Cross Sector Data Linkage for Evaluating the Flexible Housing Pool of Chicago and Cook County, 2018-2021

Early Impact Evaluation Report

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COOK COUNTY HEALTH

Prepared by:

Keiki Hinami, MD MS
Kruti Doshi, MBA
William Trick, MD

Health Research and Solutions Unit, Center for Health Equity & Innovation, Cook County Health

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Abbreviations

CCS	Clinical Classification Software
CoC	Continuum of Care
COVID19	Coronavirus Disease 2019
FHP	Flexible Housing Pool of Chicago and Cook County
HIPAA	Health Insurance Portability and Accountability Act
HMIS	Homelessness Management Information System
IIR	Incident Rate Ratio
ICD-10-CM	International Classification of Diseases, 10th Revision, Clinical Modification
PPRL	Privacy Preserving Record Linkage
PSH	Permanent Supportive Housing
SCaN	Service Coordination and Navigation

1 Summary

The Flexible Housing Pool program of Chicago and Cook County (FHP) takes a multi-system approach to offer permanent supportive housing (PSH) units to high-risk individuals and families experiencing homelessness in the City of Chicago and suburban Cook County. In doing so, FHP seeks to reduce costs to crisis systems and improve health outcomes for clients of the program.

FHP was established in 2018 as a cross-sector collaboration led by the City of Chicago, Cook County Health, Corporation for Supportive Housing, the Center for Housing & Health, and other key partner organizations listed in this document. By the end of CY2022, FHP successfully placed over 900 clients into stable housing. Through generous support from the J.B. and M.K. Pritzker Family Foundation and the Blue Cross & Blue Shield Foundation, we conducted an early evaluation of FHP using high-value data aggregated and joined from multiple sources. In this document, we summarize the short-term impact of FHP on the health and behavior of people who suffer among the highest health risks in our community. Additional evaluation reports, which extend the present analysis or incorporate complementary data from interviews and focus groups conducted by Loyola University's Center for Urban Research and Learning, are forthcoming.

The first three years of the FHP straddled a uniquely disruptive period in recent history with the COVID-19 pandemic. During 2020, as authorities shifted the nation's infection control strategy from mitigation to suppression, mandates for shutdowns, social distancing, and movement restrictions were associated with inadvertent increases in health risks among people experiencing homelessness.

The most dramatic evidence of this was the doubling of all-cause mortality in this population, primarily driven by an increase in dysregulated exposures to synthetic opioids. Faced with these hazards, clients housed through FHP demonstrated an estimated **30% lower mortality during the peak years of risk compared to matched controls**. When the region's clients receiving crisis services saw access barriers rise, utilization of emergency shelters, hospitals, and jail decreased. However, compared to matched controls, clients housed in FHP demonstrated a **22% relative risk reduction in jail registrations, 19% relative risk reduction in emergency department visits, and a 33% relative risk reduction in incurring inpatient days between 2019 and 2021**. Remarkably, **these reductions were amplified among clients diagnosed with substance use disorder such that 36%, 26%, and 36% relative risk reductions were observed in their jail registrations, emergency department visits, and inpatient days, respectively**. In our controlled analyses, these numbers represent an estimate of the health and social benefits attributable to the housing intervention beyond the secular trends. **The cumulative cost offset from reductions in the utilization of the region's crisis system among adult clients was $1.4 million. The concurrent reductions in mortality suggest that FHP was instrumental in reducing preventable crisis system utilization without sacrificing access to life-saving resources.**

Historic and systemic conditions for racial inequities in housing are evident in that over 70% of Chicago's people experiencing homelessness identify as Black/African American while

representing 30% in the general population. **FHP successfully housed a cohort that is 78% Black/African American clients**. **FHP's retention in housing at 12-months was 94%.** No racial disparities were found in FHP's housing and health outcomes.

FHP is an innovative program that is achieving its original objectives. Its success reinforces supportive housing as a condition for health for high-risk households. It also demonstrates how stable housing effectively reduces the strain on the health and justice systems. Appraisal of this longitudinal data establishes FHP as an important step for progress and a sound social investment in the valued lives of people.

2 Overview of the Operational Features of FHP

2.1 Investment Model

At the heart of FHP is a mechanism that allows public and private entities to contribute to a pool of funds that are used to support rent and services for clients of the program. Funds contributed to the FHP are held in an escrow account, managed and overseen by the Chicago Department of Family & Support Services. Each contributor is permitted to identify the program's new clients who are supported by the contributor's subaccount, with the provision that they refer high utilizers of crisis systems, based on generally accepted definitions. At the time of this evaluation, FHP received investments from the City of Chicago, 2 healthcare organizations (Cook County Health, Advocate Health) and 3 Medicaid managed care organizations (CountyCare Health Plan, Meridian Health Plan, Medical Home Network). Of note, CountyCare Health Plan is administered by Cook County Health. However, CountyCare members are also covered in a broad network of hospitals, health centers, and other providers outside of the Cook County Health system.

2.2 Populations Targeted for FHP's Early Cohorts

FHP seeks to serve complex clients with chronic conditions by substituting their undirected use of crisis services with supportive housing. Informed by previously published scientific studies, FHP leaders chose not to narrowly target super-utilizers – simply the highest recent utilizers of costly services – for its housing intervention. Rather, individuals exhibiting a pattern of persistent utilization of healthcare and jail were demonstrated to better identify the characteristics associated with historically marginalized populations (e.g., Black/African American men, often with behavioral health disorders, and frequent use of emergency departments and jail). In addition, healthcare utilization patterns outside of the super-utilizer archetype were previously shown to identify individuals with housing-sensitive health conditions. For the early cohorts, FHP defined persistent utilization by a threshold number of registrations in emergency departments or jail in each of two consecutive years preceding an index date. All adult clients targeted for FHP from Cook County Health records were selected because they met the minimum persistent utilization of healthcare and jail, and were among the top-half utilizers of emergency shelter or street outreach services overseen by Chicago's Department of Family & Support Services. A smaller number of adult clients were selected by other healthcare organizations using their own criteria of high utilization. Notably, following Housing First principles, clients are eligible for FHP regardless of legal immigration status, eligibility for public insurance or benefits, justice system involvement, medical or behavioral conditions, adherence to treatment, disability, and eligibility

for PSH through the US Department of Housing and Urban Development. Thus, **FHP has some of the lowest barriers to housing, making housing more accessible than many PSH programs.**

Separately from the adult cohort described above, FHP housed individuals and families from the homeless youth population (i.e., age 18-24) as part of Chicago's 2019 declaration to reduce youth housing instability and homelessness by 25 percent. Whereas many targeted for the FHP's youth cohort also exhibited persistent utilization, the majority were selected with a lower threshold level of service use or as participants of the Service Coordination and Navigation (SCaN), a youth gun violence prevention program overseen by Chicago's Department of Family & Support Services. A greater proportion of the youth cohort than the adult cohort was comprised of households with minor dependents.

2.3 Outreach to the FHP Target Population

To protect against the propagation of inequities in housing, an intentional design of the FHP involved an outreach process that was not driven by clients' self-advocacy. Identification of the target populations described above selected candidates representative of the service population in terms of race-ethnicity, medical and behavioral comorbidities, and patterns of crisis service utilization. Working off this target list, outreach specialists relied on a multi-modal approach to initially contact candidates (e.g., telephone communications, in-reach at the most recent shelter or street outreach program on record, and an electronic notification system that alerted outreach specialists when candidates registered in emergency departments or jail). Upon assessment of explicit inclusion/exclusion criteria, eligible candidates were referred into FHP.

2.4 Housing and Supportive Services

Clients enrolled into FHP were placed into stable housing as promptly as possible. The Center for Housing & Health is the primary service provider and oversees outreach, pre-tenancy, and tenancy support services to all clients. Contracted agencies aided the provision of client services. The Center for Housing & Health constantly held community stakeholder meetings and engaged landlords to maintain an adequate supply of housing units on a rolling basis. Process data was tracked on an electronic dashboard and frequently reviewed to assist efforts with improving the time to housing. Tenancy support specialists provided traditional case management to clients, including maintaining health insurance coverage if eligible. Care coordinators were responsible for performing home-based assessments and assisting with referrals to medical appointments, transportation, and medical-legal services. In late 2022, a community support team provided mental health support to FHP clients.

3 Outcomes Evaluation

3.1 Aggregated Data

We designed and implemented an approach that allows repeated aggregation of data from multiple sources. The strategy adopted privacy-preserving record linkage (PPRL) techniques to join disparate records attributable to individual clients while upholding the highest standards of privacy protection. For added privacy protection that was demanded by many data contributors, the final dataset was fully anonymized according to HIPAA definitions. We included all FHP

clients of adult and youth programs in the data, regardless of their original referral source. For this present evaluation, we joined data from sources tabulated below.

Data Source	Data Description	Dates
All Chicago	Emergency shelter & street outreach service record in the Chicago Continuum of Care (CoC)	2018-2021q3
All Chicago	FHP inception cohort candidate list from the Chicago CoC	2017-2018
Alliance to End Homelessness in Suburban Cook County	Emergency shelter & street outreach service record in the suburban Cook CoC	2018-2021
Center for Housing & Health	Outreach and supportive services to clients targeted for FHP	2019-2022
Cook County Health	Health system record in 2 hospitals, 15 adult community health centers, registration in Cook County Jail	2016-2021
CountyCare	Healthcare claims of the largest Medicaid managed care plan in Cook County	2016-2021
Cook County Medical Examiner	Forensically Examined Deaths in Cook County	2018-2021
Illinois Department of Public Health Hospital Discharge	Utilization of emergency and hospitalizations in Cook County	2018-2021

3.2 Capture and Retention in Stable Housing

As of June 28, 2022, N=1403 candidates were selected for outreach; n=761 (54%) for the adult cohort and n=642 (46%) for the youth cohort (see section 2.2). The large majority was selected from Cook County Health, including the FHP inception cohort for whom outreach commenced in February 2019. A total of n=518 (37%) clients from among the outreached candidates were placed into stable housing, comprising 244 adults and 274 youths. The proportion of candidates who were ultimately housed (about one third) was accurately predicted by managers of the Center for Housing & Health who anticipated the historically observed pattern of itinerancy, resolution of homelessness, or death that make candidates ineligible to continue into programmatic housing.

Referral Source of Candidates to FHP	Not Youth N=761	Youth N=642	TOTAL N=1403
Cook County Health – hospitals and community health centers	492 (65%)	545 (85%)	1037 (74%)
CountyCare – Medicaid Health Plan	156 (21%)	0	156 (11%)
Service Coordination and Navigation Program	0	70 (11%)	70 (5%)
Meridian – Medicaid Health Plan	64 (8%)	0	64 (5%)
UI Health – hospital	33 (4%)	0	33 (2%)
Coordinated Entry System of Chicago	0	24 (4%)	24 (2%)
Advocate Aurora Health – hospital	12 (2%)	0	12 (1%)
Medical Home Network – Medicaid Managed Care	<10 (1%)	0	<10 (<1%)
Cermak Health Services (jail registrations) of Cook County Health	0	<10 (<1%)	<10 (<1%)

As of December 31, 2021, N=436 clients were housed. For clients who were housed at least one year prior to this analysis, the **12-month retention rate in stable housing was 94%**. Reasons for not being retained in stable housing included death (3.2%), self-discharge or lost to contact (2.5%), institutionalization or incarceration (1.8%), and successful graduation from the

program into self-supported housing (1.6%). Among those who were housed, a greater proportion of Black/African American clients were retained in housing than were lost from the program (80% vs. 56%, p=0.006). The average number of days (95% confidence interval) in housing for participants as of June 28, 2022, was 455 (434, 477) days.

3.3 Characteristics of Housed Clients

	Adults	Youths
N	206	230
Housed year, n(%)		
2019	50 (24)	0
2020	46 (22)	33 (14)
2021	110 (53)	197 (86)
Age category, n(%)		
<18	0	47 (20)
18-24	15 (7)	183 (80)
25-34	31 (15)	0
35-44	32 (16)	0
45-54	75 (36)	0
55+	53 (26)	0
Sex category, n(%)		
Other	13 (6)	11 (5)
Female	67 (33)	148 (64)
Male	126 (61)	71 (31)
Race category, n(%)		
Other	22 (11)	16 (7)
Black/African American	146 (71)	194 (84)
Latinx	16 (8)	17 (7)
White	22 (11)	<10 (1)
Top 15 Clinical Classification Software (CCS)* Diagnoses, 2018-2021		
Non-CCS code (XXX000)	189 (92)	165 (72)
Other specified status (FAC025)	125 (61)	41 (18)
Essential hypertension (CIR007)	116 (56)	10 (4)
Schizophrenia spectrum and other psychotic disorders (MBD001)	61 (30)	14 (6)
Alcohol related disorders (MBD017)	95 (46)	15 (7)
Musculoskeletal pain, not low back pain (MUS010)	122 (59)	54 (23)
Asthma (RSP009)	75 (36)	44 (19)
Suicidal ideation/attempt/intentional self-harm (MBD012)	56 (27)	19 (8)
Fluid and electrolyte disorders (END011)	83 (40)	17 (7)
Opioid-related disorders (MBD018)	68 (33)	<10 (1)
Depressive disorders (MBD002)	85 (41)	32 (14)
Bipolar and related disorders (MBD003)	65 (32)	12 (5)
Heart failure (CIR019)	17 (8)	0 (0)
Stimulant-related disorders (MBD021)	73 (35)	<10 (2)
Abdominal pain and other digestive/abdomen signs and symptoms (SYM006)	101 (49)	101 (44)
Cook County Health Record, 2016-2021, n(%)		
Absent CCH record	36 (17)	62 (27)
CountyCare only	30 (15)	101 (44)
Health system only	32 (16)	31 (13)
Both CountyCare and Health system	108 (52)	36 (16)
Jail registration	78 (38)	54 (23)

*https://www.hcup-us.ahrq.gov/toolssoftware/ccs10/ccs10.jsp

The characteristics of clients housed in FHP from inception through 2021 are tabulated above. Age category was based on clients' age on a uniform index date (January 1, 2018). Race category classified non-Hispanic Black as Black/African American, and all Hispanic racial categories as Latinx. Client's medical diagnoses were categorized using the Clinical Classification Software (CCS) developed for the Healthcare Cost & Utilization Project by the US Agency for Healthcare Research and Quality, which maps ICD-10-CM diagnosis codes to descriptive categories. The top 2 categories (Non-CCS code, Other specified status) mapped to non-diagnostic or miscellaneous ICD-10 codes. We tabulated the 15 most prevalent categories assigned during hospital-based encounters between 2018 and 2021 for the region's users of emergency shelters or street outreach services. Because these diagnosis categories are listed in order of prevalence among the broader population of people experiencing homelessness, the change in frequency ranking among the FHP housed population is noteworthy. For example, encounters related to heart failure were more infrequent, whereas those related to abdominal symptoms appeared more frequently among housed adults compared to youths.

Schizophrenia, major depressive, and bipolar disorders were prevalent among clients housed in FHP; **60% of adults and 20% of youths were assigned at least one ICD-10-CM code between 2018 and 2021 defined as a Serious Mental Illness** by the Illinois Department of Human Services Division of Mental Health. In comparison, the prevalence of Serious Mental Illness in the general US population is 4%. In addition, **70% of adults and 21% of youth were coded for healthcare encounters involving substance use disorder**. Co-occurring serious mental illness plus substance use disorder was coded in 48% adults and 6% of youth.

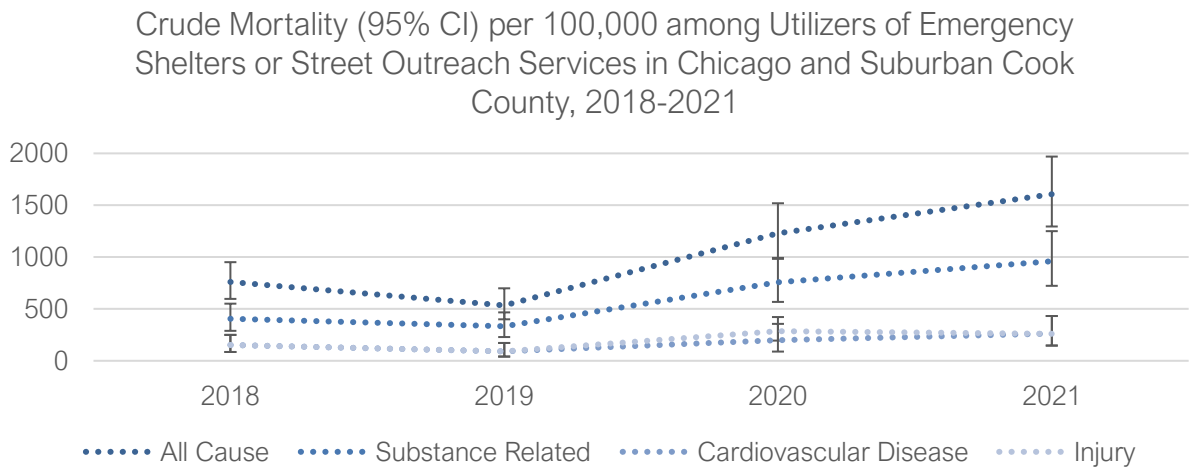
Among clients housed in FHP, 38% of adults and 23% of youth were justice-involved defined by at least a single registration in Cermak Health Service of Cook County Jail records between 2016 and 2021.

3.4 Mortality

We observed an alarming rise in mortality among people experiencing homelessness during the pandemic years in Cook County. The crude all-cause mortality increased to around 1600 per 100,000 clients who used emergency shelter or street outreach services during 2021. That same year, substance-related deaths claimed the largest share of total mortality at 960 per 100,000. Substance-related mortality was 32-fold greater than that observed in the general population of the United States. Mortality for each year between 2018 and 2021 is plotted below, with connecting lines between years added to illustrate the magnitude of trends. Reference values for age-adjusted death rate in the general U.S. population are tabulated below for comparison.

Of note**, the subset of persistent utilizers, as defined for the FHP's early cohorts (see section 2.2), exhibited an even greater all-cause mortality risk at 1549 per 100,000 in 2019, 1573 per 100,000 in 2020, and 2829 per 100,000 in 2021**. The FHP targeted this extremely high-health-risk population for its housing intervention. The reasons for the increase in mortality, especially substance-related deaths, during the pandemic are incompletely understood. But mediating risk factors include: imposed social isolation, greater psychosocial stressors, reduction in supportive resources, loss of employment, and releases from

incarceration in a detoxed state susceptible to fatal overdoses.



We hypothesized that PSH reduces mortality risk through the provisions of stable housing and supportive services. Prior to outreach of the inception cohort, our statistical power calculation estimated that N=750 housed clients would be needed for sufficient power to detect a 30% mortality reduction.

Comparison of Estimated 2021 Mortality Rate per 100,000		
	Chicago/Suburban Cook HMIS	US*
All Cause	1606	842
Substance/Overdose	960	30
Cardiovascular	262	173
Injury	262	49

*https://www.cdc.gov/mmwr/volumes/71/wr/mm7117e1.htm
*https://www.cdc.gov/drugoverdose/deaths/index.html

However, FHP had housed a total of N=390 adults and youths as of 2021, excluding n=46 dependent children <18 years of age (see section 3.3). Therefore, the expected result of our analysis at this time is not a statistically significant conclusive finding but an unbiased estimate of the mortality benefit attributable to PSH.

We performed four different methods for comparing mortality between the cohort that was housed prior to January 1, 2022 through FHP and a propensity score matched control group of persistent utilizers not housed through FHP (see **Appendix A**). Propensity score matching techniques are useful to protect against biased estimates of effect by balancing a non-parsimonious list of potential confounders. The relative mortality risk estimated using the evaluation data is shown below:

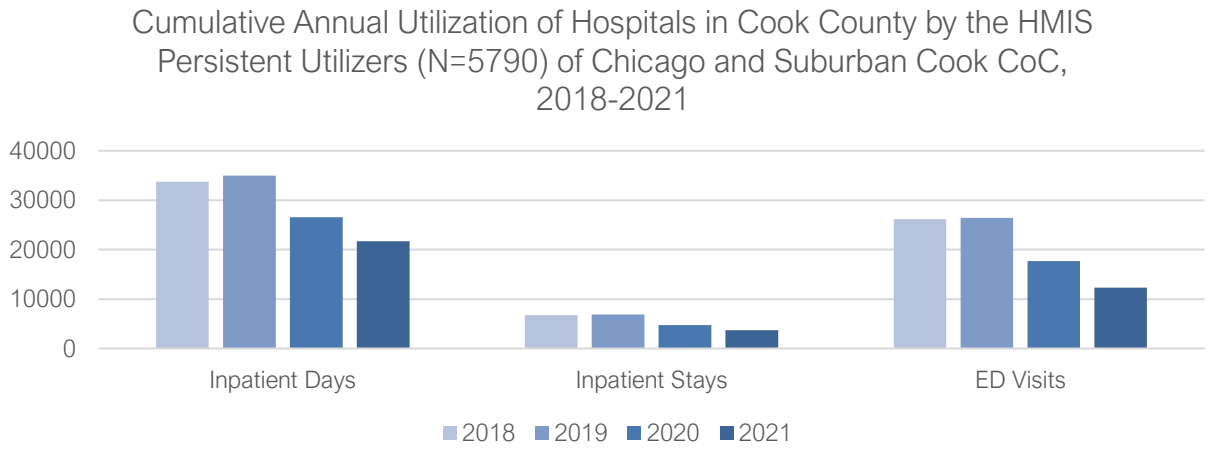
Matching Method	N	Odds Ratio	95% Confidence Interval
Nearest neighbor matched comparison with caliper 0.1	708	0.63	(0.27, 1.48)
Inverse probability of treatment weights	6487	0.72	(0.31, 1.64)
Standardized mortality ratio weights	6487	0.75	(0.36, 1.54)
Within overlapping propensity score values	5793	0.77	(0.34, 1.75)

All four methods yielded **fairly consistent estimates of reduced mortality, ranging from 23% to 37%.** In the nearest neighbor matched comparison, we observed 23 deaths among 708 individuals; 2.5% among clients housed in FHP vs. 4.0% among controls, p=0.29. If these diverging risks are upheld in future analysis with the projected sample size, **70 clients housed in PSH will prevent 1 all-cause death**.

Among the stably housed clients who died in 2020 or 2021, 67% suffered a substance-related death involving synthetic opioids. Accidental drowning, non-accidental injuries, and cardiovascular condition were the primary cause of death in the remainder of cases. Because illicit substances remain the most prevalent threat even to housed clients, more needs to be done programmatically to drive down the number of deaths from overdoses. Periodic detailed mortality reviews of these cases may illuminate whether evidence-based treatment for opioid use disorder is being made sufficiently accessible to all clients of FHP. Although stricter surveillance of the housed population is neither practical nor desirable, care coordinators and tenancy support specialists may have a role in conducting structured assessments and intervening in clients' overdose risk.

3.5 Hospital Utilization

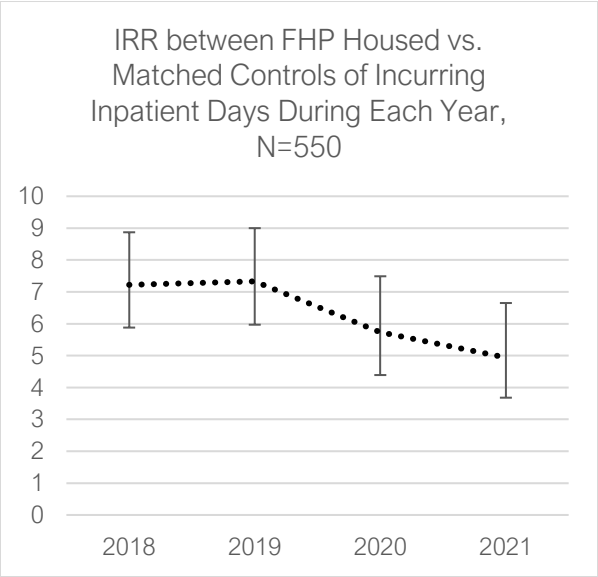
The secular trends in county-wide hospital utilization by residents experiencing homelessness during the pandemic is important to understand the effects of individual behavior and relevant pandemic-era policies. As illustrated in the graph below, the volume of county-wide healthcare resources consumed by persistent utilizers declined during the pandemic years. Over the four years from 2018 through 2021, we observed average annual reductions in cumulative inpatient days by 13%, inpatient stays by 16%, and emergency department visits by 19%. The average annual reductions in the number of clients who were hospitalized was 15% and clients visiting the emergency department was 17%.

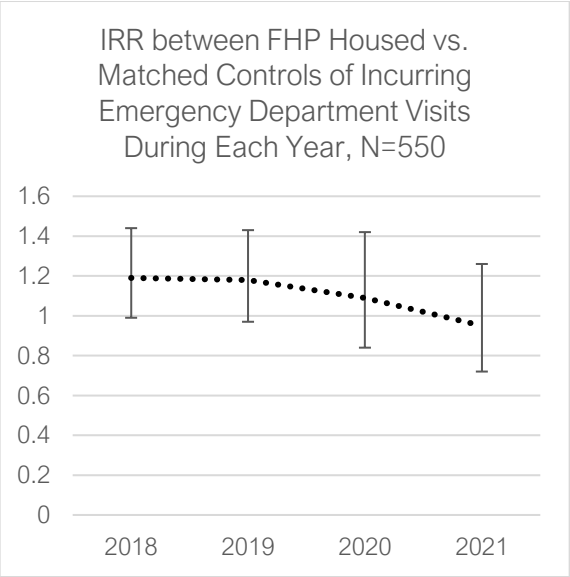


The reasons for these declines are likely multifactorial. For example, the City of Chicago's Expedited Housing Initiative placed over 1250 households with a higher risk of severe COVID-19 (primarily people older than 50) into Rapid Rehousing during 2020-21. This may have detectably improved the health of clients who were most likely to use hospital-based services. In addition, Chicago has seen several consecutive years of outward migration from areas with high levels of poverty. This may have resulted in objectively fewer clients of shelters and street outreach services that also used hospitals during 2020-21. Finally, hospital-based diversion and decompression policies imposed by COVID-19 may have contributed to higher access barriers to hospital-based services. The important takeaway is that changes in hospital utilization

attributable to FHP intervention must be measured while accounting for the declining secular trends.

When we exclude the N=230 youths housed in FHP due to their relatively infrequent use of hospital-based services, we have N=206 adults who were housed in FHP prior to January 1, 2022. Over the four years between 2018 through 2021, we observed average annual reductions in cumulative inpatient days by 16%, inpatient stays by 18%, and emergency department visits by 20%. The average annual reductions in the number of clients who were hospitalized was 12% and clients visiting the emergency department was 9%. To put into context the declining secular trends shown above, we calculated the relative risk of each utilization outcome between the housed cohort and their propensity score matched controls (see **Appendix B**). The trends in incident rate ratios (IRR) as a measure of relative risk across the four years are shown below.





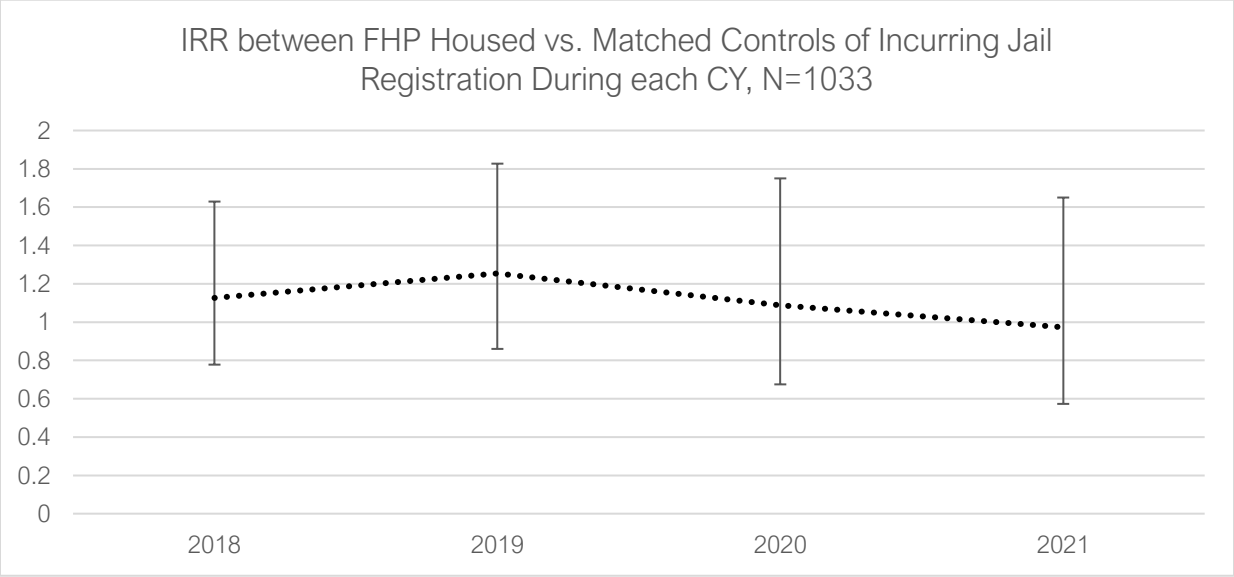
The trends reveal several important findings. First, the risk of hospital-based utilization among the FHP housed cohort was higher compared to controls. This means that FHP was successful in serving clients with a higher risk of healthcare utilization than controls with an otherwise similar phenotype. Second, and more importantly, we detected a decreasing relative risk of healthcare utilizations starting after 2019 when the first clients were housed. Because no FHP clients were housed in 2018, that year represents the pre-housing baseline. Over three years from 2019 through 2021, the monotonic decline reflects 24%, 46%, and 100% of the cohort being placed into stable housing (see Section 3.3). **During this period, the 33% relative risk reduction in incurring inpatient days and the 19% relative risk reduction in experiencing emergency department visits represents the impact of the housing intervention beyond the secular trends as we approach 100% of the cohort in stable housing**. When we include utilization data from 2022 for the next data aggregation, we may find that these risk reduction figures may be underestimated. For now, this analysis approximates the lower bounds of reductions in crisis healthcare utilization.

In exploratory analysis, we compared the subsets of clients and their controls with diagnosis codes for substance use disorder or mental health disorder. **For clients with substance use disorder, the relative risk reductions for inpatient days and hospital visits were 36% and 26%, respectively, as we approached all clients stably housed. For clients with mental health disorder, the corresponding relative risk reductions were 37% and 21%. These figures suggest that the effectiveness of supportive housing as a humane substitute for crisis healthcare utilization may be greater for clients with behavioral health conditions.**

Hospitals and their emergency departments are life-saving resources for people experiencing homelessness. As such, it is not desirable to obtain a reduction in their utilization by raising access barriers. Our analysis indicates that the observed reduction in hospital use by the housed population was not simply a supply-side effect. **Precisely because clients housed through FHP exhibited reductions in both mortality and hospital-based care, we observe the desired decrease in potentially preventable healthcare encounters.**

3.6 Jail Registrations

The number of people incarcerated in Cook County Jail declined during the pandemic years. To assess the housing-attributable effects on adults and youths housed through FHP prior to January 1, 2022, we again used propensity score matching to identify a control group with balanced characteristics, and calculated the relative risk (incident rate ratio, IRR) of incurring a registration event in Cook County Jail for each of four years between 2018 and 2021 (see **Appendix C**).



Because jail registrations are considerably less frequent than hospital visits, the confidence intervals around the estimated relative risks are wide. However, we observed a similar pattern of unchanged risk during the two pre-pandemic years (2018-19), followed by a sustained decline during the subsequent pandemic years (2020-21) as we approached all FHP clients being placed into stable housing. **Based on point estimates, we observed a 22% relative risk reduction in jail registration events for the housed population compared to matched**

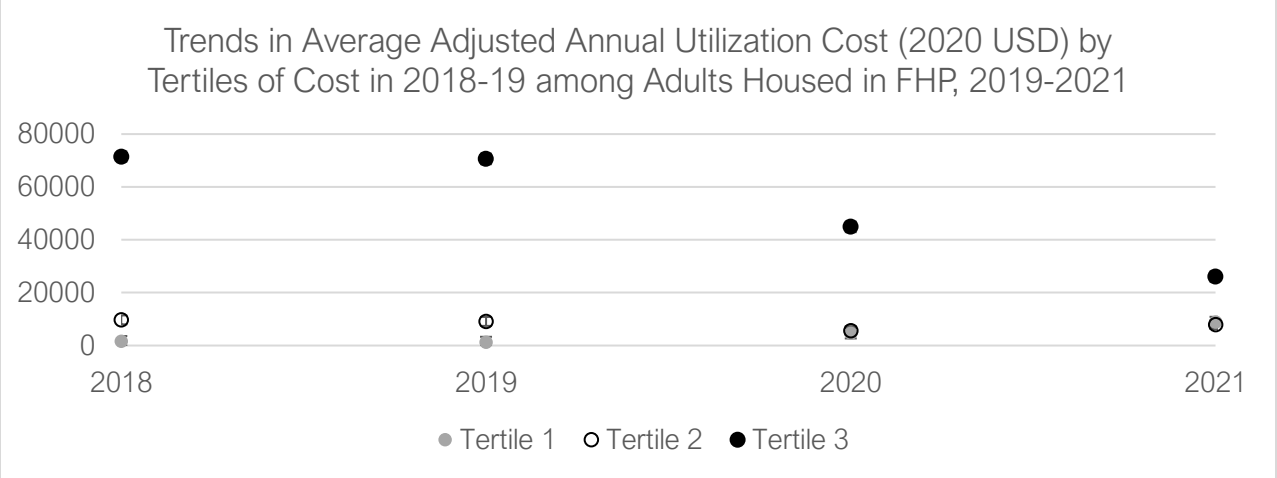
controls. In exploratory sub-group analysis, we again found greater relative risk reductions in the subgroup diagnosed with substance use disorder (36% reduction) or mental health disorder (25% reduction).

3.7 Cost Offset

The observed reductions in crisis systems among adult clients of the FHP yielded cost reductions from a societal perspective. We estimated the magnitude of this cost reduction as an offset of real costs of the FHP program. We imputed the costs of each actual utilization event according to published sources (see **Appendix D**). We then calculated the cumulative utilization cost of individuals in the FHP housed cohort for each calendar year between 2018 and 2021. Compared to *concurrent matched controls*, **the total cost offset from reductions in crisis system utilization among adult clients alone was $1.4 million over 2020 and 2021. This translates into a $7629 per client cost offset of the FHP program costs over 2020 and 2021.**

The magnitude of this average per client cost reduction is conservative for several reasons. First, as discussed above (section 3.5), we compared the FHP housed cohort with controls who themselves saw greater opportunities for stable housing during the study period. Second, we only accounted for crisis system costs and not costs incurred by other city departments like streets & sanitation, residential care programs like nursing homes, and all residents of the region through effects on quality of life. Third, the pattern of crisis system utilization during the pandemic was highly abnormal (section 3.5), and the benefits of the PSH program may be more evident when compared to typical utilization patterns seen subsequently in 2022-2023. Some of these limitations will be addressed in future analyses.

To further understand the return on investments we stratified the adult cohort by tertiles of total cost during the two pre-housed years (2018-2019) and plotted their average annual costs.



Using *historical controls* adjusted for age, sex, race, and diagnoses related to substance use or mental health disorders, we quantified the cost offset for each tertile. **By 2021, households in tertile 3 recorded an average annual cost reduction of $45,408 per client. Even if only a fraction of this reduction is attributable to the housing intervention (Section 3.3), the FHP**

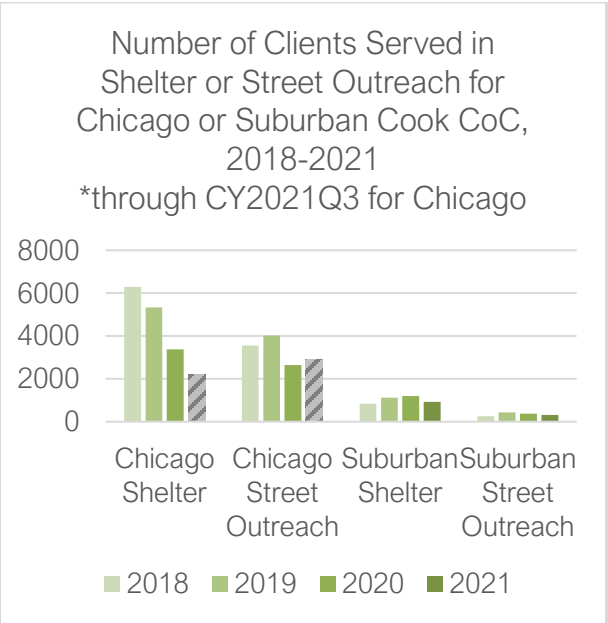
program cost per client in the highest pre-housing-cost tertile was almost completely offset by reductions in crisis system utilizations.

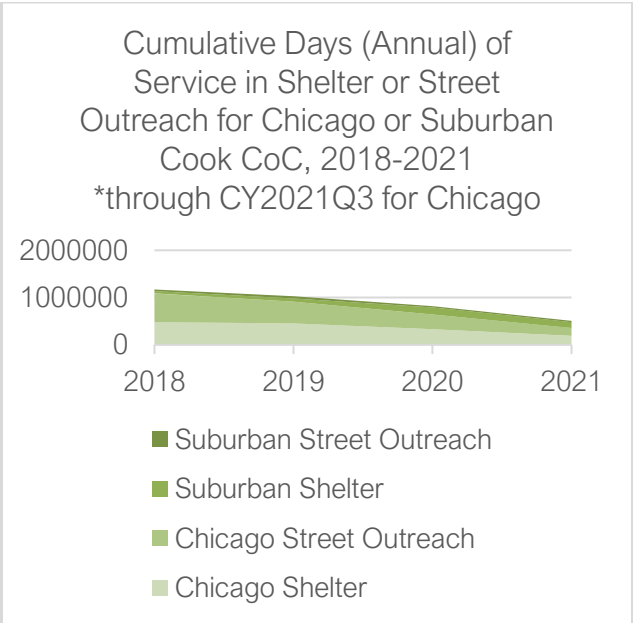
The cost offset for tertile 2 was $1755 per client, which also represents average cost savings for the region's crisis systems. During the pandemic years, households in tertile 1 experienced a modest increase in average annual utilization costs by $7275. Clients in this lowest tertile of pre-housing utilization cost were more likely to be comprised of women and families. The relatively smaller increase in utilization costs may hypothetically represent the cost of "catch-up" care for previously neglected conditions, as frequently observed in these populations.

It is encouraging that supportive housing moderated the extreme costs for nearly 1 in 3 FHP clients. We are currently engaging the City of Chicago to account for costs associated with emergency responders. Also, there are likely long-term societal cost offsets that are generated from the program, such as more stable family environments leading to improved employment and educational opportunities for some clients and their family members, and a decompression of the emergency shelter system to serve additional clients.

4 FHP Future Cohorts

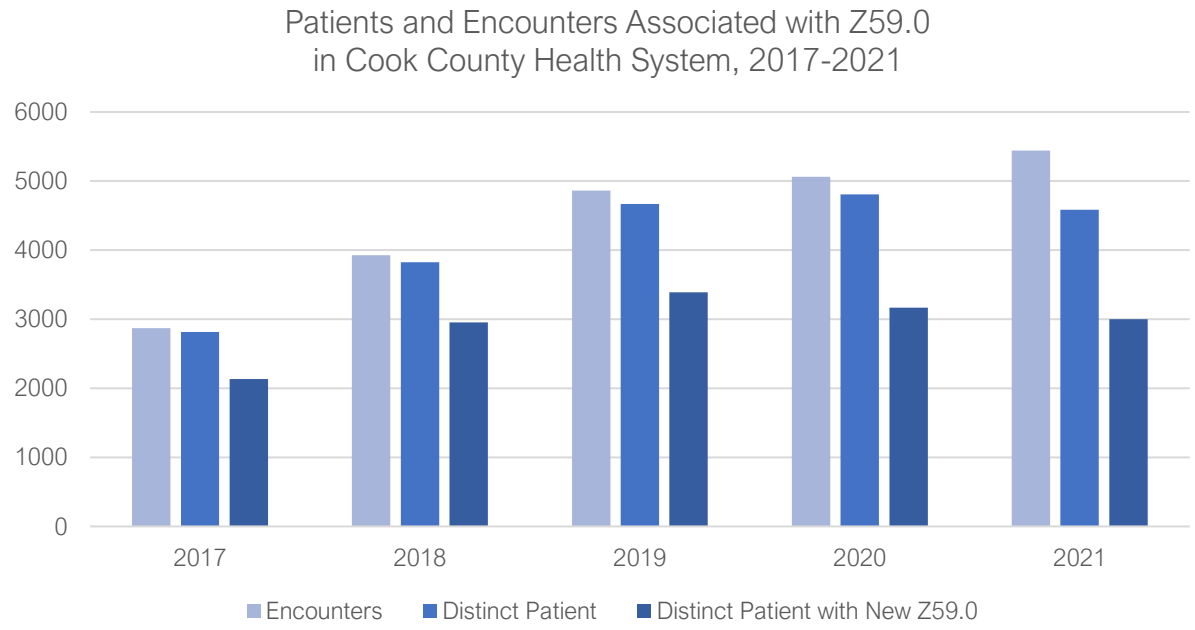
The early adult cohorts were selected from the combined high utilizations of emergency shelters, street outreach services, emergency departments, and jail to demonstrate the cross-sector impact of the program. As illustrated in this report, FHP's supportive housing intervention had a profound impact on crisis service utilization, which is often considered a surrogate measure of health. But beyond surrogate measures, we are also confirming PSH's potential to reduce the risk of the terminal adverse health outcome (death), alluding to other upstream benefits in health. To deliver these benefits of PSH to more people at risk, the data compiled for this analysis compels us to consider alternate approaches to identifying future FHP cohorts. In this section, we describe the rationale for opening future FHP referrals to high-risk clients outside of the data-match.





Due to the convergence of many factors, the number of distinct clients served in emergency shelters or street outreach services declined in Chicago during the peak of the pandemic. As a result, the total volume of shelter and street outreach service days is trending downwards in the region (see figures above). As partly hypothesized in Section 3.5, this may reflect the successful placement of clients into stable housing through various housing programs or an increase in access barriers to points of services.

Despite the observed declines in Chicago's emergency shelters, a growing number of people experiencing homelessness are engaging healthcare services as observed in the annual increase in the number of patients who are assigned the ICD10-CM code for homelessness (Z59.0) in Cook County Health encounters (see figure below).



Across the Cook County Health system, the approximately 3000 new patients who were assigned Z59.0 during each of the last 5 years, may represent patients whose homelessness is emergent or is newly recognized. As shown in previous research, only one-third of patients assigned Z59.0 in healthcare encounters have a corresponding record in the region's Homelessness Management Information System (HMIS). This means that a significant number of patients assigned Z59.0 may experience unsheltered or other high-risk forms of homelessness. Individuals whose homelessness is recognized solely by health systems often have a greater likelihood of using emergency departments for health services and a higher burden of behavioral health needs.

If FHP is to adapt its outreach to where growing numbers of high-risk people experiencing homelessness are seeking services, it may be unduly limiting to look only to the relatively small number of people exhibiting cross-sector high utilization patterns. Instead, each sector may have a role in independently identifying the phenotypes associated with housing-sensitive conditions. In the housing sector, medical respite

programs are proliferating as a new model of temporary supportive housing that cares for people dealing with housing insecurity and disabling comorbidities. Because about 70% of clients in medical respite programs have never stayed in emergency shelters, a requirement for cross-sector high utilization would improperly penalize a population that often needs PSH resources.

In the justice system, individuals recognized as homeless are less likely to have used shelters and street outreach services. Among Cook County Health patients assigned Z59.0 since 2016, only 27% registered in jail had ever received services in shelter or street outreach across Cook County. Furthermore, people with behavioral health conditions – associated with homelessness – were shown to be no less likely to be incarcerated since the implementation of Illinois bail reform in 2017. This phenomenon may contribute to the accumulation of jail detainees who are not released for reasons other than criminal risk (e.g., homelessness). Moreover, people with any history of encounters with the justice system continue to suffer stigma-related barriers to housing.

5 Conclusion

FHP is a data-driven multi-stakeholder people-centered program that employs an innovative paradigm to deliver evidence-based permanent supportive housing to high-risk individuals and families of Cook County. Despite serious disruptions caused by the COVID-19 pandemic, a team of regional government agencies, service providers, healthcare organizations, and generous funders successfully housed over 900 households (as of January 2023) and provided supportive services to objectively improve lives. And in doing so, the program is shifting care away from crisis systems and into homes. Supportive housing is confirmed as a condition for better health in populations suffering chronic conditions. Future investments in FHP are compelled by the health benefits obtained by clients, a better infrastructure to meet the needs of a neglected population, and the unwavering commitment of people building a better city and county.