI = -10, 1; Table 2).
- Study subjects placed in housing were significantly less likely to participate in detoxification. Among detoxification participants, there was no difference in the number of days of service use (AME = -0.4; 95% CI = -1, 0.1; Table 2).

Fig. 4. Substance use–related Medicaid utilization one year after NY/NY III placement (placed) or application (unplaced). Panel (a) shows the percentage of clients with Medicaid claims. For the participants who have Medicaid claims, panel (b) shows the average number of visits (emergency department [ED]), days (inpatient, detox), and claims (outpatient).



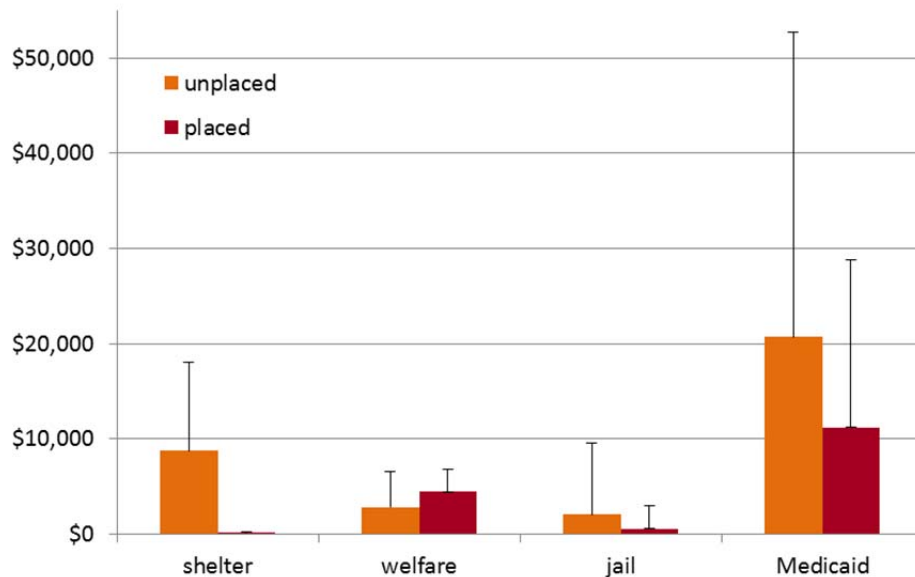
## CHAPTER V

### RESULTS—Cost Analysis

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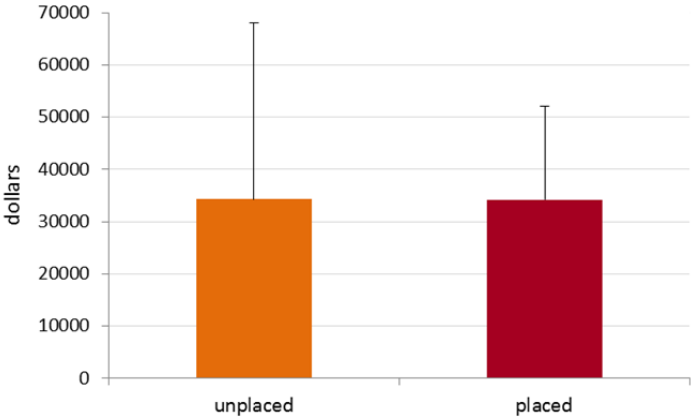
- Single shelter costs substantially decreased for placed participants. The expected shelter cost savings due to housing placement is \$9,344 per placed person per year (95% CI = \$8,395, \$10,366; Table 2, Fig. 5).
- Total welfare costs increased for placed participants. The change in welfare cost associated with housing placement was \$658 per placed person per year (95% CI = \$318, \$998; Table 2, Fig. 5).
- There was a decrease in jail cost associated with placement in NY/NY III housing. On average, the decrease in jail cost due to housing placement was \$1,488 per placed person per year (95% CI = -\$2,480, -\$496; Table 2, Fig. 5).
- Medicaid costs decreased by about one-third for placed participants compared to unplaced participants. The expected Medicaid savings due to placement in NY/NY III housing is \$3,983 per placed person per year (95% CI = \$5,797, \$2,168; Table 2, Fig. 5).

Fig. 5. Public service costs one year after NY/NY III placement (placed, N=456) or application (unplaced, N=335).



- Taking into account spending for Medicaid, jail, welfare, shelter, and the NY/NY III housing subsidy, we found no significant difference in costs for unplaced and placed participants (AME = \$972, 95% CI = -\$2,154, \$4,595; Table 2, Fig. 6).

Fig. 6. Total public service costs (Medicaid, jail, welfare, shelter, and NY/NY III subsidy) one year after NY/NY III placement (placed) or application (unplaced).



## CHAPTER VI

### DISCUSSION

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The present study compares public service use and costs between chronically homeless individuals with active substance use disorders who were placed in NY/NY III's Population E supportive housing versus individuals who were eligible but not placed in housing due to constraints in housing unit supply. Individuals placed in Population E housing received referrals for physical and behavioral health services, assistance in applying for public benefits, and case management services. In general, substance abuse treatment was available for those placed in housing but abstinence was not a requirement of housing occupancy. Overall, study analyses found that the NY/NY III program was successful in reducing placed participant utilization of shelters, jail, and medical services as well as linking clients to public benefits.

As one would expect, significant declines in shelter use were observed for supportive housing tenants in the year after placement. The average decrease in shelter usage for placed participants was 128 days per person per year. Cost savings associated with decreases in shelter usage were estimated to be \$9,344 per person per year. Substantial cost savings (\$1,488 per person per year) were also estimated from the observed reductions in the number of days in jail for placed participants. The benefit of supportive housing for decreasing jail stays has been demonstrated for individuals with mental illness (Culhane, Metraux, Hadley, 2002; Martinez & Burt, 2006) and alcohol disorders (Larimer et al., 2009).

We found significant reductions in the number of emergency department (ED) visits and days hospitalized for a physical or mental health condition among placed participants. The observed reductions in the use of medical services are remarkable considering that over one-third of placed participants had a severe physical health diagnosis. In addition, compared to those not housed, placed participants had notable reductions in ED visits and inpatient stays related directly to substance use. When all Medicaid costs were analyzed together, cost savings associated with housing placement were \$3,983 per person per year. Reductions in health care service use and associated savings were similar in type, if smaller in magnitude, to those reported in other studies (Basu, Kee, Buchanan & Sadowski, 2012; Gilmer et al., 2009; Martinez & Burt, 2006; Tsai, Mares, & Rosenheck, 2010; Tsemberis, Gulcur, & Nakae, 2004). Similar to other studies, the current study found no discernible differences in outpatient healthcare claims (Anderson, Sherwood, & TWR Consulting, 2000; Mondello, et al., 2007; Perlman & Parvensky, 2006). This suggests that either being housed allows placed participants to achieve better health, thus needing fewer medical services overall, or housing programs are able to successfully link tenants to more appropriate, and less costly, outpatient services.

Public assistance (i.e., cash assistance and food stamps) was the only service domain in which individuals placed in housing had significantly greater costs (\$658 per person per year). However, the higher public assistance costs associated with housing placement can be viewed as a positive program outcome, as it represents individuals being successfully linked to services that help ensure access to food and other basic needs. Higher public assistance costs for placed

compared to unplaced participants must be viewed in the context of the total public service costs incurred by study participants. In sum, NY/NY III housing for Population E is associated with a decrease in incarceration and use of shelter and medical services, while the greater support experienced by placed participants post housing leads to an increase in their use of public benefits.

The costs savings for placed participants in the year after being housed offset the cost of the NY/NY III housing subsidy. When the cost of NY/NY III housing (approximately \$18,000 per person per year) was included in the analysis of total service cost, we found no statistically significant differences in total costs between placed and unplaced. While encouraging, these findings did not show net cost savings as in other studies. For example, in an evaluation of Seattle's 1811 Eastlake—a congregate-site, Housing First program for chronically homeless persons with severe alcohol problems—Larimer and colleagues (2009) reported a \$2,449 per person per month savings in total costs (including ED and inpatient hospital stays, jail, shelter, housing, and Medicaid costs) for participants placed in supportive housing compared to those on the housing waiting list. The cost savings observed by Larimer and colleagues may be attributed to their selection for housing of individuals with the highest pre-housing costs for alcohol-related ED, detoxification, and jail services. Individuals who are heavy users of the crisis services while homeless are likely to experience a substantial decline in service use after being housed. In order to fully offset the cost of the housing subsidy, it may be necessary for supportive housing programs to target individuals with the highest utilization of crisis services (Culhane et al., 2008; Poulin, Maguire, Metraux, & Culhane 2010; Rosenheck, Kaspro, Frisman, and Liu-Mares, 2003).

## **Limitations**

The current study has a number of strengths. First, it includes the use of administrative data, which is not subject to the bias inherent in subject self-report. We also report data from a range of service types and locations. For example, access to Medicaid datasets allowed us to track medical services across a number of hospitals and outpatient clinics. Third, few studies investigate tenant outcomes in supportive housing programs designed for individuals with substance use disorders but who do not also have a co-occurring serious mental illness. The main limitation of this study is that it did not include datasets that captured information on services provided under Medicaid managed care and non-Medicaid covered care, for example charity care received at city hospitals. There were other limitations as well. Administrative data may be prone to mistakes in data entry, although there is no reason to believe these errors would be more prevalent in data from either study group. Participants in this study were not randomly assigned housing treatment; however, our propensity score approach statistically controlled for observed differences between treatments. Lastly, Medicaid enrollees in New York State may have access to medical services that are not routinely covered by Medicaid in other states. Thus, reductions in Medicaid spending observed for the supportive housing participants in this study may not be observed in locations where Medicaid provides different services.

## **Conclusion**

In a previous report, we found that the Housing First participants reported no increase in substance use, physical health or mental health problems, or criminal justice involvement over the first year of housing. We also found that participants reported that they received the services they needed and had high levels of satisfaction with their case managers (73-81%) and housing providers (53-92%). The high satisfaction ratings suggest that case managers successfully engaged with a majority of tenants.

Our data clearly show a benefit for housing of decreases in incarceration; shelter use; and substance use–related hospital stays, ED visits, and detoxification events for placed participants. Moreover, decreased public service utilization translated into decreased public costs. All together, we found no statistically significant differences between housed and non-housed individuals for total costs of care supported by government. Given this cost-neutrality, public officials have options for allocating resources that take into account other social benefits from progressive approaches to addressing homelessness, notably among disenfranchised populations.

## REFERENCES

- Anderson, A., Sherwood, K., & TWR Consulting. (2000). The Connecticut supportive housing demonstration program evaluation report. New Haven, CT: Corporation for Supportive Housing.
- Bang, H., & Robins, J. M. (2005). Doubly robust estimation in missing data and causal inference models. *Biometrics*, 61(4), 962-973.
- Basu, A., Kee, R., Buchanan, D., & Sadowski, L. S. (2012). Comparative cost analysis of housing and case management program for chronically ill homeless adults compared to usual care. *Health Services Research*, 47(1pt2), 523-543.
- CASAHOPE (2012a). *Unlocking the Door: An Implementation Evaluation of Supportive Housing for Active Substance Users in New York City*. Retrieved from <http://www.casacolumbia.org/sites/default/files/files/Unlocking-the-door-an-implementation-evaluation-of-supporting-housing-for-active-substance-users-in-new-york-city.pdf>.
- CASAHOPE (2012b). *Twelve-Month Tenant Outcomes for Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*. Retrieved from <http://www.casacolumbia.org/sites/default/files/files/Twelve-month-tenant-outcomes-for-persons-housed-by-ny-ny-IIIs-supportive-housing-for-active-substance-users.pdf>.
- CASAHOPE (2011). *Characteristics of Persons Housed by NY/NY III's Supportive Housing for Active Substance Users*. Retrieved from <http://www.casacolumbia.org/sites/default/files/files/Characteristics-of-persons-housed-by-NY-NY-IIIs-supportive-housing-for-active-substance-users.pdf>.
- Charlson, M. E., Pompei, P., Ales, K. L., MacKenzie, C. R. (1987). A method of classifying prognostic comorbidity in longitudinal studies: development and validation. *Journal of Chronic Diseases*, 40(5), 373-83.
- Collins, S.E., Malone, D.K., Clifasefi, S.L., Ginzler, J.A., Garner, M.G., Burlingham, B., ...Larimer, M.E. (2012). Project-based housing first for chronically homeless individuals with alcohol problems: Within-subjects analyses of 2-year alcohol trajectories. *American Journal of Public Health*, 102 (3), 511-519.
- Culhane, D. P., Gross, K. S., Parker, W. D., Poppe, B., & Sykes, E. (2008). Accountability, cost-effectiveness, and program performance: progress since 1998. In *National Symposium on Homelessness Research*.
- Culhane, D. P., & Metraux, S. (2008). Rearranging the deck chairs or reallocating the lifeboats? Homelessness assistance and its alternatives. *Journal of the American Planning Association*, 74(1), 111-121.
- Culhane, D. P., Metraux, S., & Hadley, T. (2002). Public service reductions associated with placement of homeless persons with severe mental illness in supportive housing. *Housing Policy Debate*, 13(1), 107-163.
- Edens, E. L., Mares, A. S., Tsai, J., & Rosenheck, R. A. (2011). Does active substance use at housing entry impair outcomes in supported housing for chronically homeless persons?. *Psychiatric Services*, 62(2), 171-178.

- Gilmer, T., Manning, W., & Ettner, S. (2009). A cost analysis of San Diego County's REACH program for homeless persons. *Psychiatric Services, 60*(4), 445-450.
- Gulcur, L., Stefancic, A., Shinn, M., Tsemberis, S., & Fischer, S. N. (2003). Housing, hospitalization, and cost outcomes for homeless individuals with psychiatric disabilities participating in continuum of care and housing first programmes. *Journal of Community & Applied Social Psychology, 13*, 171-186.
- Hernan, M. A., Brumback, B., & Robins, J. M. (2001). Marginal structural models to estimate the joint causal effect of nonrandomized treatments. *Journal of the American Statistical Association, 96*(454), 440-448
- Hirsch, E., Glasser, I., D'Addabbo, K., & Cigna, J. (2008). *Rhode Island's Housing First program evaluation*. Retrieved from [http://www.uwri.org/live united/documents/Housing\\_First\\_RI\\_Report\\_Full.pdf](http://www.uwri.org/live%20united/documents/Housing_First_RI_Report_Full.pdf)
- Hwang, S. W. (2000). Mortality among men using homeless shelters in Toronto, Ontario. *Journal of the American Medical Association, 283*(16), 2152-2157.
- Kang, J. & Schafer, J. L. (2007). Demystifying double robustness: a comparison of alternative strategies for estimating a population mean from incomplete data. *Statistical Science, 22*(4), 523-39.
- Kertesz, S. G., Crouch, K., Milby, J. B., Cusimano, R. E., & Schumacher, J. E. (2009). Housing First for homeless persons with active addiction: Are we overreaching? *The Milbank Quarterly, 87*(2), 495-534.
- Kushel, M. B., Perry, S., Bangsberg, D., Clark, R., & Moss, A. R. (2002). Emergency department use among the homeless and marginally housed: results from a community-based study. *American Journal of Public Health, 92*(5), 778-784.
- Kushel, M. B., Vittinghoff, E., & Haas, J. S. (2001). Factors associated with the health care utilization of homeless persons. *Journal of the American Medical Association, 285*(2), 200-206.
- Larimer, M. E., Malone, D. K., Garner, M. D., Atkins, D. C., Burlingham, B., Lonczak, ... Marlatt, G. A. (2010). Health care and public service use and costs before and after provision of housing for chronically homeless persons with severe alcohol problems. *Journal of the American Medical Association, 301*(13), 1349-1357.
- Manning, W. G., Basu, A., Mullahy, J. (2005). Generalized modeling approaches to risk adjustment of skewed outcomes data. *Journal of Health Economics, 24*, 465-88.
- Manning, W. G., Mullahy, J. (2001). Estimating log models: to transform or not to transform? *Journal of Health Economics, 20*(4), 461-94.
- Mares, A. S., & Rosenheck, R. A. (2010). Twelve-month client outcomes and service use in a multisite project for chronically homelessness adults. *The Journal of Behavioral Health Services & Research, 37*(2), 167-183.
- Martinez, T. E., & Burt, M. R. (2006). Impact of Permanent Supportive Housing on the Use of Acute Care Health Services by Homeless Adults. *Psychiatric Services, 57*(7), 992-999.
- Mondello, M., House, S., Gass, I. A. B., & Consulting, A. B. G. (2007). Cost of Homelessness. *Cost Analysis of Permanent Supportive Housing. State of Maine—Greater Portland, Maine Department of Health and Human Services*.



- O'Connell, M.J., Kaspro, W., & Rosenheck, R., 2009. Direct Placement Versus Multistage Models of Supported Housing in a Population of Veterans Who Are Homeless. *Psychological Services, 6*(3), 190-201.
- Padgett, D. K., Gulcur, L., & Tsemberis, S. (2006). Housing First services for people who are homeless with co-occurring serious mental illness and substance abuse. *Research on Social Work Practice, 16*(1), 74-83.
- Pearson, C. L., Locke, G., Montgomery, A. E., & Buron, L. (2007). The applicability of housing first models to homeless persons with serious mental illness: Final report. Washington, D.C.: United States Department of Housing and Urban Development, Office of Policy Development and Research. Retrieved from <http://www.huduser.org/publications/homeless/hsgfirst.html>
- Perlman, J., & Parvensky, J. (2006). Denver Housing First Collaborative: Cost benefit analysis and program outcomes report. *Colorado Commission for the Homeless*.
- Poulin, S. R., Maguire, M., Metraux, S., & Culhane, D. P. (2010). Service use and costs for persons experiencing chronic homelessness in Philadelphia: a population-based study. *Psychiatric Services, 61*(11), 1093-1098.
- Robertson, M. J., & Cousineau, M. R. (1986). Health status and access to health services among the urban homeless. *American Journal of Public Health, 76*(5), 561-563.
- Rosenheck, R., Kaspro, W., Frisman, L., & Liu-Mares, W. (2003). Cost-effectiveness of supported housing for homeless persons with mental illness. *Archives of General Psychiatry, 60*, 940-951.
- Sadowski, L. S., Kee, R. A., VanderWeele, T., & Buchanan, D. (2009). Effect of a housing and case management program on emergency department visits and hospitalizations among chronically ill homeless adults: A randomized trial. *The Journal of the American Medical Association, 301*(17), 1771-1778.
- Salit, S. A., Kuhn, E. M., Hartz, A. J., Vu, J. M., & Mosso, A. L. (1998). Hospitalization costs associated with homelessness in New York City. *New England Journal of Medicine, 338*(24), 1734-1740.
- Snow, D. A., Baker, S. G., & Anderson, L. (1989). Criminality and homeless men: An empirical assessment. *Social Problems, 36*(5), 532-549.
- Tsai, J., Mares, A. S., & Rosenheck, R. A. (2010). A multisite comparison of supported housing for chronically homeless adults: "housing first" versus "residential treatment first". *Psychological Services, 7*(4), 219.
- Tsemberis, S., & Eisenberg, R. F. (2000). Pathways to Housing: Supported housing for street-dwelling homeless individuals with psychiatric disabilities. *Psychiatric Services, 51*(4), 487-493.
- Tsemberis, S., Gulcur, L., & Nakae, M. (2004). Housing First, consumer choice, and harm reduction for homeless individuals with a dual diagnosis. *American Journal of Public Health, 94*(4), 651-656.