FUSE 10Yr Follow-Up Report – Initial Findings

INTRODUCTION

The NYC Frequent Users System Engagement Intervention

The New York City Frequent Users System Engagement program (FUSE) was part of the Corporation for Supportive Housing's (CHS) *Returning Home Initiative,* a multi-year effort of public, inter-agency collaboration and investment that provided supportive housing for people cycling between incarceration and homelessness. NYC FUSE targeted persons with recurring homelessness and incarceration, most of whom challenged also by health, mental health, and/or substance use issues. Columbia University researchers evaluated FUSE by comparing program participants with a closely matched comparison group of "frequent users."[1] This evaluation found that supportive housing significantly reduced participants' (re)admissions to and time spent in jail and homeless shelters and their use of crisis healthcare services. These reductions resulted in significantly lower costs for publicly supported services, offsetting housing and other program costs. Results have inspired jurisdictions throughout the US to launch similar efforts (see: https://www.csh.org/fuse/).

Now, 10 years later, the FUSE Long Term Study presents a unique opportunity to examine stable housing as a critical component of successful community reentry, not simply in the short term but over people's lives. The 10Yr study is comprised of two phases to investigate sustained impacts on people's lives: first, a quantitative analysis of matched administrative data, tracking homeless shelter, jail incarceration, and hospital visits over time; and second, analysis of quantitative and qualitative data from in-person interviews with FUSE study participants. While important bench-marks, reincarceration and shelter or hospital admissions are limited and imprecise proxies for desistence of criminal behavior, maintaining housing stability, or improving health, let alone capturing all the multiple interactive elements of post-jail or shelter success. It is important to examine outcomes 'through the lens of overall healthy adult development across multiple life domains'[2] including family and social support, employment, civic and community engagement, as well as physical and mental health, and quality of life. Personal interviews will broaden our understanding of these issues.

[1] Aidala A, McAllister W, Yomogida M, & Shubert V (2013). Frequent Users Service Enhancement (FUSE) Intervention Evaluation. New York: Corporation for Supportive Housing. http://www.csh.org/wp-content/uploads/2014/01/FUSE-Eval-Report-Final_Linked.pdf

[2] National Academies of Sciences, Engineering, and Medicine (NAM). (2022). *The Limits of Recidivism: Measuring Success After Prison.* Washington, DC: The National Academies Press. https://doi.org/10.17226/26459

Research Questions

The primary research question motivating the FUSE 10Yr Follow Up Study is: To what extent can providing supportive housing break the cycle of homelessness and crisis and improve life outcomes over the long term for individuals with complex medical and behavioral health needs who are swept up in carceral systems? A secondary question is: What can we learn from differences among FUSE provider agency services and implementation that may have affected program outcomes and inform future FUSE-like initiatives?

METHODS

Data and Techniques

This report presents results of phase one of the FUSE 10Yr study based on analyses of outcomes using linked administrative data from the NYC Departments of Homeless Services (DHS) and Corrections (DOC) and the NYS Department of Health SPARCS database on hospital inpatient and ER events. Data span from five years prior to housing placement/baseline interview to 10 years after placement/interview. We accessed these data in collaboration with NYC Center for Innovation through Data Intelligence (CIDI).[3]

For the implementation component, we relied on conversations and interviews with staff of housing agencies participating in the original FUSE initiative as well as with early FUSE champions and other key stakeholders. We also reviewed printed or online program materials.

To analyze housing outcomes, we used information on homeless shelter admissions and stays; to analyze criminal justice involvement, we employed information about jail incarceration; and to look at health outcomes, we utilized ER and hospital admission episodes.

In the following analyses, we examine single point-in-time and cumulative over time outcomes for jail and shelter use and overall patterns of institutional involvement, taken as a whole, beyond participants' use of individual public systems. A distinguished Science and Practice Advisory Panel that includes leaders from research, housing providers, corrections and homeless service sectors, and persons with lived incarceration or homeless experience have informed our analyses and interpretation of results.[4]

FINDINGS

Homeless Shelter and Jail Incarceration

We analyze point-in-time and 10-year cumulative effects of FUSE using multivariable regression models to predict outcomes, controlling for theoretically relevant variables and for that previous research has shown mattered for outcomes of interest. Control variables include baseline measures of educational level, income from a job or social security, veteran status, disability status, number of chronic illnesses, health functioning, psychiatric diagnosis, mental health treatment, hard drug use, coping skills, and pre-intervention length of homeless experience and shelter use. We examine outcomes over the follow-up period starting from the baseline assessment. For the intervention

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[3] Center for Innovation Through Data Intelligence (CIDI) is a research and policy center in the Office of the Mayor of the City of New York, Maryanne Schretzman, DSW Executive Director. See www.nyc.gov/cidi

[4] See the Acknowledgements at the end of document for Science and Practice Advisory Panel members.

group, this start date/assessment was immediately after people moved into FUSE II supportive housing; for the comparison group, the start date/assessment was timed to coordinate with the start date/ assessments of the intervention group.

We found statistically significant differences in the number of homeless shelter episodes and the total number of days sheltered over 10 years. FUSE program participants spent 256 fewer days in a shelter than members of the matched comparison group (Table 1). They also had fewer episodes of shelter admission. If we focus only on the tenth year, we can see that the intervention group outperformed the comparison group regarding the number of shelter episodes and length of time in shelter.

Regarding jail experience, FUSE participants spent an average of 237 fewer days in jail over the follow-up period, a statistically significant difference (Table 2). Other differences are not as significant, and in some instances, the comparison group performed better, especially in the tenth year when the mean number of days in jail for the intervention group was higher (16.5 vs. 7.2 days). This difference may result from a small number of FUSE participants with extended jail stays, as the great majority of both groups had fewer than a single jail admission in the tenth year.

Table 1. Homeless Shelter Use 10 Yrs. from FUSE Enrollment & Baseline Interview

Measures	Intervention Group Mean (n = 60)	Comparison Group Mean (n = 70)	Difference of Means
Number of days over 10 years	330.4	586.6	-256.2***
Number of episodes over 10 years	12.7	34.5	-21.8***
Any episodes over 10 years	88.4%	93.9%	-5.5%
Number of days during the 10th year	24.1	46.2	-22.1***
Number of episodes during the 10th year	1.8	2.1	-0.3
Any episodes during the 10th year	22.3%	30.8%	-8.4%**

* p < .05   ** p < .01   *** p < .001

Table 2. Jail Incarceration 10 Yrs. from FUSE Enrollment & Baseline Interview

Measures	Intervention Group Mean (n=60)	Comparison Group Mean (n=70)	Difference of Means
Number of days over 10 years	141.4	236.6	-95.2***
Number of episodes over 10 years	3.9	4.7	-0.8
Any episodes over 10 years	76.9%	71.4%	5.4%
Number of days during the 10th year	16.5	7.2	9.4***
Number of episodes during the 10th year	0.2	0.2	0.0
Any episodes during the 10th year	13.0%	9.2%	3.8%

* p ≤ .05   ** p ≤ .01   *** p < .001

We also examined point-in-time and aggregated effects for jail and shelter episodes for each post-intervention year and the total number of admissions or days in jail or shelters over the 10 years. Figures 1 and 2 show *cumulative comparisons* of days spent in shelter and days spent in jail for each year. The figures compare averages for the intervention group (blue bars) and comparison group (red bars). The gap favoring FUSE participants is statistically significant for both shelter and jail. The average number of days spent in any homeless shelter was 261 fewer among FUSE participants than among comparison group members, and the average number of days spent in jail was 104 fewer. The most significant differentials were in the earlier years.

Figure 1. Cumulative Average Days Spent in Homeless Shelter over 10 Years
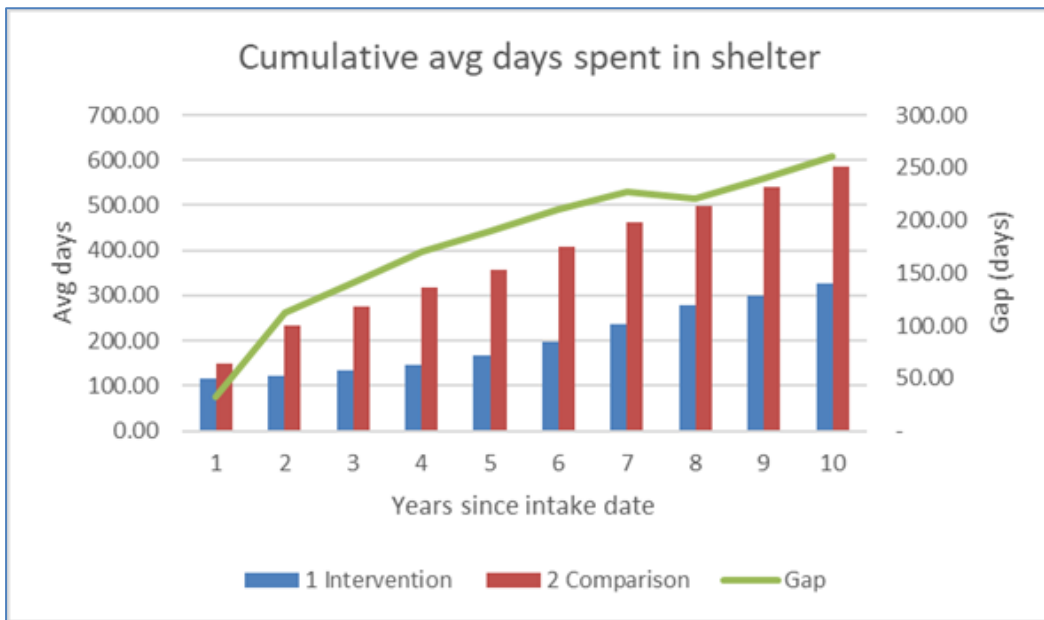
Figure 2. Cumulative Average Days Spent in Jail over 10 Years
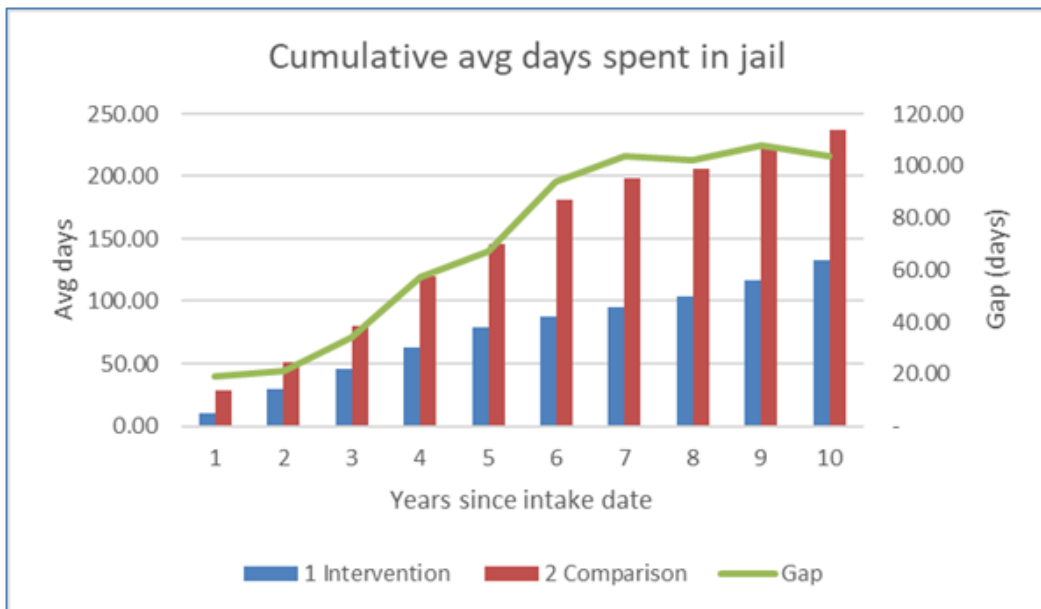
Figures 3 and 4 examine *year-by-year comparisons* of days spent in shelter or jail. These show that the annual benefits of FUSE can be somewhat less than cumulative results suggest, and, for a few later years, the comparison group outperforms the intervention group. This finding may indicate that the FUSE intervention effect diminishes in later years, or that the numbers indicate a "cross-over" effect. It could be that, over time, increasing numbers of the comparison group became permanently housed and received associated benefits based on existing or additional system-level resources for supportive housing, while a small group of FUSE participants, who did not benefit from FUSE, remained cycling or institutionalized for the duration. Note that the first part of this explanation supports the program service logic of FUSE and points to the importance of FUSE's providing these resources some years earlier in people's lives than would otherwise be the case.

Figure 3. Year by Year Average Days Spent in Homeless Shelter over 10 Years
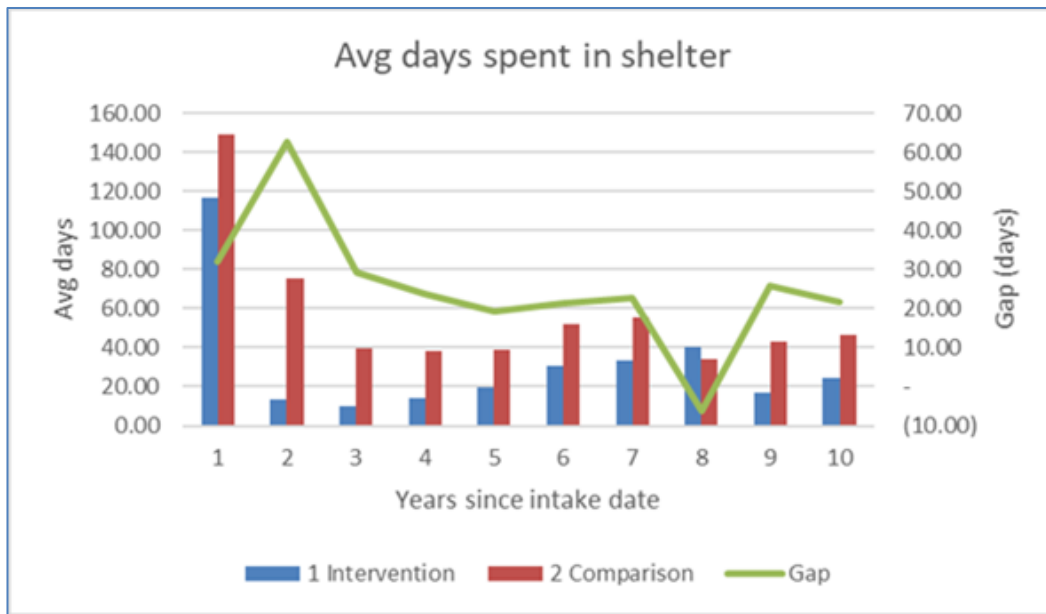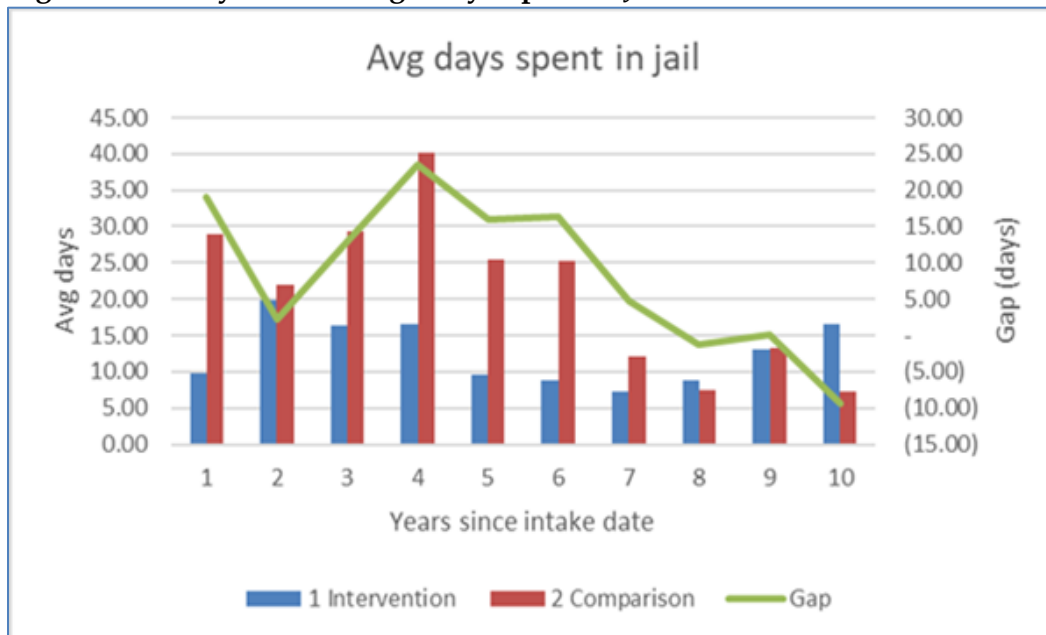

Figure 4. Year by Year Average Days Spent in Jail over 10 Years

Hospital Inpatient Stays and Emergency Room Visits

Using multivariable regression analyses, we also examine point-in-time and 10-year cumulative effects of FUSE on hospital inpatient stays and emergency room visits. We found a 40% reduction over the 10 years in the average number of hospital inpatient days (Table 3). The number of episodes over the study period shows little difference. However, a greater proportion of FUSE participants have had at least one overnight inpatient stay in the hospital during the last year of the study period.

We see a similar pattern for Emergency Room Visits (Table 4). FUSE participants have had, on average, fewer days with an ER visit over the 10-year follow-up period. However, they are more likely than comparison group members to have visited the ER during the tenth year after program enrollment. Interpreting this finding is complicated by the possible overlap with the onset of the COVID-19 pandemic that brought many previously healthy individuals into the ER for testing or symptom management.

Table 3. Inpatient Hospitalization 10 Yrs. from FUSE Enrollment & Baseline Interview

Measures	Intervention Group Mean (n=60)	Comparison Group Mean (n=70)	Difference of Means
Number of days over 10 years	62.6	87.2	-24.6 **
Number of episodes over 10 years	21.6	26.6	-5.0
Any episodes over 10 years	85.5%	84.3%	1.2%
Number of days during the 10th year	3.1	6.7	-3.6*
Number of episodes during the 10th year	1.5	2.3	-0.8
Any episodes during the 10th year	41.0%	29.2%	11.8%***

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

Table 4. Hospital Emergency Room Visits 10 Yrs. from FUSE Enrollment & Baseline Interview

Measures	Intervention Group Mean (n=60)	Comparison Group Mean (n=70)	Difference of Means
Number of days over 10 years	35.0	43.6	-8.6 *
Number of episodes over 10 years	16.1	21.0	-4.9
Any episodes over 10 years	85.7%	82.9%	2.9%
Number of days during the 10th year	1.1	1.4	-0.3
Number of episodes during the 10th year	1.0	1.3	-0.3
Any episodes during the 10th year	37.2%	23.1%	14.1%***

* $p \leq .05$ ** $p \leq .01$ *** $p \leq .001$

We also examined point-in-time and aggregated program effects, comparing hospital inpatient episodes in each year after the intervention and the total number of hospital days in jail or shelters over the 10 years. Figure 5 shows *cumulative days* hospitalized each year over the study period, comparing averages among members of the intervention group (blue bars) and comparison group (red bars). It indicates that, on average, FUSE participants spent fewer days in hospital over 10 years.

When looking at *year-by-year comparisons*, however, the pattern is inconsistent and we see no effect or results favoring comparison group members for several years. Again, findings may indicate a diminished effect of FUSE over time. On the other hand, it may be that FUSE-provided stable housing and its concomitant range of client-centered services created conditions for people to receive care for previously untreated physical health or behavioral health problems.

Figure 5. Cumulative Average Days Hospitalized over 10 Years
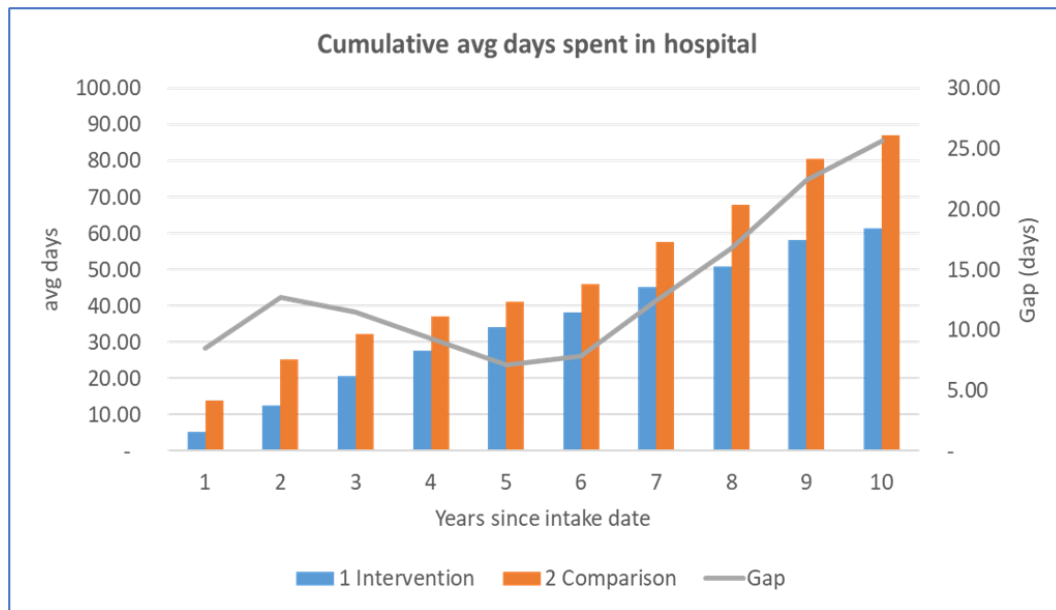
Figure 6. Year by Year Average Days Hospitalized over 10 Years
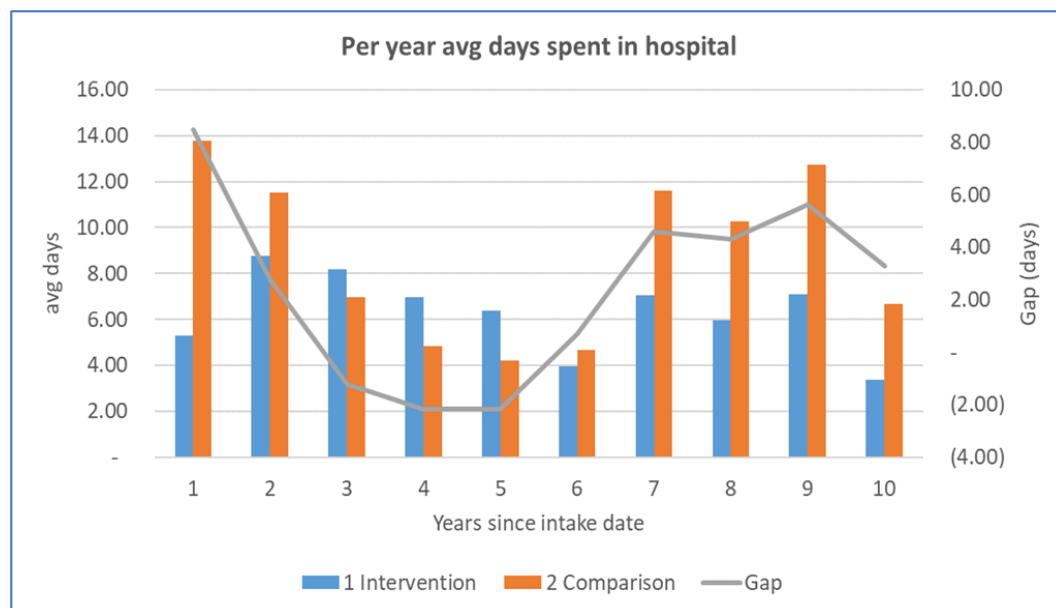
Over Time Patterns of Shelter and Jail Experience

A key aim of the FUSE 10-Year Long Term Study is to look for the effects of the intervention on overall patterns of housing status, incarceration, hospital, and other institutional involvement. For this part of the analysis, we carried out a Department of Corrections and a Department of Homeless Services administrative data match to identify patterns of incarceration and shelter use over the study period. As we did in the original NYC FUSE evaluation,[5] we employed optimal matching analysis to examine the timing, duration, and sequencing of people's institutional histories to identify those in either the intervention or comparison groups who had similar life-course trajectories prior to and after the FUSE program enrollment/baseline interview and to group those with most similar histories. This approach differs from the point-in-time and time-aggregated averages in previous tables and figures. These latter measures do not assess patterns of housing stability and institutional involvement over time and cannot show both their dynamic nature and the heterogeneity among individuals with multiple and complex needs.

Here we report trajectory analysis results for incarceration and shelter use and cycling based on whether people were in jail, shelter, or both for one or more days in successive 30-day periods (a "month") over the 10-year follow-up period. Figure 7 shows the trajectory of a specific person who is a statistical exemplar of each trajectory class. Despite people in both the intervention and comparison groups having similarly intense histories of incarceration and shelter use prior to FUSE,[6] this figure reports that a large post-intervention class of FUSE enrollees (63%) had no jail or shelter experience after an early period of shelter stays. For program participants, post-FUSE enrollment cycling between jail and shelter is absent, except for a small percentage of enrollees (13%). In contrast, the large majority of comparison group members are in trajectory classes with multiple jail episodes (63%), including one class where incarceration dominates throughout follow-up.

This analysis indicates a strong FUSE impact on life-courses individuals with multiple, recurring episodes of homelessness and jail incarceration might have followed but for the intervention. Comparison group members continued their previous histories of shelter use and incarceration, with the timing, sequencing, and duration of location (i.e., jail, shelter, or both) defining variation between classes. Except for a few people in the intervention group who had early post-intervention jail experience, FUSE participants had little or sporadic shelter use and almost no incarceration over the 10 year follow up period (Figure 7).

Dissemination and Implementation Analysis

A final component of phase one of the FUSE 10-Year Long Term Study utilized a "dissemination and implementation" (D&I) approach to look retrospectively at the original NYC FUSE program implementation to assess ongoing FUSE dissemination. Our D&I work seeks to articulate learnings from the original NYC FUSE program and inform ongoing replication of the FUSE model. This work can inform the analysis of possible differences among FUSE housing provider agency services and implementation that may have affected program outcomes.

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[5] Aidala A, et al. (2013) op. cit. . See also McAllister W, Kuang L & Lennon MC (2011). Rethinking research on forming typologies of homelessness. *Am J Public Health*, 101(4): 596-601.

[6] Alatas H, McAllister W, & Yomogida M (2022). Temporality in Quasi-Experimental Design: Using Optimal Matching Analysis to Test for Comparison/Treatment Group Differences. Unpublished report, New York: INCITE, Columbia University.

Figure 7. 10-Year Trajectories of Incarceration and Homeless Shelter Involvement from FUSE Enrollment/Baseline Interview
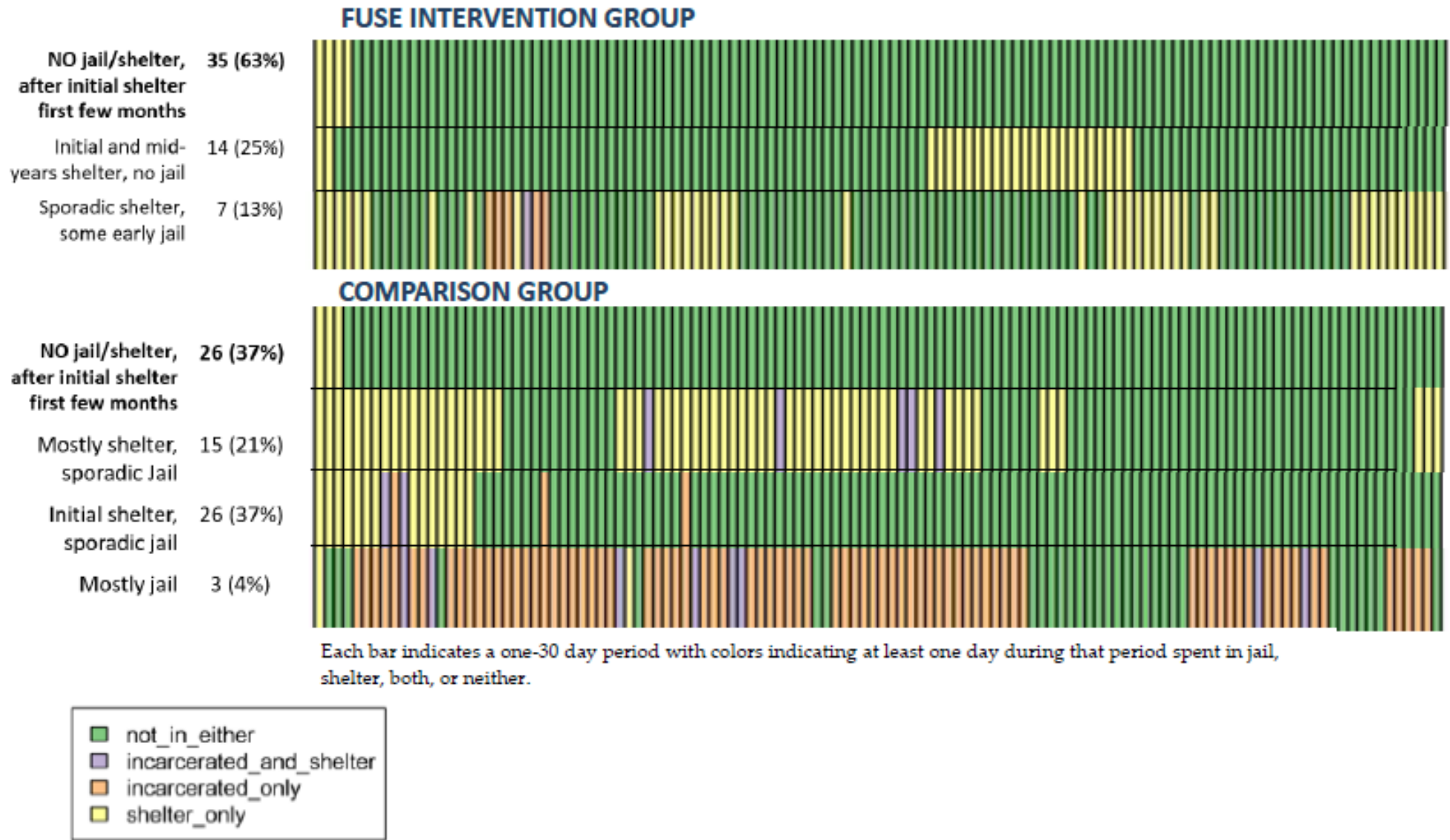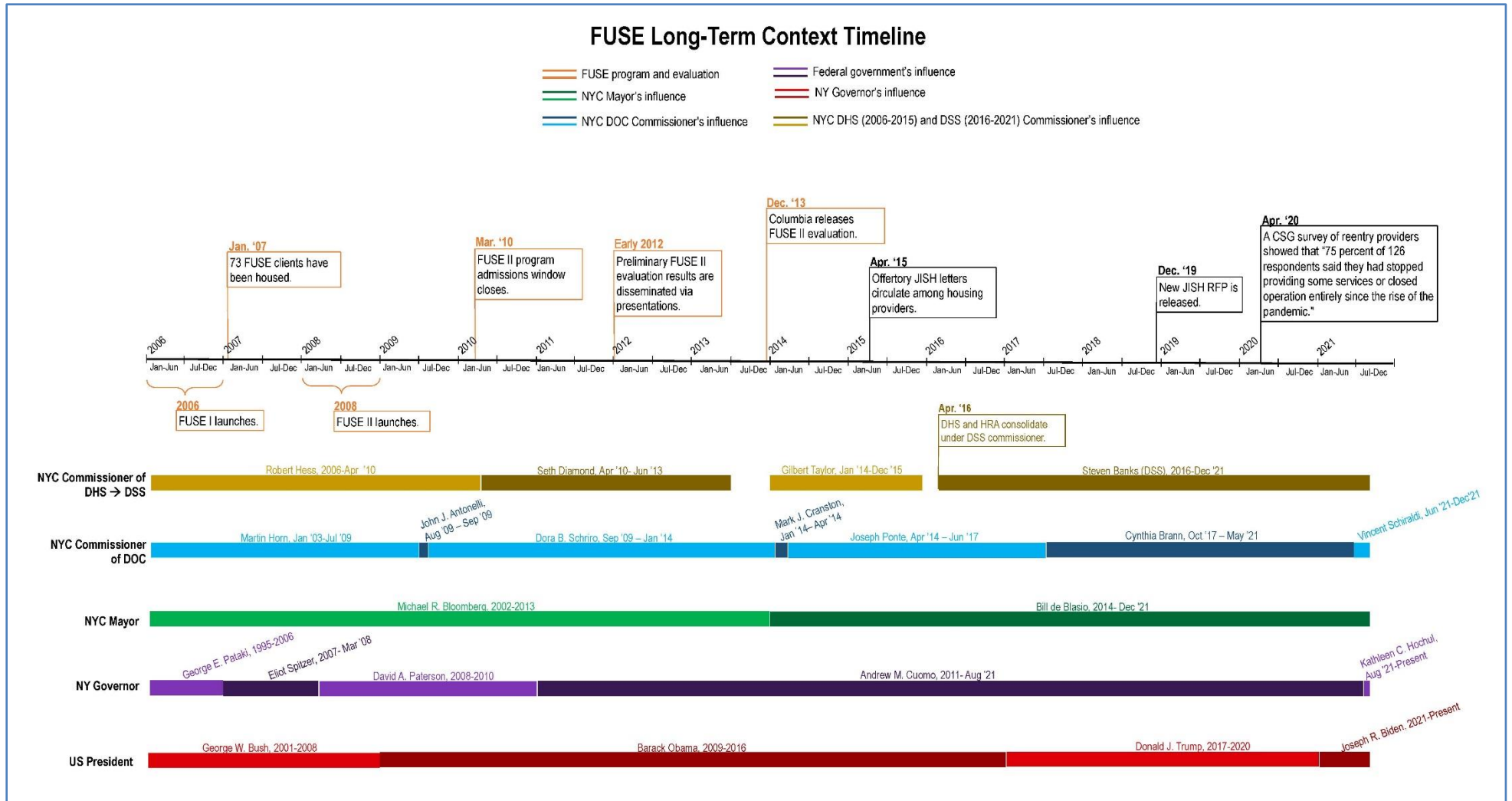

Each bar indicates a one-30 day period with colors indicating at least one day during that period spent in jail, shelter, both, or neither.

Legend:
- ☐ not_in_either
- ☐ incarcerated_and_shelter
- ☐ incarcerated_only
- ☐ shelter_only

Figure 8. FUSE Long-Term Political, Criminal Justice, Housing Policy Contextual Factors 2006 - 2021

To this end, we reviewed FUSE background materials, such as meeting notes, project proposals, and program reports. We had conversations with FUSE stakeholders with knowledge of the supportive housing landscape, including program champions, initiative leaders, and others. In addition, we interviewed key informants from the housing agencies participating in the NYC FUSE program. We also compared NYC FUSE to two recent initiatives that adapted the FUSE model: the NYC Justice Involved Supportive Housing (JISH) program and Denver's Social Impact Bond (SIB) initiative.

Our D&I analysis is guided by theoretical frameworks emphasizing the centrality of broader social and political contexts for program implementation. With input from our Science and Practice Advisory Panel, we collected information about changing political and policy contexts over time, focusing on events and transitions that seem more likely to have influenced FUSE agencies, the FUSE program overall, and the lives of FUSE participants. Figure 8 is an example of a timeline template.

D&I research activities included developing a database with detailed variables created by coding housing characteristics and services in crucial service domains for each of the six housing programs participating in NYC FUSE. We coded multiple variables under different domains to capture specifics of housing facility and service characteristics. We have begun to develop a classification system for empirically defining models-of-care to characterize FUSE housing providers and to examine the extent to which program differences may have an effect on client outcomes.

The main conclusion of our D&I analysis is the utility of thinking of FUSE as a framework for an implementation strategy comprised of six core elements: (1) identify and prepare champions, especially public officials; (2) conduct local needs assessments using cross-system administrative data matches; (3) promote adaptability; (4) build a cross-sector coalition of implementers and other stakeholders; (5) provide centralized technical assistance; and (6) stage implementation scale-up.[7] Considering FUSE a proven framework for intervention research has potential for clarifying future learnings about FUSE initiatives. It also has potential for facilitating scaling-up both the FUSE strategy and a flexible supportive housing approach, adapted to local conditions and target populations with regard to type of housing, funding sources, and services responsive to variable client needs. Using the FUSE framework in this way would serve the maximum number of individuals possible, who would otherwise continue cycling between homeless shelters, jails, and crisis care systems.

First Look at Cost Savings

The original NYC FUSE evaluation demonstrated that the FUSE housing-based intervention, resulting in reduced usage of jails, shelters, and crisis care health services, generated $15,700 per person in public savings. This paid for over two-thirds of FUSE housing and service costs. The absence of detailed information about the utilization of medical services limits total cost offset analysis. However, we conducted a "first look" of cumulative savings associated with reduced jail and homeless shelter system involvement (Figure 9).

Gabriel Schuster, MS, Analyst and Senior Program Manager at the Corporation for Supportive Housing, conducted this analysis. Examining cost savings over five years showed that reduced jail incarceration saved an estimated $108,763 per person, comparing FUSE housing program

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[7] Torsiglieri, A (2022). Implementation of the New York City FUSE Initiative: Looking Back to Guide Future Dissemination. MPH Thesis. New York: Mailman School of Public Health, Columbia University.

participants to comparison group members, and reduced homeless shelter use saved over $25,000

per person.[8] When considering costs for FUSE supportive housing and associated services over the five years, Schuster found that an estimated $45,000 per person reduction of publicly funded jail and shelter costs have been realized. FUSE study participants were selected from over 1,000 individuals with complex needs and comparable cycling patterns between jail and homeless shelters. Therefore, we can conservatively estimate that $45,000,000 in public expenditures would have been saved within five years had all 1,000 persons received supportive housing comparable to the FUSE housing and services model.[9] Note that this cost savings estimate does not include additional savings associated with avoidable crisis care medical and behavioral health services which for the original FUSE evaluation, and for similar supportive housing interventions, was a major driver of cost savings for publicly funded services.[10]

Figure 9. Cumulative Jail and Shelter Costs Savings Compared to FUSE Program Costs

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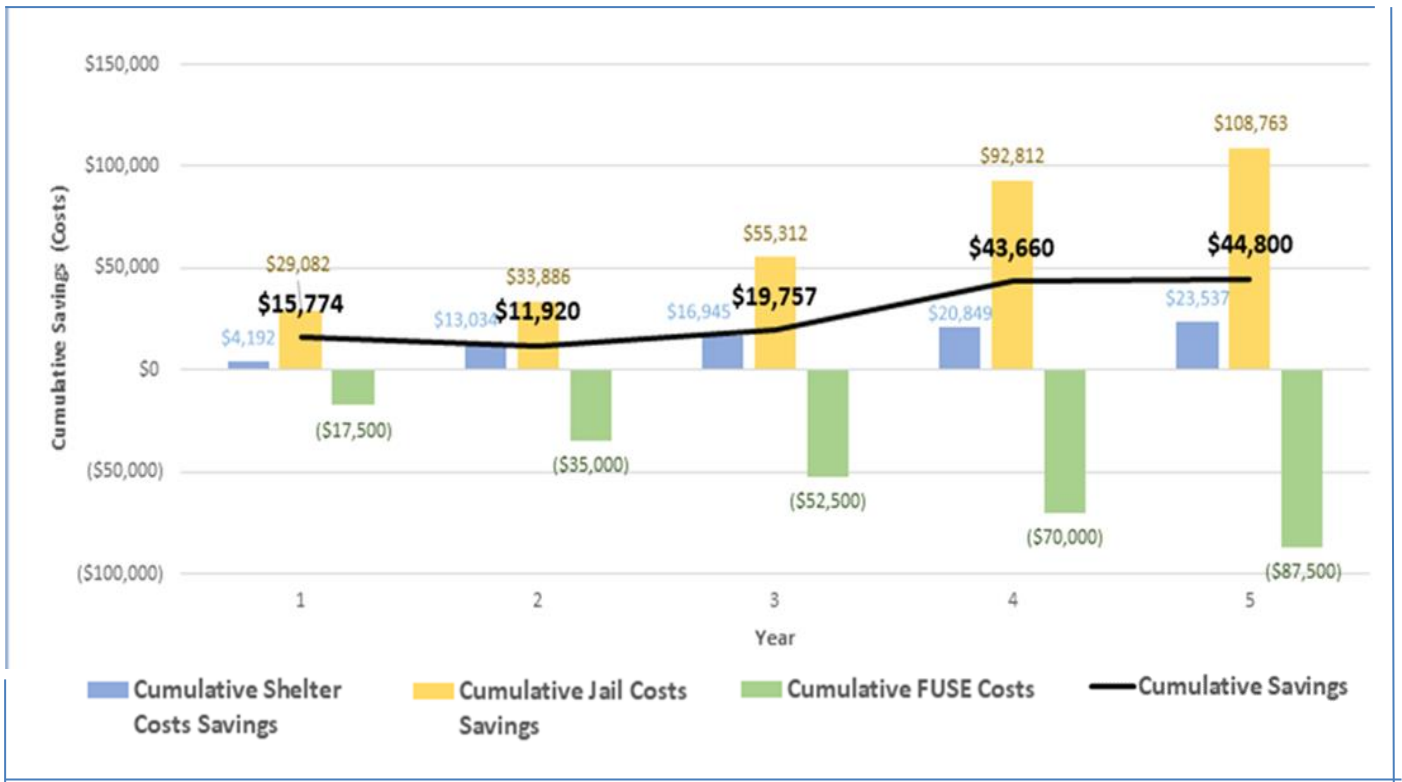
[8] Gabriel Schuster, personal communication, August 4, 2022.

[9] For additional analyses of the potential of the FUSE model of supportive housing to reduce public costs associated with NYC jail incarceration, see CSH (2022). *Advancing Supportive Housing Solutions to Reduce Homelessness for People Impacted by the Criminal Legal System, A Report for New York City Leaders*.

[10] Aidala et.al (2013) op cit. Gillespie, S et al. (2021*). Costs and Offsets of Providing Supportive Housing to Break the Homelessness-Jail Cycle*. Urban Institute Metropolitan Housing and Communities Policy Center, Research Report.

SUMMARY AND NEXT STEPS

This first phase of the FUSE 10-Year Long Term Study based on analyses of matched administrative data sets has demonstrated effective outcomes over the follow-up period for NYC FUSE participants compared to a closely matched comparison group. Participants have spent fewer days in shelter, have had fewer episodes of shelter admission, and have wasted fewer days in jail. Further, FUSE participants are much more likely to experience helpful changes in their life trajectories relative to their previous cycling between jail and homeless shelters, a cycling that characterized both intervention and comparison group members. Preliminary economic analysis indicates the potential for savings of public expenditures associated with reduced jail and shelter system involvement.

However, several findings require further analysis to understand these results more thoroughly. Year-by-year comparisons of time spent in shelter or jail show more significant intervention and comparison groups differences than cumulative analyses indicate. Sometimes, differences suggest the comparison group performed better. These contra-indicators appear mainly in the later years of the follow-up period, suggesting the FUSE effect diminishes over time. Or it may mean that, over time, increasing numbers of the comparison group essentially received permanent supportive housing and services comparable to FUSE from existing or expanded supportive housing resources, at the same time as a small group of FUSE participants continued to cycle or were institutionalized over the 10 years. (The trajectory analysis provides some evidence for this explanation.)

Similarly, over the 10-year period, FUSE participants have spent fewer days in the hospital. However, the year-by-year comparisons of hospitalization found no difference between FUSE and comparison group members or in some cases more days for FUSE than for the comparison group. Again, this pattern may indicate a diminished FUSE effect. Or, it may mean that FUSE-provided stable housing and a range of FUSE client-centered services created conditions for participants to receive care for previously unidentified or untreated physical health or behavioral health problems. It just took some time for these FUSE-induced housing and service provisions to have this effect.

Further analysis that disentangles these explanations will allows us to *understand* FUSE's impact more accurately. To this point, we have shown FUSE has strong effects over roughly five-plus years post-enrollment, with possibly diminishing effects (or their absence) as follow-up approaches over 10 years. However, understanding how FUSE produces these effects and how the two analytic groups look more similar as time passes requires analyses beyond the information available in administrative databases. Analyzing information from in-person interviews with study participants allows us to learn how the patterns we observed happened and how it is that comparison group members "caught up" with those from the program. We can examine outcomes across multiple life domains including education, employment, family and social relationships, and individual well-being. We can consider the program elements and services that comprised the 'model of care' of different FUSE providers, as well as general contextual policy and economic conditions, that facilitated or posed barriers to success. With this information, we can identify how FUSE interacted with what was happening in a person's life – not simply the presence or absence of exposure to the FUSE program.

This additional information is needed to analyze the factors that produced the trajectory classes we observe. Additionally, this knowledge could be useful for designing service initiatives in tune with the post-intervention life-course trajectories particular kinds of clients are likely to have. Identifying indicators of different life histories can enable service providers to make programmatic decisions early on based on likely trajectory group, such as providing more or less intensive services from the start or providing "booster" services at critical moments for at-risk individuals. Such analysis can also suggest who may not need an initiative's services or may need different services after an initial period.

Thus, in the next phase of the FUSE Long Term Study, we plan to implement semi-structured, personal interviews with FUSE intervention and comparison group study participants to learn about their lives over the 10 years since initial study contact. Including the voices and experiences of FUSE study participants will be essential for understanding program successes and limitations, given the complexities of the participants' individual lives. Our Science and Practice Advisory Panel also has stressed the importance of conducting personal interviews with study participants, both to give them a voice beyond their representation as quantitative data points in administrative data sets and to inform program and policy decision-making. It will also be crucial to include the voices of FUSE and other service providers who have worked with participants to understand specific programmatic factors that can help explain program success or failure over time, and inform implementation of improved options in the future.

ACKNOWLEDGEMENTS