



RESEARCH REPORT

Costs and Offsets of Providing Supportive Housing to Break the Homelessness-Jail Cycle

Findings from the Denver Supportive Housing Social Impact Bond Initiative

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Executive Summary

Without housing and services, people caught in a revolving door of homelessness, police interactions, and jail stays also frequent detoxification centers, emergency departments, and other emergency services. This negative cycle affects their well-being and comes at an enormous cost to taxpayers.

In 2016, the City and County of Denver launched the Denver Supportive Housing Social Impact Bond Initiative (Denver SIB) to shift resources from expensive emergency services to more permanent, affordable housing and supportive services that can be difficult to fund without up-front capital. The initiative aimed to increase housing stability and decrease jail stays for people trapped in the homelessness-jail cycle. The Urban Institute, as the evaluation partner for the Denver SIB, tracked the implementation of the initiative and evaluated the efficacy of supportive housing between 2016 and 2020. Supportive housing services were provided by Colorado Coalition for the Homeless (CCH) and the Mental Health Center of Denver (MHCD). This report details the costs of supportive housing provided by the Denver SIB and the costs and cost offsets associated with supportive housing's effects on outcomes across the housing and homelessness assistance, criminal justice, and health care systems.

Total Costs of the Supportive Housing Program

Supportive housing is an intensive intervention that carries significant costs across local, state, and federal funding sources. Although the total cost of a full year of the program varied between the two Denver SIB providers (CCH and MHCD), the cost to each system other than Medicaid was similar.

The annual per unit cost of the Denver SIB program was \$22,265 for CCH and \$35,770 for MHCD. Those per unit costs were spread across multiple levels of government:

- Housing assistance payments (\$10,950 for both CCH and MHCD) were provided primarily through housing vouchers from Colorado's Division of Housing at the state level.
- Supportive housing services were funded in part by the SIB financing mechanism (\$9,165 for CCH and \$9,183 for MHCD), although MHCD used other revenue sources as well. These funds were provided up front by private investors, but they were eventually repaid by the City and County of Denver in accordance with the Denver SIB contract.
- Additional resources for supportive services were leveraged through federal Medicaid funding, which varied greatly between the two providers. For CCH, a federally qualified health care

center, Medicaid revenue provided an average of \$2,150 per unit for supportive services costs. For MHCD, a mental health center, Medicaid revenue provided an average of \$15,637 per unit for supportive services costs.

Cost Offsets from Savings in Other Public Services

To compare the costs of the program with the costs avoided in other systems as a result of supportive housing services, we used per person costs instead of per unit costs. These per person costs are estimates of the actual costs for the average Denver SIB participant based on the average number of days spent in SIB housing per year, as opposed to the unit cost of a full year of supportive housing. On average, participants referred to CCH spent 198 days in housing per year, and participants referred to MHCD spent 158 days in housing per year. As a result, the average annual per person cost of Denver SIB supportive housing was \$12,078 for CCH and \$15,484 for MHCD.

We compared the annual per person costs of the Denver SIB with the annual per person cost reductions from avoided outcomes in other services. We found the following:

- **Approximately half the total annual per person cost of the Denver SIB was offset by reductions in the costs of other public services.** The treatment group had \$6,876 less in total annual per person costs associated with avoided outcomes compared with the control group.
 - » Some of the largest avoided costs were those for jail days (\$2,386), ambulance rides (\$1,662), and emergency department visits (\$534).
 - » Overall, 57 percent of the cost of providing supportive housing to Denver SIB participants referred to CCH and 44 percent of the cost of providing supportive housing to Denver SIB participants referred to MHCD were offset by the costs avoided in other public services and outcomes.
- **Among the government funding sources for the various services, the City and County of Denver had the greatest amount of avoided costs (\$3,733 per person annually) because it pays for shelter, jail, courts, police, and public safety.** This was followed by \$2,196 in costs avoided at the federal level for emergency health care use billed to Medicaid and \$947 in costs avoided by the state of Colorado for reductions in prison days and for housing assistance provided outside the Denver SIB program.
- **Because housing assistance was primarily funded at the state and federal levels, a large share of the City and County's costs for Denver SIB supportive services was offset by reductions in**

local costs for other avoided outcomes. The annual cost of supportive services primarily paid for by the City and County of Denver, after accounting for the services covered by Medicaid revenue, totaled \$4,972 for each participant referred to CCH and \$3,975 for each participant referred to MHCD. (MHCD also used other revenue sources for the cost of supportive services.) As a result, 75 percent of Denver’s cost of providing supportive services to SIB participants referred to CCH and 94 percent of Denver’s cost of providing supportive services to SIB participants referred to MHCD were offset by the costs avoided for local outcomes (\$3,733 per person).

- **Scaling up the program to end chronic homelessness in Denver County would cost between \$14.6 and \$18.7 million annually, but \$8.3 million of that total cost would be offset by savings in other services.** Expanding the supportive housing program to serve all 1,209 people experiencing chronic homelessness in the county would allow the government funding sources to realize the maximum cost benefit. Denver would see the largest cost savings, with \$4.5 million in cost offsets compared with the \$4.8 to \$6.0 million contribution the City and County would need to make for services. However, scaling up the program to end chronic homelessness would also require Denver to marshal between \$5 and \$7 million in additional housing assistance per year, an unprecedented level of investment in supportive housing for this group of residents.

Conclusion

The Denver SIB was a remarkable success, serving a highly vulnerable population and demonstrating that supportive housing increases people’s housing stability, reduces their criminal justice system interactions, and improves their access to appropriate health care. In addition to providing better outcomes for people, the Denver SIB proved to be a better use of taxpayer dollars than the current status quo of the homelessness-jail cycle. The costs borne by various public funders were substantially offset by reductions in costs associated with the negative outcomes avoided by participants in the supportive housing program. Scaling up supportive housing would require an increase in funding at multiple levels of government, but the Denver SIB findings show that expansion would also maximize the return on investment of public dollars and help end the homelessness-jail cycle.

Costs and Offsets of Providing Supportive Housing to Break the Homelessness-Jail Cycle

In the absence of housing and services, people caught in a revolving door of homelessness, police interactions, and jail stays also frequent detoxification centers, emergency departments, and other emergency services. This negative cycle not only affects their well-being but also comes at an enormous cost to taxpayers. This report compares the cost of the homelessness-jail cycle with the cost of a supportive housing program designed to better serve the people caught in that cycle. Cost estimates are based on the results of a randomized controlled trial evaluation (described in appendix A) of the Denver Supportive Housing Social Impact Bond Initiative (Denver SIB).

Background

When Mayor Michael Hancock launched the Denver SIB in 2016, he recognized the immense costs borne by the City and County of Denver in the absence of adequate housing and services for people experiencing homelessness. “Denver is among many cities in which jails and emergency rooms have become the most expensive housing program for the chronically homeless,” Hancock said. “The Social Impact Bond program will create long term solutions that combine evidence-based programming with smart financing to help our most vulnerable stabilize their lives.”¹ By marshaling \$8.6 million from private investors through pay for success financing and leveraging state housing resources, federal tax credits, and Medicaid funding, the Denver SIB aimed to shift resources from expensive emergency services to permanent, affordable housing and supportive services that can be difficult to fund without up-front capital. The city hoped this investment would lead to an increase in housing stability, a decrease in arrests and jail stays, and better access to health care for people in supportive housing, improving residents’ lives while lifting some of the burden on local budgets. Supportive housing was provided by Colorado Coalition for the Homeless (CCH) and the Mental Health Center of Denver (MHCD). These two providers were managed by an intermediary for the project, a joint effort by the Corporation for Supportive Housing and Enterprise Community Partners. Under a contract with the City and County of Denver, the Urban Institute was the evaluator for the Denver SIB (see appendix B for more details on the Denver SIB framework). If the program worked, as indicated by performance

measures outlined in the pay for success contract and validated by a rigorous evaluation, the city agreed to repay, potentially with a positive return, the private investors. If the program did not achieve its performance measures, the city was not obligated to repay the investors. This report details the costs of supportive housing provided by the Denver SIB and the costs and cost offsets associated with the impact of supportive housing on outcomes across the housing and homelessness assistance, criminal justice, and health care systems.

Evidence Base

Multiple studies have measured the impact of supportive housing on housing stability and criminal justice system involvement and the potential cost savings or cost offsets that result from these changes. The quasi-experimental New York City FUSE II evaluation found a stark increase in housing stability and a decrease in jail stays for the target population. This resulted in a difference of \$15,680 in the amount of public funding spent on people in supportive housing and those in the comparison group receiving other services as usual, and a 67 percent offset of program costs associated with supportive housing (Aidala et al. 2014). A study tracking the public service use of New York City residents with several mental health diagnoses and experiencing homelessness found that residents in supportive housing had reduced service use across multiple systems and that supportive housing was associated with a \$12,146 net reduction in costs for health, corrections, and shelter use annually per person (Culhane, Metraux, and Hadley 2002). The study concluded that 95 percent of the costs of supportive housing were offset by reductions in other services attributable to the housing placement. Finally, a pre-post study conducted in Portland, Maine, found reductions in the cost of shelter nights, health care, jail, and police one year after participants entered supportive housing, compared with participants' use of these services in the year before entering supportive housing (Mondello et al. 2007). These cost reductions generated a cost offset of \$14,036, which combined with \$13,092 in program housing costs for a net cost savings of \$944 per person in the year after the program.

The literature suggests that supportive housing may have an impact on health care outcomes, decreasing costs by reducing the use of high-cost services, although the evidence is mixed. Several studies found that the use of emergency rooms, for both avoidable and unavoidable visits, decreased with the provision of supportive housing (Levanon Seligson et al. 2013; Martinez and Burt 2006; Mondello et al. 2007; Sadowski et al. 2009). However, Aidala and coauthors (2014) and Kessell and coauthors (2006) found no reductions in emergency department visits for individuals in supportive housing in their pre-post and retrospective cohort studies. Various matched comparison and pre-post

studies found reductions in psychiatric hospitalizations for individuals in supportive housing (Aidala et al. 2014; Culhane, Metraux, and Hadley 2002; King County 2013; Levanon Seligson et al. 2013; Mondello et al. 2007). Aidala and coauthors (2014) did not find an effect on detoxification facility days, nor did Larimer and coauthors' (2009) quasi-experimental study and Rosenheck and coauthors' (2003) random assignment study. However, Aidala and coauthors (2014) found a large decrease in residential alcohol and drug treatment days, with the intervention group avoiding residential treatment completely.

Researchers have also found significant reductions in the cost of care for participants in supportive housing (Aidala et al. 2014; Culhane, Metraux, and Hadley 2002; Flaming et al. 2013; Larimer et al. 2009; Martinez and Burt 2006). Culhane, Metraux, and Hadley (2002), for example, found an average 32 percent reduction in inpatient Medicaid claims, along with an increase in outpatient Medicaid claims. Cost savings were driven by a decrease in the use of the most expensive health care services, in particular reductions in hospital visits and inpatient psychiatric services.

In a review of supportive housing, the National Academies of Sciences, Engineering, and Medicine (2018) concluded there is "insufficient evidence" that the permanent supportive housing model is cost-effective, in part because very few studies of this topic have used a randomized controlled trial design or applied best practices in cost-effectiveness research. However, the report concluded that cost savings are feasible when permanent supportive housing interventions focus on individuals who are high users of emergency medical services.

Research Questions

To build the evidence base, the Denver SIB cost analysis leveraged a five-year randomized controlled trial evaluation (Cunningham et al. 2021) to calculate and compare the costs and outcomes associated with participants who received Denver SIB supportive housing and the costs and outcomes associated with participants who received usual care in the community. The evaluation focused on interactions with police, jail, courts, public safety services, homelessness assistance, housing, and health care. Cost analysis questions included the following:

- What were the annual per person costs of the supportive housing intervention?
- What were the unit costs of system utilization (e.g., police contact, arrest, booking, jail day) in criminal justice/public safety, homelessness, housing, and health care?
- What were the average costs incurred by program participants based on system utilization?

- What were the average costs incurred by the control group based on system utilization?
- How were costs distributed across systems and funding streams? Where were the cost savings or offsets, if any, for supportive housing participants compared with the control group?

Program Model and Implementation

The Denver SIB targeted people who were experiencing homelessness and had mental health and/or substance use challenges that resulted in frequent interactions with police and other public systems. To create a list of eligible people, project partners defined the target population as all people who had eight or more arrests with the Denver Police Department over three consecutive years. Three of the arrests must have been transient, meaning that the person had no address or gave a shelter address.

Among the pool of eligible people, the Urban Institute conducted a lottery to randomly assign people to the supportive housing program or to the control group, whose members did not participate in the program but continued to access services otherwise available in the community. The individuals assigned to the supportive housing program (Denver SIB participants) were referred to CCH or MHCD, which were responsible for locating them in the community and engaging them in the program.

Referrals to the supportive housing program were made on a rolling basis starting in January 2016, and the evaluation tracked participants through December 31, 2020. This report focuses on the 724 individuals who were either referred to the program (363 people) or randomized into the control group (361 people) before January 1, 2018, and uses data on the two-year observation period after their referral to understand annualized cost offsets associated with program participation and other cross-system outcomes. Of the 724 individuals randomized into the Denver SIB, most were men (85 percent), and the median age was 44 years. Forty-seven percent were white, 34 percent were Black, 13 percent were Latinx, and 6 percent were Native American.

The Denver SIB offered supportive housing using a Housing First approach, meaning that participants were subject to as few requirements and preconditions as possible before entering housing. The Denver SIB leveraged various housing assistance funds, including vouchers from the Colorado Division of Housing and other sources. Immediately after engaging with service providers, Denver SIB participants were often offered bridge housing while they worked on the documentation necessary for a permanent voucher and lease agreement. Bridge housing was provided in motels and in congregate or single-room occupancy housing in buildings owned and operated by a Denver SIB service provider. The SIB used a combination of permanent housing types: scattered-site units rented with a

housing subsidy in the private market and single-site buildings with designated supportive housing units.

Denver SIB services were similar to the assertive community treatment model of intensive clinical treatment, support, and case management. The core components of this model are smaller, shared caseloads; a multidisciplinary team approach; clinical services provided in the home; and an unlimited time frame. For this project, assertive community treatment teams included clinical social workers, case managers, peer specialists, psychiatrists, and nurses. Assertive community treatment services for the Denver SIB were funded in large part by the City and County of Denver through pay for success financing, as well as through Medicaid reimbursements. The two Denver SIB providers had different experiences using Medicaid for supportive services, but over the five years of project implementation, both increased organizational capacity to bill Medicaid for mental health, substance use, pharmaceutical, and other supportive services for participants receiving Denver SIB housing and services.

Data Collection and Methods

For the cost analysis, we estimated a dollar value for each outcome or service measured by the evaluation, such as a day in supportive housing, a day in shelter, a day in jail, an arrest, a court case, or an emergency department visit. Some costs, like housing assistance payments or Medicaid billings and payments, were captured at an individual level in administrative data. For other costs, we conducted a literature review to determine whether any rigorous cost studies had been done recently in the Denver area. If those estimates were not available, we collected data directly from local service providers or public agencies to estimate a cost. In the remainder of this section, we discuss our cost data-collection methods for each domain of our study. The tables describe the data source for each of the outcomes or services included in our cost analysis.

Costs Estimated Using Administrative Data

Housing assistance and Medicaid costs were determined through analysis of administrative data. Housing assistance costs were estimated using the monthly housing assistance payments made by the Colorado Division of Housing or the Denver Housing Authority to landlords or property managers on behalf of study participants during the evaluation period. If information on housing assistance payments was not available for a participant in Denver SIB housing, we imputed the average housing assistance

payment for SIB housing for documented days the participant was in housing, including days in bridge housing, as reported by the SIB service providers.

Health care costs were estimated using Medicaid claims and encounter data from Colorado Access, a managed-care organization for both behavioral and medical care, and Denver Health and Hospital Authority, another comprehensive medical managed-care program. We analyzed both the amounts billed and the amounts paid for office-based care, emergency department visits, inpatient care, ambulance trips, and other services.

Costs Estimated through Direct Data Collection

We used direct data collection with local service providers to estimate the costs of supportive housing services, emergency shelter, police contacts and arrests, court cases, short-term detoxification facility visits, and 911 and emergency medical services (EMS) responses. We estimated an average daily cost for supportive housing services provided via the Denver SIB through direct data collection with CCH and MHCD. We worked with these service providers to determine their Denver SIB program budgets during the evaluation period for staff salaries, benefits, supplies and office expenses, and other administrative and program expenses (appendix C lists the Denver SIB service providers' expenses and sources of revenue). These budgets were not based on program capacity at any point in time but actual, annual costs for the Denver SIB. We then divided these total costs by the total number of days Denver SIB participants spent in SIB housing to estimate an average daily cost.

For emergency shelter costs, we focused on the programs that Denver SIB participants were most likely to use based on our analysis of homeless management information systems data provided by the Metro Denver Homeless Initiative. We then worked with staff at these programs to estimate a daily cost. In some cases, homeless service programs had already created a recent cost estimate, which we used. In other cases, we worked with the program to calculate a cost based on their total annual program costs divided by their total number of annual shelter nights. We estimated separate costs for overnight and day shelters, including for before and during the COVID-19 pandemic, as costs significantly increased as a result of pandemic restrictions on shelter capacity.

To estimate the costs of police contacts and arrests, court cases, short-term detoxification facility visits, and 911 and EMS responses, we relied on internal analysis provided by the Denver Department of Public Safety and Denver County Court. Police costs for officers and vehicles were applied based on the type of response, including a response when no arrest was made, a response when an arrest was made and a citation was given, and a response when an arrest was made and a person was booked into

custody. Court costs included the average time spent by key court actors such as judges, law clerks, defense attorneys, and prosecutors and were applied based on the highest charge per booking and the average share of those bookings that did not go to trial, went to a trial that lasted two days, or went to a trial that lasted a week and a half. The cost of detoxification and EMS responses included the costs of 911 operations, staff salaries, and transport.

Costs Estimated from Previous Literature

We relied on previous studies to estimate the average costs of a night in jail and a night in prison. The costs of a night in jail were based on a Denver Sheriff Department analysis of the Denver County Jail and the Van Cise-Simonet Detention Center (Kincheloe 2019). This analysis considered costs for people who had serious mental health issues and/or were on suicide alert and costs for people in a general population unit or a special management unit. We identified which of these cost categories Denver SIB participants were in using administrative data from the Denver Sheriff Department. Jail costs also account for average litigation costs incurred by the City and County of Denver on behalf of the Denver Sheriff Department. The estimated cost of a night in prison came from Colorado's responses to the Vera Institute of Justice's Price of Prisons survey (Mai and Subramanian 2017).

Supportive Housing Estimates

We estimated the average daily cost of Denver SIB supportive housing based on the average housing assistance and the average supportive housing services provided to those in the supportive housing treatment group. The average cost of housing assistance provided to someone in the Denver SIB supportive housing treatment group was \$30 per day, or \$10,950 for a full year (table 1). The average cost of supportive housing services is reported separately for CCH and MHCD because of the significant difference in these costs. Using annual budgets as described above, we estimated the cost per day for CCH SIB supportive services to be \$31, or \$11,315 for a full year. We estimated the cost per day for MHCD SIB supportive services to be \$68, or \$24,820 for a full year. The annual per unit cost was \$22,265 for housing and supportive services provided by CCH and \$35,770 for housing and supportive services provided by MHCD.

TABLE 1

Denver SIB Housing and Services Annual per Unit Costs

Service	Estimated cost of services per day	Estimated cost of housing per day	Total estimated cost per day	Estimated cost of services per year	Estimated cost of housing per year	Total estimated cost per year
Supportive housing, CCH	\$31	\$30	\$61	\$11,315	\$10,950	\$22,265
Supportive housing, MHCD	\$68	\$30	\$98	\$24,820	\$10,950	\$35,770

Sources: The cost of services is estimated from Colorado Coalition for the Homeless (CCH) and Mental Health Center of Denver (MHCD) program budgets and data on program entries and exits. The cost of housing is estimated from housing assistance payment data from the Denver Housing Authority and the Colorado Division of Housing.

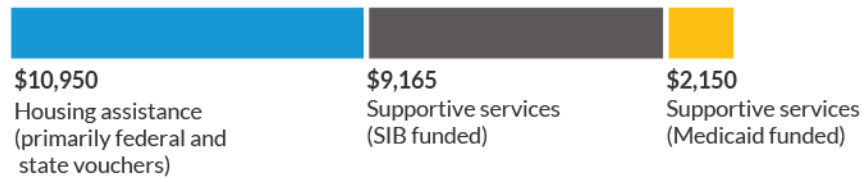
Note: Per day unit costs were multiplied by 365 to estimate the annual unit costs of services and housing.

Supportive housing is an intensive intervention that carries significant costs. For the Denver SIB initiative, the costs were spread across several sources and levels of government. Housing assistance payments were provided primarily through housing vouchers allocated by the federal government and the Colorado Division of Housing at the state level. The initiative also leveraged federal low-income housing tax credits to build two supportive housing buildings, but this analysis does not specifically factor in the cost of developing those buildings, as discussed later, in the section on the analysis’s limitations. Supportive housing services, including some bridge housing while participants worked toward permanent housing, were provided in part by the SIB financing mechanism. These funds were supplied up front by the Denver SIB’s private investors but were eventually repaid by the City and County of Denver in accordance with the SIB contract. In addition, MHCD used other revenue sources for the cost of supportive services, including grants and interest income. And both CCH and MHCD leveraged federal Medicaid dollars for a share of Denver SIB supportive services. The share of supportive services that was paid for by Medicaid revenue during the Denver SIB implementation varied greatly by provider. CCH, a federally qualified health care center, reported Medicaid revenue that represented an average of 19 percent of the cost of supportive housing services over the first four years of Denver SIB implementation. MHCD, a mental health center, reported Medicaid revenue that represented an average of 63 percent of the cost of supportive housing services over the first four years of Denver SIB implementation. Together, these resources funded the Denver SIB supportive housing provided by CCH and MHCD (figure 1). Although the per unit cost of a full year of the program varied between the providers, the cost to each system other than Medicaid was similar.

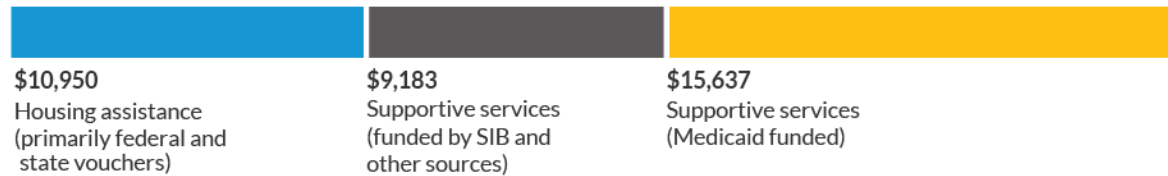
FIGURE 1

Denver SIB Supportive Housing Annual per Unit Cost, by Provider and Funding Source

Colorado Coalition for the Homeless \$22,265



Mental Health Center of Denver \$35,770



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Sources: The cost of services is estimated from Colorado Coalition for the Homeless and Mental Health Center of Denver program budgets and data on program entries and exits. The cost of housing is estimated from housing assistance payment data from the Denver Housing Authority and the Colorado Division of Housing.

Notes: The Medicaid-funded supportive services costs are based on reported Medicaid revenue from Colorado Coalition for the Homeless (19 percent of service costs) and Mental Health Center of Denver (63 percent of service costs). Mental Health Center of Denver used both SIB funding and other revenue sources to pay for the services not funded by Medicaid.

Other Estimates

SHELTER AND HOUSING ASSISTANCE

We estimated the average cost of a night in emergency shelter to be \$32.54 before the COVID-19 pandemic and \$59.32 once the pandemic started (table 2). The costs during the pandemic include those of both emergency shelters that continued operating at reduced capacity and temporary shelters opened at the National Western Complex and the Denver Coliseum. The average cost for the use of a day shelter increased from \$7.50 before the pandemic to \$20.00 during the pandemic. These shelter visits were often short and transactional—clients might get a bus token, take a shower, or use a computer. But they could also involve more intensive services for employment, benefits, or housing. In addition to shelter costs, some people in the control group, who were receiving usual care, accessed housing assistance such as vouchers and rapid re-housing. Based on administrative data, the average cost of this housing assistance, provided outside the Denver SIB program, was \$24.40 a day.

TABLE 2

Shelter and Housing Assistance Unit Costs

Service	Unit of service	Estimated cost (\$)
Overnight emergency shelter: pre-pandemic	Per day in shelter through March 14, 2020	32.54
Overnight emergency shelter: pandemic	Per day in shelter after March 14, 2020	59.32
Day shelter: pre-pandemic	Per visit through March 14, 2020	7.50
Day shelter: pandemic	Per visit after March 14, 2020	20.00
Housing assistance (non-SIB)	Per day	24.40

Sources: The costs of emergency shelter and day shelter were estimated using data collected from Denver-area emergency shelter and day shelter providers most frequently reported for SIB participants in homeless management information systems data. The cost of housing provided outside the Denver SIB program was estimated using housing assistance payment data from the Denver Housing Authority and the Colorado Division of Housing.

Note: Overnight emergency shelter includes transitional housing.

CRIMINAL JUSTICE, PUBLIC SAFETY, AND DETOXIFICATION

Criminal justice and public safety costs vary considerably based on both the severity of the offense and the needs of the person involved. The average cost of a police response with either no arrest or a citation (noncustodial arrest) was \$64.32, while the cost of a police response with a custodial arrest, in which someone is brought into police custody, was \$178.92 (table 3). Most arrests for the Denver SIB population did not result in trials, but they still incurred court costs, for staff time for preparation and hearings, that averaged \$636.12 per booking. For the 3 percent of misdemeanor and general sessions cases that went to trial, the average court costs were \$7,831.18. For the 11 percent of felony cases that went to trial, the average court case cost more than \$24,000. Jail costs, which include medical services provided in jail, averaged \$160 per night. If people received special attention because they were on serious mental health or suicide alert, the average daily cost increased to \$200 per night. And the cost per jail night for people staying in a special management unit (with or without being on a serious mental health or suicide alert) was almost \$268. Other criminal justice and public safety costs include prison, at \$108 per day; 911, at \$35.29 per response; EMS, at \$68.72 per response; and detoxification, at \$47.49 per response.

TABLE 3

Criminal Justice, Public Safety, and Detoxification Unit Costs

Service	Unit of service	Estimated cost (\$)
Police contact: no arrest or noncustodial arrest	Per incidence	64.32
Custodial arrest	Per incidence	178.92
Court cost: no trial	Per booking	636.12
Court cost: misdemeanor or general sessions trial	Per booking	7,831.18
Court cost: felony trial	Per booking	24,557.41
Jail day (general)	Per day	160.51
Jail day (special management unit)	Per day	267.96
Jail day: serious mental health or suicide alert	Per day	200.98
Prison	Per day	108.00
911	Per response	35.29
Emergency medical services	Per response	68.72
Detoxification	Per response	47.49

Sources: Jail costs are from the Denver Sheriff Department. Court costs are estimated using data from the Denver County Court. Police, arrest, detoxification, emergency medical services, and 911 costs are from the Denver Department of Public Safety. The cost of prison is from the Vera Institute of Justice.

HEALTH CARE USE

We did not estimate an overall unit cost for each type of service billed to and paid for by Medicaid for Denver SIB participants. Instead, we used claims data to analyze actual costs billed and paid for each individual in the treatment and control groups and the impact of supportive housing on those claims.

We analyzed claims data for the following types of services:

- office-based care, including for substance use disorder diagnoses, psychiatric diagnoses, and other diagnoses
- emergency department visits, including preventable emergency department visits (defined as those that occur because of asthma, substance use, or dental issues)
- inpatient stays, including those for substance use disorder diagnoses, psychiatric diagnoses, and other diagnoses
- ambulance, including any ambulance transport
- other care, including laboratory, x-ray, and other miscellaneous claims

Limitations

Each data source used for the cost analysis has important limitations to note. We focused primarily on daily operating costs and did not factor in capital costs required for the physical buildings used by each of these systems. Additionally, we did not seek to estimate individual quality-of-life measures or other

societal benefits from externalities such as reduced victimization. Many limitations listed here affect our understanding of costs connected to outcomes experienced in other systems and by the control group. Given these limitations, our analysis provides a conservative estimate of the cost offsets compared with the cost of the intervention, and true offsets are likely to be greater than our estimates.

- **Denver SIB supportive housing:** Although we tried to collect cost data in the same categories for both SIB supportive housing providers, providers may not account for or report revenue and expenses in the same way. Differences in accounting and reporting may lead to some of the differences we see in the providers' costs. Additionally, we do not account for the costs of developing buildings used for the supportive housing initiative. Two buildings were constructed and used almost entirely for Denver SIB participants, while parts of other buildings, both new and existing, were used to house SIB participants.
- **Shelter and housing assistance:** The coverage and completeness of shelter data improved during SIB implementation, and we are likely missing some shelter days from earlier periods. Exit dates for shelter stays were imputed if they were missing (5 percent of emergency shelter stays and 21 percent of day shelter stays). Denver Housing Authority data only included housing assistance payments for people in housing as of January 2021, so our analysis may be missing payments for control group participants who received assistance from Denver Housing Authority but left housing before January 2021. SIB participants, particularly those in the control group, may have stayed in other types of housing, such as with family or friends, and those housing stays would not be captured in either the outcomes or the cost data.
- **Criminal justice and public safety:** Jail and prison costs represent time periods from before the COVID-19 pandemic, and we know actual costs during the pandemic were likely higher given the public health restrictions on capacity in these settings. Court costs are conservative because they are focused on staff time and do not include other costs such as those for facilities, administration, and security. Data on Denver Fire Department responses were only available for one year and therefore are not included in these estimates. Finally, we know some people in the evaluation spent time in jails outside Denver, and those costs are not included.
- **Health care use:** We have Medicaid claims from the two primary managed-care plans in Denver, but we know some Denver SIB participants had other plans and claims we are missing. For the pharmacy claims we collected, we could not access payment data for prescription medication, a notable limitation of our cost estimates for health care use. Finally, there is a major difference between costs billed to and costs paid by Medicaid. We do not have information on reasons for denials and which systems bore the cost of denied claims.

Costs and Cost Offsets

We applied the unit costs described in the previous section to the outcomes experienced by people in the Denver SIB supportive housing treatment group and by people in the control group receiving services as usual in the community (for a full analysis of project outcomes, see Cunningham et al. [2021]). Outcomes for each group were regression-adjusted and estimated using both an intent-to-treat approach and a treatment-on-the-treated approach that defined treatment as being housed in Denver SIB supportive housing. We controlled for race/ethnicity, age at randomization, gender, the number of jail days in the three years before randomization, the number of jail stays in the three years before randomization, the number of arrests in the three years before randomization, and the number of custodial arrests in the three years before randomization (see appendix A for details on estimation methods and baseline equivalence one year before randomization). For Medicaid outcomes, we also controlled for the pre-randomization value of the outcome. The cost differences estimated by the intent-to-treat analysis include the outcomes and associated costs for all participants referred to the supportive housing treatment group whether they entered housing or not (although the Denver SIB achieved a high take-up rate for supportive housing, 79 percent—see Cunningham et al. [2021] for more analysis of program engagement). The cost differences estimated by the treatment-on-the-treated analysis include the outcomes and associated costs for treatment participants who were housed, resulting in larger cost differences than those estimated using the intent-to-treat approach (both estimates are provided in the tables below).

Because the impact of supportive housing on these outcomes was determined using a rigorous randomized controlled trial evaluation, the differences in outcomes and the associated costs can be directly attributed to the Denver SIB supportive housing intervention and not to any differences in participants or changes that may have been happening in the community simultaneously. In this section, we present average per person annualized costs based on a two-year period of observation after randomization. For many outcomes, we have three years of data and see that the cost differences hold at approximately the same size each year.

Shelter and Housing Assistance

Compared with people who received services as usual in the community, those referred to supportive housing had significantly lower annualized per person costs associated with emergency shelter provided through the local homeless services system and far higher per person costs associated with permanent housing assistance, primarily provided through housing vouchers funded at the state and

federal levels (table 4). This difference represents a shift away from local emergency shelter costs to permanent housing assistance provided primarily at the state and federal levels.

TABLE 4

Annualized per Person Shelter and Housing Assistance Cost Differences

Dollars

Service	Intent-to-Treat Regression Adjusted			Treatment-on-the-Treated IV Regression Adjusted		
	Treatment	Control	Difference	Treatment	Control	Difference
Shelter	1,121	1,446	-325*	1,025	1,445	-420*
Housing assistance	6,368	678	5,690***	8,068	686	7,382***

Sources: Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Demographic and arrest data, used as controls in the regression, are from the Denver Police Department. Jail stay data, used as controls in the regression, are from the Denver Sheriff Department.

Notes: Shelter includes transitional housing. Housing assistance includes Denver SIB housing subsidies for the treatment group and other permanent housing, rapid re-housing, and permanent supportive housing subsidies received by the treatment and control groups. Sample for the treatment group is 363 people. Sample for the control group is 361 people. IV = instrumental variables.

*/**/*** Significant at the 0.10/0.05/0.01 level.

Criminal Justice, Public Safety, and Detoxification

The largest difference in monetary costs within the criminal justice, public safety, and detoxification systems was associated with the reduction in jail days for those offered Denver SIB supportive housing (table 5). Annualized per person jail costs fell by \$2,386 (a reduction of 23 percent), compared with the costs of serving people as usual in the community. The next largest monetary difference was a reduction in costs associated with court cases of \$520 (29 percent), followed by a \$221 reduction in costs associated with police contacts (35 percent), a \$112 reduction in costs associated with custodial arrests (30 percent), a \$66 reduction in costs associated with short-term detoxification visits (63 percent), and a \$64 reduction in costs associated with noncustodial arrests, which typically lead to a ticket or citation (50 percent). Costs also decreased for prison days and EMS responses (and related 911 operations), although the differences were not statistically significant. Except for prison days, all these outcomes represent costs borne by the City and County of Denver and therefore were costs avoided by the City and County of Denver for those offered SIB supportive housing.

TABLE 5

Annualized per Person Criminal Justice, Public Safety, and Detoxification Cost Differences

Dollars

Service	Intent-to-Treat Regression Adjusted			Treatment-on-the-Treated IV Regression Adjusted		
	Treatment	Control	Difference	Treatment	Control	Difference
Jail	8,052	10,438	-2,386***	7,338	10,435	-3,098***
Courts	1,247	1,767	-520***	1,091	1,767	-675***
Police contacts	411	632	-221***	344	632	-288***
Arrests: custodial	259	370	-112***	225	370	-146***
Arrests: noncustodial	65	129	-64***	46	129	-82***
Short-term detox (plus 911 operations)	39	105	-66***	19	105	-86***
Prison	1,404	1,673	-269	1,323	1,673	-350
EMS (plus 911 operations)	188	227	-39	177	227	-50

Sources: Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Demographic and arrest data, used as controls in the regression, are from the Denver Police Department. Jail stay data, used as controls in the regression, are from the Denver Sheriff Department.

Notes: Sample for the treatment group is 363 people. Sample for the control group is 361 people. IV = instrumental variables. */**/** Significant at the 0.10/0.05/0.01 level.

Health Care

For health care costs, we looked at Medicaid billings and payments. In each category of health care use that we analyzed, we observed higher per person Medicaid billings than payments (table 6), which is expected for this population. Various reasons may lead to a denial of payment or a reduced payment from Medicaid, although other agencies or systems are likely bearing the cost of those claims. As expected based on the theory of change for supportive housing, Medicaid payments went up significantly for office-based care and down for emergency department visits and ambulance rides for those offered supportive housing, compared with people who received services as usual in the community. A large share of the treatment group's office-based care, as well as the care captured in the "other" category in table 6, was related to clinical assertive community treatment services provided to Denver SIB participants by CCH and MHCD. We also see an increase in Medicaid billings and payments for inpatient stays for those offered supportive housing, although this increase does not correspond with a significant increase in the number of inpatient stays (Hanson and Gillespie 2021) and thus reflects a change in billing and payment but not a significant change in actual use. Overall, we see a decrease in per person health care billings to Medicaid for those offered supportive housing. In the

analysis of cost offsets in the next section, we use health care billings to Medicaid because we think they represent use better than Medicaid payments, which may be denied or reduced for various reasons.

TABLE 6
Annualized per Person Health Care Use Cost Differences
Dollars

Service	Intent-to-Treat Regression Adjusted			Treatment-on-the-Treated IV Regression Adjusted		
	Treatment	Control	Difference	Treatment	Control	Difference
Medicaid billings						
Office-based care	3,273	2,404	869**	3,533	2,405	1,128**
ED visits	2,248	2,782	-533	2,091	2,779	-688
Inpatient stays	5,161	3,055	2,106*	5,792	3,057	2,735*
Ambulance	3,634	5,296	-1,662**	3,140	5,292	-2,152**
Other care	17,654	21,692	-4,037	16,450	21,685	-5,235
Medicaid payments						
Office-based care	1,404	798	605***	1,585	799	785***
ED visits	296	411	-116*	261	411	-150*
Inpatient stays	763	473	290*	849	473	376*
Ambulance	318	433	-115**	284	433	-149**
Other care	1,377	1,946	-569*	1,206	1,946	-740*

Sources: Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority. Demographic and arrest data, used as controls in the regression, are from the Denver Police Department. Jail stay data, used as controls in the regression, are from the Denver Sheriff Department.

Notes: Supportive services associated with assertive community treatment team services provided by Colorado Coalition for the Homeless and Mental Health Center of Denver to Denver SIB participants are primarily captured in the “office-based care” and “other care” categories of Medicaid claims. Sample for the treatment group is 363 people. Sample for the control group is 361 people. ED = emergency department. IV = instrumental variables.

*/**/*** Significant at the 0.10/0.05/0.01 level.

A Better Investment in Outcomes

As discussed earlier, we analyzed the daily cost of providing housing assistance and supportive services to participants in the Denver SIB. Multiplying those daily costs by 365 days yielded the estimated cost of providing a unit of Denver SIB supportive housing for a full year. These costs can be helpful for program budgeting. However, participants might not have been in housing for a full year for many reasons, including the time it took to initially locate and engage participants and if they exited housing long enough to lose their voucher or died. (Housing exits are analyzed in detail in the Denver SIB evaluation report, Cunningham et al. [2021]). Through our evaluation, we measured the actual number of days participants spent in housing after referral to the program to estimate the actual costs for the average participant (which we call per person costs in the section below), and we compared those costs with participants’ cost reductions in the use of other emergency services.

When considering the comparisons that we detail in this section between the average cost of the Denver SIB and the average cost of avoided outcomes, it is important to note that the Denver SIB costs are not the costs of providing a unit of supportive housing for a full year. Instead, they are an estimate of the actual costs for an average Denver SIB participant based on the average numbers of days spent in Denver SIB housing per year. Per person costs are lower than the cost of providing a unit of supportive housing for a full year. We use per person costs of the Denver SIB, instead of per unit costs, for this analysis because we compare them with estimated per person costs avoided in other systems based on actual outcomes observed for the treatment and control groups. Just as the cost of supportive housing would go up if participants spent more days in the program in a year, the costs avoided would go down if the Denver SIB program served fewer participants overall, so using per person costs for each side of the comparison is important.

On average, participants referred to CCH spent 198 days in housing per year, and participants referred to MHCD spent 158 days in housing per year (table 7). Churning by participants is expected when vulnerable people are being served and is important to take into account when planning, though churning is not often well documented in evaluations. The Denver SIB's churn meant the service providers could engage and house new participants in the open housing slots created in the process. Over the Denver SIB's five years of implementation, the providers housed 365 individuals in the 257 SIB-funded supportive housing slots, or 1.4 participants per slot.

As we described earlier, the average cost of housing assistance is the same for participants whether they were referred to CCH or MHCD because the providers used similar vouchers for the majority of participants in Denver SIB housing. However, the average cost of supportive services is different for each provider, as is the average annual number of days that participants spent in the supportive housing program. Because of these differences, table 7 presents the average annual per person cost of Denver SIB supportive housing for CCH and MHCD separately.

TABLE 7
Average Annual per Person Cost of Denver SIB Housing and Services

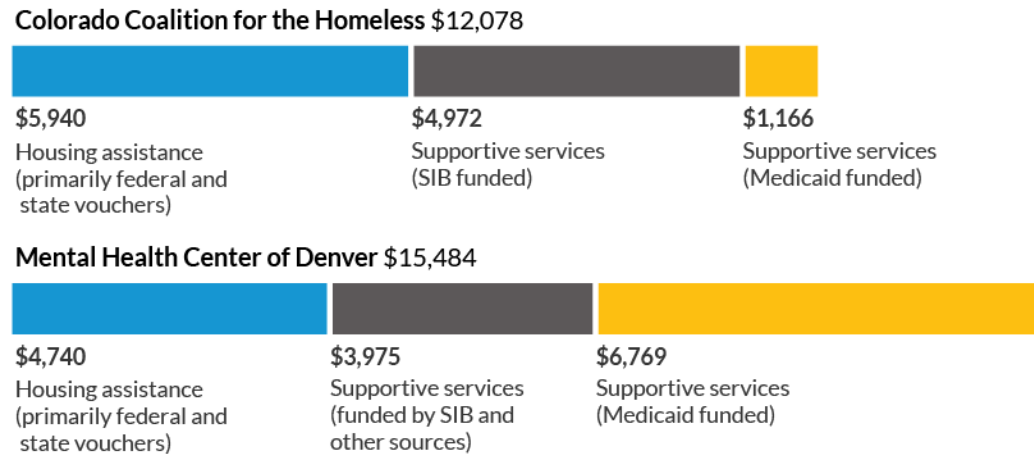
	Cost per day of services	Cost per day of housing	Average annual number of days in program	Average annual per person cost
CCH participants	\$31	\$30	198	\$12,078
MHCD participants	\$68	\$30	158	\$15,484

Sources: The cost of services is estimated from Colorado Coalition for the Homeless (CCH) and Mental Health Center of Denver (MHCD) program budgets and data on program entries and exits. The cost of housing is estimated from housing assistance payment data from the Denver Housing Authority and the Colorado Division of Housing.

Note: The average annual number of days in the program is based on CCH and MHCD program data on housing exits and entries.

As before, we can look at the average annual per person cost in terms of the share paid by each funding source leveraged for the Denver SIB initiative, including housing vouchers, SIB and other funding for supportive services, and Medicaid funding for supportive services. Figure 2 shows how these funding sources differed by provider.

FIGURE 2
Denver SIB Supportive Housing Annual per Person Cost, by Provider and Funding Source



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Sources: The cost of services is estimated from Colorado Coalition for the Homeless and Mental Health Center of Denver program budgets and data on program entries and exits. The cost of housing is estimated from housing assistance payment data from the Denver Housing Authority and the Colorado Division of Housing.

Notes: The Medicaid-funded supportive service costs are based on reported Medicaid revenue from Colorado Coalition for the Homeless (19 percent of service costs) and Mental Health Center of Denver (63 percent of service costs). Mental Health Center of Denver used both SIB funding and other revenue sources to pay for the services not funded by Medicaid.

For the comparisons of Denver SIB supportive housing costs with the costs that were avoided in other systems, we used the cost differences between the treatment and control groups that were estimated by the intent-to-treat analysis, which includes all participants referred to supportive housing whether they entered housing or not.

About Half the Annual per Person Cost of the Denver SIB Was Offset by Cost Reductions in Emergency Public Services

Table 8 presents the cost of outcomes experienced by participants in the treatment and control groups as detailed above. Together, these represent the costs observed by the evaluation across multiple systems, payers, and levels of government. Overall, the annualized per person costs were \$6,876 lower for the treatment group than for the control group. Figure 3 illustrates the size of the cost avoidances across outcomes, with some of the largest avoidances in reduced jail, ambulance, and emergency department costs.

TABLE 8
Annualized per Person Cost Avoidance, by Category
Dollars

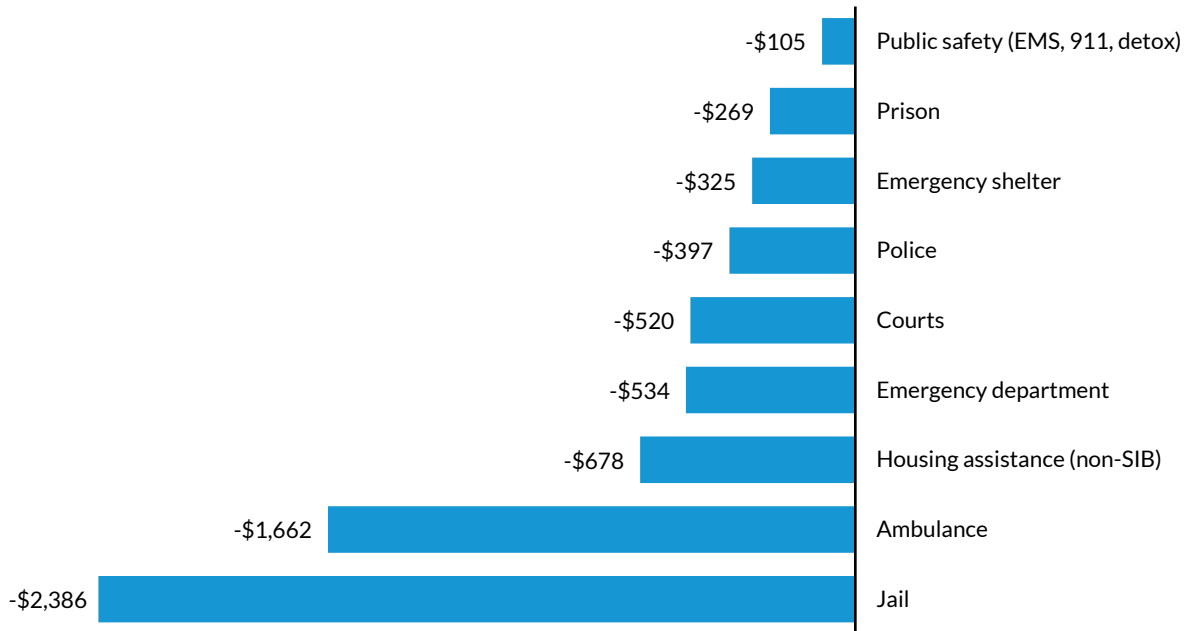
Outcomes	Treatment group	Control group	Cost avoidance
Shelter and housing assistance	1,121	2,124	-1,003
Emergency shelter	1,121	1,446	-325
Housing assistance (non-SIB)	0	678	-678
Criminal justice, public safety, and detox	11,665	15,342	-3,677
Jail	8,052	10,438	-2,386
Courts	1,247	1,767	-520
Police	735	1,132	-397
Public safety (EMS, 911, detox)	227	332	-105
Prison	1,404	1,673	-269
Emergency health care use	5,882	8,078	-2,196
Emergency department	2,248	2,782	-534
Ambulance	3,634	5,296	-1,662
Total	18,668	25,544	-6,876

Sources: Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority.

Notes: Data are intent-to-treat regression-adjusted estimates. Emergency health care use includes Medicaid claims billed for emergency department visits and ambulance rides.

FIGURE 3

Annualized per Person Cost Avoidance, by Category and Dollar Amount



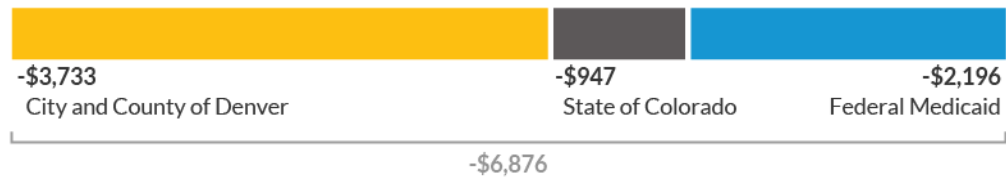
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Sources: Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority.

Cost avoidance can also be considered by the source of the funding for the various services. Figure 4 shows that most avoided costs accrued to the City and County of Denver, which pays the shelter, jail, court, police, and public safety costs. The second-largest amount of avoided costs was in emergency health care billed to Medicaid at the federal level. The state of Colorado had the smallest cost avoidance based on some housing assistance provided outside the Denver SIB program and prison days.

FIGURE 4

Annualized per Person Cost Avoidance, by Payer



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Sources: Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority.

Notes: Cost avoidances for emergency shelter, jail, courts, police, and public safety are attributed to the City and County of Denver. Cost avoidances for non-SIB housing assistance and prison are attributed to the state of Colorado. Cost avoidances for emergency health care are attributed to Medicaid.

We compared the total annualized per person cost avoidance estimate (\$6,876) with the average annual per person costs for Denver SIB supportive housing provided by CCH (\$12,078) and MHCD (\$15,484). These costs for the Denver SIB also represent multiple funding sources and levels of government. Overall, 57 percent and 44 percent of the cost of providing supportive housing to Denver SIB participants referred to CCH and MHCD, respectively, were offset by the costs avoided across observed outcomes (table 9). This range of cost offsets aligns with what other cost studies of supportive housing have found (Aidala et al. 2014; Culhane, Metraux, and Hadley 2002; Mondello et al. 2007). Although the avoided outcomes did not fully offset the cost of the supportive housing intervention across all systems, they represent approximately half of the total per person annual cost of the Denver SIB. Another large benefit of the Denver SIB, of course, was the positive impact it had on the well-being of participants, presumably linked to the avoidance of negative outcomes, which we did not monetize for this analysis.

TABLE 9

Annual per Person Cost Offset, by Provider

	Colorado Coalition for the Homeless	Mental Health Center of Denver
Annualized average per person cost offset	\$6,876	\$6,876
Annual average per person Denver SIB supportive housing cost	\$12,078	\$15,484
Share of per person intervention cost offset by avoided outcomes	57%	44%

Sources: The cost of services is estimated from Colorado Coalition for the Homeless and Mental Health Center of Denver program budgets and data on program entries and exits. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority.

A Large Share of Denver’s SIB Services Costs Were Offset by Reductions in Costs for Local Emergency Services

The City and County of Denver spearheaded the Denver SIB and leveraged other resources for the initiative. Denver agreed to pay for supportive services, housing resources were marshaled primarily through vouchers at the federal and state levels, and providers agreed to annual targets for federal Medicaid revenue. (MHCD also used other revenue sources for the cost of supportive services, including grants and interest income.) On the cost avoidance side, most of the outcomes observed by the evaluation were associated with costs to the City and County of Denver, with the exception of prison days and emergency health care use. To understand the cost offsets of supportive housing specifically for Denver, table 10 compares the cost of supportive housing services (including some bridge housing) primarily paid by the City and County through the SIB funding mechanism with the avoided costs in systems funded by the City and County.

The avoided costs for the City and County of Denver total \$3,733 per person on an annual basis. Broken down by provider, the annual cost of supportive services primarily paid for by the City and County of Denver is \$4,972 for each participant referred to CCH and \$3,975 for each participant referred to MHCD (although MHCD also leveraged other revenue sources for these services). Overall, approximately 75 percent and 94 percent of the City and County’s cost of providing supportive services to Denver SIB participants referred to CCH and MHCD, respectively, were offset by costs that the City and County avoided for local outcomes. In other words, a large share of the City and County’s investment in Denver SIB services was offset by the costs we estimated it avoided in negative outcomes for SIB participants (figure 5).

TABLE 10

Annual per Person Cost Offset for City and County of Denver, by Provider

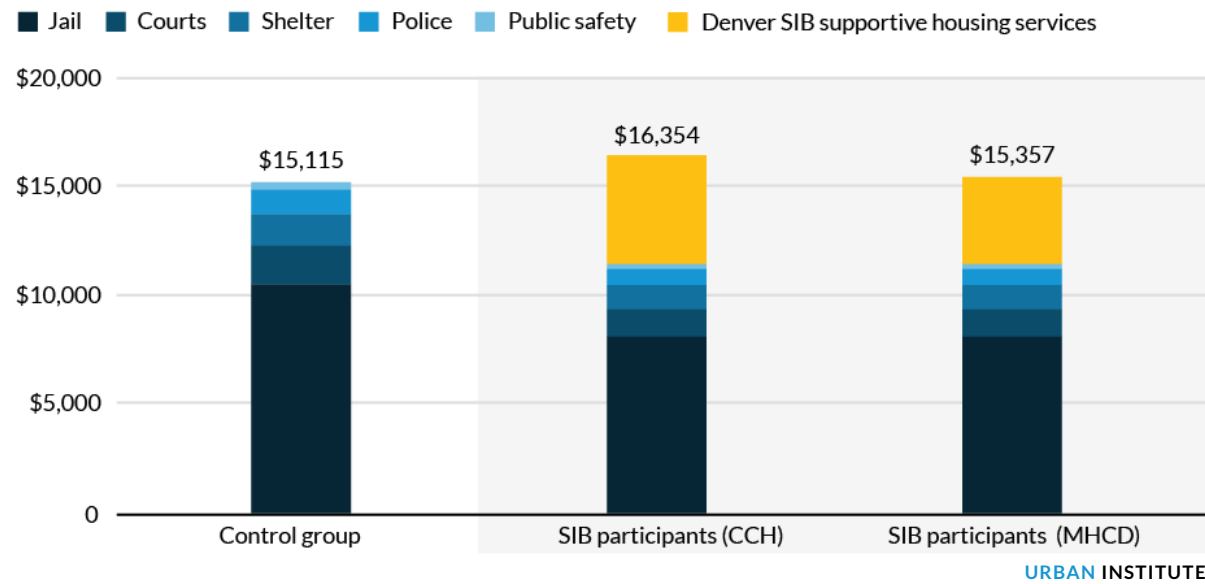
	Colorado Coalition for the Homeless	Mental Health Center of Denver
Annualized average per person local cost avoidance	\$3,733	\$3,733
Annual average per person Denver SIB services cost	\$4,972	\$3,975
Share of per person services cost offset by local avoided outcomes	75%	94%

Sources: The cost of services is estimated from Colorado Coalition for the Homeless and Mental Health Center of Denver program budgets and data on program entries and exits. Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety.

Notes: Cost avoidances for emergency shelter, jail, courts, police, and public safety are attributed to the City and County of Denver. The cost of Denver SIB services is the share of services (not including permanent housing) not funded by Medicaid based on authors' analysis. The Mental Health Center of Denver used both SIB funding and other revenue sources for these services.

FIGURE 5

Average Annual per Person Costs for the City and County of Denver



Sources: The cost of services is estimated from Colorado Coalition for the Homeless (CCH) and Mental Health Center of Denver (MHCD) program budgets and data on program entries and exits. Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from the Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety.

Notes: Cost avoidances for emergency shelter, jail, courts, police, and public safety are attributed to the City and County of Denver. The cost of Denver SIB services is the share of services (not including permanent housing) not funded by Medicaid based on authors' analysis. MHCD used both SIB funding and other revenue sources for these services.

The Return on Investment Reflects the Success of the Program and the Goal of Pay for Success Financing

The analysis above focuses on annual per person costs. We can also look at the total investment made by Denver through the SIB financing mechanism over the five years of the initiative and compare that with the cost offsets estimated to accrue to Denver's local budgets for the full Denver SIB population over five years. The Denver SIB initiative began with an \$8.6 million investment from a pool of eight private investors, along with housing resources through state- and federal-funded vouchers and federal tax credits and Medicaid reimbursement for supportive services. The private investment primarily funded supportive services and a small amount of flexible housing subsidies for some participants. To calculate the total five-year cost offsets for Denver, we multiplied the average annualized per person cost offset attributed to local budgets (\$3,733) by the 363 people who were referred to supportive housing and included in our analysis and then multiplied by the five years the program was implemented. This total cost offset for Denver of approximately \$6.8 million is almost 80 percent of the up-front investor capital.

However, through the SIB contract, Denver agreed to make success payments based on outcomes achieved, with different outcomes associated with payments of different sizes. These payment outcomes are detailed in Gillespie and coauthors (2021). Including both the housing stability payments and the jail day reduction payment, Denver paid a total of \$9.64 million in success payments (table 11). These payments represent the full initial investment plus an additional \$1 million based on the project's outcomes. The project was so successful that it passed the contract threshold in which one investor agreed to share a portion of the success payments with providers.

The payments also reflected the goal of pay for success financing. This innovative financial arrangement is meant to transfer the risk of scaling up a social program from local government to private investors. Had the Denver SIB not achieved the agreed-upon outcomes, Denver would not have been responsible for paying the investors. Because the program did achieve such positive outcomes, the investors made a small return. The goal was for Denver to have rigorous evidence of the outcomes that can be achieved with supportive housing, as well as evidence that the cost offsets locally are equivalent to or more than the cost of the investment. Going forward, Denver could directly fund such services through an outcomes-based contract rather than a social impact bond financing mechanism that provides a return to investors. In fact, Denver has already begun this type of direct funding through an ongoing expansion of the Denver SIB program.

TABLE 11

Return on Investment for the Denver SIB Supportive Housing Initiative

Measure	Amount
Investor capital	\$8,600,000.00
Total success payments	\$9,638,911.36
Housing stability payments	\$4,534,911.36
Jail day reduction payment	\$5,104,000.00
Net return (total success payments minus investor capital)	\$1,038,911.36
Return on investment	12%

Source: Investor payment calculations are from Sarah Gillespie, Devlin Hanson, Alyse D. Oneto, Patrick Spauster, Mary Cunningham, and Michael Pergamit, “Denver Supportive Housing Social Impact Bond Initiative: Final Outcome Payments” (Washington, DC: Urban Institute, 2021).

More Resources across Multiple Levels of Government Are Needed to Scale Up Supportive Housing

Based on the analysis above, supportive housing is a smart investment. Not only does it better serve residents by helping them avoid negative outcomes, the cost is largely offset by reductions in costs associated with those avoided outcomes. To realize the maximum cost benefit, supportive housing should be scaled up to meet the full need of people experiencing chronic homelessness. According to the 2020 point-in-time count, 1,209 people were experiencing chronic homelessness in Denver County.² To offer supportive housing to this entire population for one year would cost between \$14.6 and \$18.7 million following the Denver SIB model used by CCH and MHCD (table 12). Denver SIB participants were selected based on frequent interactions with the criminal justice system, but other people experiencing chronic homelessness in Denver may use some systems more and others less. If we assume that, overall, this population would have similar cost offsets to those in our analysis, we could expect this investment to lead to the avoidance of outcomes that would be associated with \$8.3 million in costs across all public budgets.

TABLE 12

Estimated Annual Costs and Offsets for the Denver SIB Supportive Housing Initiative at Scale

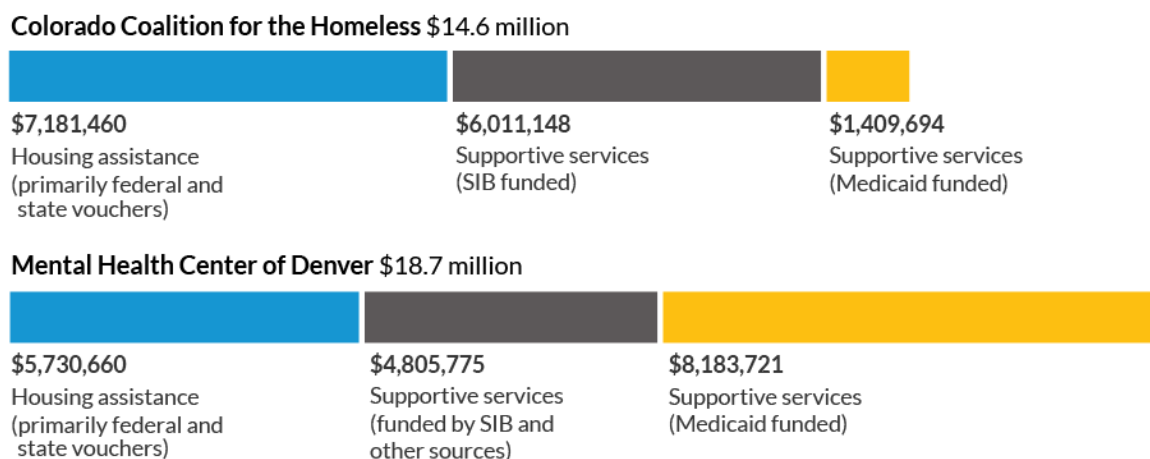
Costs at scale	Colorado Coalition for the Homeless	Mental Health Center of Denver
Annual cost of supportive housing	\$14,602,302	\$18,720,156
Annualized average cost offset	\$8,313,084	\$8,313,084

Source: Authors’ calculations based on Denver SIB costs and cost offsets by provider.

Notes: According to the 2020 point-in-time count, 1,209 people were experiencing chronic homelessness in Denver County. This table estimates the annual costs and annualized cost offsets of providing supportive housing to 1,209 people.

Scaling up supportive housing would require blending an increase of resources at all levels of government. Denver would need to marshal \$5 to \$7 million in new housing assistance per year dedicated to supportive housing for this population. This targeted level of housing assistance is not currently prioritized for this population. Denver would also need to directly fund supportive services. The level of funding necessary would differ based on what share of services could be paid for with federal Medicaid revenue. If Medicaid revenue reimbursed 19 percent of the cost of services (as CCH demonstrated), Denver would need to contribute \$6.0 million annually. If Medicaid reimbursed 63 percent of service costs (as MHCD demonstrated), Denver would need to contribute \$4.8 million per year (figure 6).

FIGURE 6
Estimated Annual Denver SIB Costs at Scale, by Provider and Funding Source



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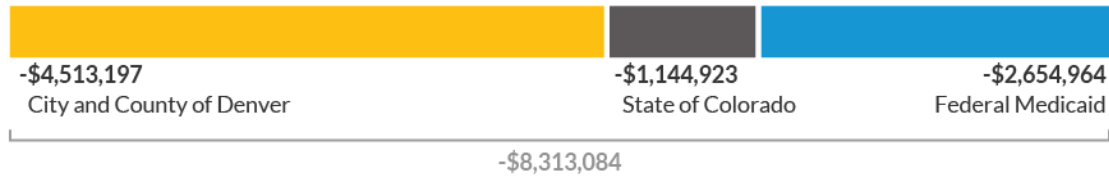
Sources: Authors' calculations based on Denver SIB costs by provider. Housing assistance data are from the Denver Housing Authority and Colorado Division of Housing. The cost of services is estimated from Colorado Coalition for the Homeless and Mental Health Center of Denver program budgets and data on program entries and exits.

Notes: According to the 2020 point-in-time count, 1,209 people were experiencing chronic homelessness in Denver County. This figure estimates the per year costs of providing supportive housing to 1,209 people. The Medicaid-funded supportive service costs are based on reported Medicaid revenue from Colorado Coalition for the Homeless (19 percent of service costs) and Mental Health Center of Denver (63 percent of service costs). Mental Health Center of Denver used both SIB funding and other revenue sources to pay for the services not funded by Medicaid.

As the costs of scaling up supportive housing would be spread across multiple levels of government, so would the cost offsets. At scale, the largest cost offsets would accrue to budgets funded by the City and County of Denver (figure 7). As mentioned earlier, this breakdown may look different if other people experiencing homelessness have different cost offsets across systems than Denver SIB participants.

FIGURE 7

Offsets at Scale, by Funding Source



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Sources: Authors' calculations based on total cost offsets. Shelter data are from the Metro Denver Homeless Initiative, and costs are estimated from selected programs. Housing assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing. Jail use and cost data are from the Denver Sheriff Department. Court costs are estimated using booking data from Denver Sheriff Department and data from the Denver County Court. Police and arrest data are from the Denver Police Department, and costs are estimated by the Denver Department of Public Safety. Detoxification, emergency medical services, and 911 use and cost data are from the Denver Department of Public Safety. Prison data are from the Colorado Department of Corrections, and costs are estimated using data from the Vera Institute of Justice. Medicaid claims data are from Colorado Access and Denver Health and Hospital Authority.

Notes: According to the 2020 point-in-time count, 1,209 people were experiencing chronic homelessness in Denver County. This figure estimates the per year cost offsets of providing supportive housing to 1,209 people. Cost avoidances for emergency shelter, jail, courts, police, and public safety are attributed to the City and County of Denver. Cost avoidances for non-SIB housing assistance and prison are attributed to the state of Colorado. Cost avoidances for emergency health care use are attributed to Medicaid.

Conclusion

The Denver SIB was a remarkable success, serving a highly vulnerable population of people and demonstrating impact on almost every outcome of interest to the City and County of Denver, and beyond. Associated with those outcomes were shifts in costs that aligned with the theory of change for supportive housing, including decreases in costs to the criminal justice system and emergency services and increases in costs for permanent housing and community-based, preventive services. Not only did the Denver SIB achieve better outcomes for people, it proved to be a better use of taxpayer dollars than the status quo of the homelessness-jail cycle. The costs borne by various public funders were substantially offset by reductions in costs associated with the negative outcomes avoided by participants in the supportive housing program. Based on the evidence from the Denver SIB, scaling up supportive housing would require an increase in funding at multiple levels of government, but it would maximize the return on investment of public dollars and help end the homelessness-jail cycle.

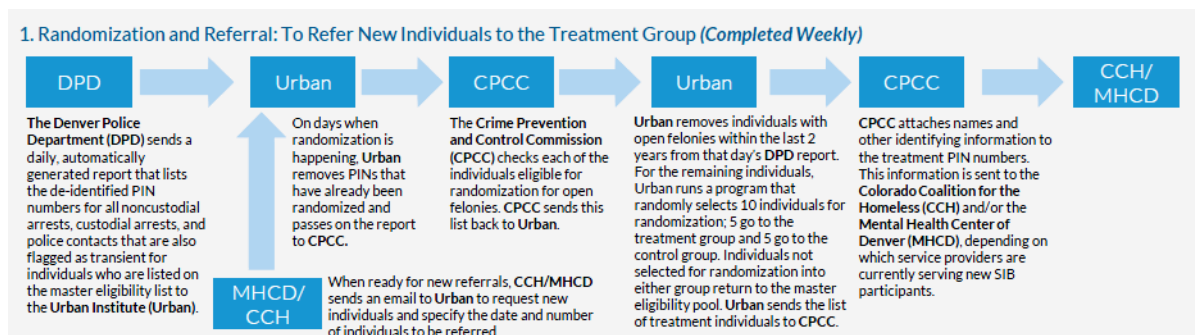
Appendix A. Randomized Controlled Trial Design

In this appendix, we describe the randomized controlled trial design, data, measures, and estimation methods used to evaluate the outcomes and impact of the Denver SIB supportive housing program.

The evaluation used a randomized controlled trial design. It randomly assigned eligible individuals to either a treatment group, whose members were referred for supportive housing, or a control group, whose members received services as usual in the community. Eligible individuals were defined as those who had eight or more arrests over three years, including at least three arrests in which they were marked as transient, meaning they had no permanent address at the time of the police contact. The Denver Police Department (DPD) identified eligible individuals through a data pull and created a de-duplicated, de-identified, electronically maintained eligibility list for the initiative, assigning a unique ID to each individual on the list. DPD matched the eligibility list with daily arrest and contact lists. For individuals on the Denver SIB master eligibility list, DPD generated a daily report that listed de-identified PIN numbers for all people with noncustodial arrests, custodial arrests, and police contacts and flagged whether they were marked as transient (figure A.1). On days the Denver SIB partners randomized new individuals into the evaluation, Urban removed from the report the PINs that had already been randomized and passed on the report to the referral coordinator within the city. The referral coordinator researched each PIN number eligible for randomization that day and documented the date and charges of any open felonies within the previous two years. She sent this documentation to Urban, and Urban removed PIN numbers with open felonies within the previous two years from that day's eligibility list. For the remaining PIN numbers, Urban ran a program that randomly selected PIN numbers based on the number of individuals the Denver SIB partners chose to randomize into the evaluation that day. Half of those new PIN numbers were randomized to the treatment group and half to the control group, stratified by the type of intake (custodial arrest, noncustodial arrest, or police contact). PIN numbers not selected for randomization into either group were returned to the master eligibility pool and were eligible for subsequent randomization. Urban sent the list of new treatment PIN numbers to the referral coordinator. She reattached names and other identifying information to the treatment PIN numbers and sent this information to the service providers for outreach.

FIGURE A.1

Denver SIB Randomization and Referral Process Map



Source: Mary Cunningham, Mike Pergamit, Sarah Gillespie, Devlin Hanson, and Shiva Kooragayala, *Denver Supportive Housing Social Impact Bond Initiative: Evaluation and Research Design* (Washington, DC: Urban Institute, 2016).

If both CCH and MHCD had supportive housing slots available, Urban randomly assigned the treatment individuals to the providers. The two service providers sometimes transferred individuals based on existing client relationships. Outreach workers attempted to locate each referred individual within 24 hours to minimize location challenges. Service providers spent a minimum of three months attempting to begin the process of getting a referred individual into supportive housing before requesting a new referral.

In this report, we present both intent-to-treat (ITT) and treatment-on-the-treated (TOT) estimates for cost differences. The intent-to-treat (ITT) estimate is defined as the difference between the average outcomes of those referred to the treatment group and those in the control group, adjusting for covariates measured before randomization.

All eligible people randomized into the treatment group were counted in the treatment population, regardless of whether they engaged with the service provider, passed the housing screen, or obtained housing. All eligible people randomized into the control group were counted in the control population even if they enrolled with the service provider or obtained housing.

Specifically, the ITT estimate, π_T , was measured using the following regression equation:

$$Y_i = \alpha + \beta^T T_i + \sum_{n=1}^N \beta^n X_i^n + \varepsilon_i$$

In the equation, Y_i is the outcome of interest (e.g., the number of jail days) for each individual, i , who was randomly assigned. T_i is an indicator equal to 1 for individuals assigned to the treatment group and to 0 for individuals assigned to the control group. β^T is the parameter of the ITT effect on the outcome (Y_i). X^n is a vector of pre-randomization covariates, and β^n is the vector of coefficients on the covariate,

X^n . ϵ is the regression error term. The inclusion of the pre-randomization covariates was intended to improve the precision of the estimates. We chose to control for pre-randomization variables that showed differences between the two groups at $p = 0.05$ using the DPD and Denver Sheriff Department as data sources. The covariates we control for in the model are

- race/ethnicity,
- age at randomization,
- gender,
- number of jail days in the three years before randomization,
- number of jail stays in the three years before randomization,
- number of arrests in the three years before randomization, and
- number of custodial arrests in the three years before randomization.

We ran the regressions with several different specifications to test the robustness of our results, including controlling for the pre-randomization values of the outcomes and shelter days. Although we used ordinary least squares regressions, including linear probability models, for the regressions in this report, we also ran probit models for any binary outcomes. None of the other specifications made any substantial differences to our estimates of the effect of treatment on the outcomes.

The treatment-on-the-treated estimate presents the impact of the Denver SIB on individuals who became housed compared with individuals who did not become housed, regardless of which group they were assigned to. The TOT estimate was calculated using an instrumental variables (IV) estimate (Angrist, Imbens, and Rubin 1996). The IV estimate is per person served, among those who complied with their referral assignment; this accounts for the fact that some people referred to the Denver SIB supportive housing program may not have enrolled and that some people in the control group may have ended up receiving services from the program (this did not occur during our observation period, however). Study participants are one of three types: (1) those who enrolled in the Denver SIB supportive housing program regardless of whether they were referred to it; (2) those who did not enroll in the supportive housing program even if they were referred to it; and (3) those who complied with the referral assignment they were given (to enroll in the housing program or to remain in the control group). The IV estimate represents the effect of enrollment in the housing program on outcomes among this third group, the compliers. In the special circumstance where decisions to comply or not are independent of the study outcomes, the IV estimate also represents the average treatment effect.

The IV estimate scaled up the ITT estimate by the difference between the treatment group's and the control group's fractions enrolled in the Denver SIB supportive housing program. Conceptually, we estimated the effect of referring an individual to the housing program on enrollment in the program in exactly the same way we calculated the ITT above, except that the dependent variable in the model was enrollment:

$$P_i = \alpha + \delta^T T_i + \sum_{n=1}^N \delta^n X_i^n + \varepsilon_i$$

In this equation, P_i is 1 if the individual, i , enrolled in the program, regardless of whether they were in the treatment group or the control group. Enrollment is defined as the participant's having an initial housing lease-up (enrollment) date in Denver SIB housing. T_i is an indicator equal to 1 for individuals assigned to the treatment group and 0 for individuals assigned to the control group. δ^T is the parameter of the effect of being randomly assigned into treatment on actual enrollment (P_i). X^n is a vector of pre-randomization covariates, and δ^n is the vector of coefficients on the covariates, X^n . ε is the regression error term. The IV estimate is the ratio of the two estimates:

$$\text{TOT estimate} = \frac{\beta^T}{\delta^T}$$

The two equations were estimated simultaneously using a two-stage least squares estimation procedure. In the first stage, the dependent variable (enrolling in the program) was regressed on the exogenous covariates plus the instrument (randomization into treatment). In the second stage, fitted values from the first-stage regression were plugged directly into the structural equation in place of the endogenous regressor (enrolling in the program). We included the same covariates used in the ITT regression.

TABLE A.1

Demographic, Homelessness, and Criminal Justice Characteristics 1 Year before Randomization

	Full sample	Treatment	Control	Difference
Demographic characteristics				
Age at randomization (mean)	44.20	44.12	44.27	-0.15
Men	85%	87%	83%	0.04
<i>Race/ethnicity* +</i>				
Black	34%	32%	35%	-0.03
White	47%	45%	49%	-0.04
Asian	0%	0%	0%	-0.00
Native American	6%	8%	4%	0.04***
Latinx	13%	15%	11%	0.03
Criminal justice system involvement				
<i>Arrests</i>				
Number of arrests (mean)	4.43	4.19	4.67	-0.48*
Number of custodial arrests (mean)	2.32	2.23	2.41	-0.18
Number of crimes against people (mean)	0.21	0.24	0.18	0.05
Number of crimes against society (mean)	0.66	0.60	0.73	-0.13
Number of crimes against property (mean)	0.26	0.23	0.30	-0.07
Number of other crimes (mean)	3.29	3.13	3.46	-0.33
<i>Jail</i>				
Number of jail stays (mean)	2.58	2.46	2.70	-0.25
Number of jail days (mean)	68.26	67.00	69.53	-2.53
<i>Prison</i>				
Share with any prison stays	5%	6%	5%	0.00
Number of prison days (mean)	9.24	10.01	8.45	1.56
Housing/homelessness assistance				
Share with any homelessness services	44%	45%	43%	0.02
Number of homelessness services days (mean)	115.93	121.61	110.22	11.39
Number of homelessness services (mean)	140.53	144.80	136.23	8.57
Share with any shelter stays	68%	67%	70%	-0.03
Number of days with any shelter stay (mean)	158.14	148.36	167.99	-19.63*
Number of shelter stays (mean)	191.08	174.76	207.49	-32.73**
Share with any housing assistance	7%	7%	6%	0.01
Number of housing assistance days (mean)	17.27	13.98	20.58	-6.60

Sources: Demographic and arrest data are from the Denver Police Department. Jail stay data are from the Denver Sheriff Department. Housing and homelessness assistance data are from the Metro Denver Homeless Initiative, Denver Housing Authority, and Colorado Division of Housing.

Notes: Sample for the study population is 724 people: 363 in the treatment group and 361 in the control group.

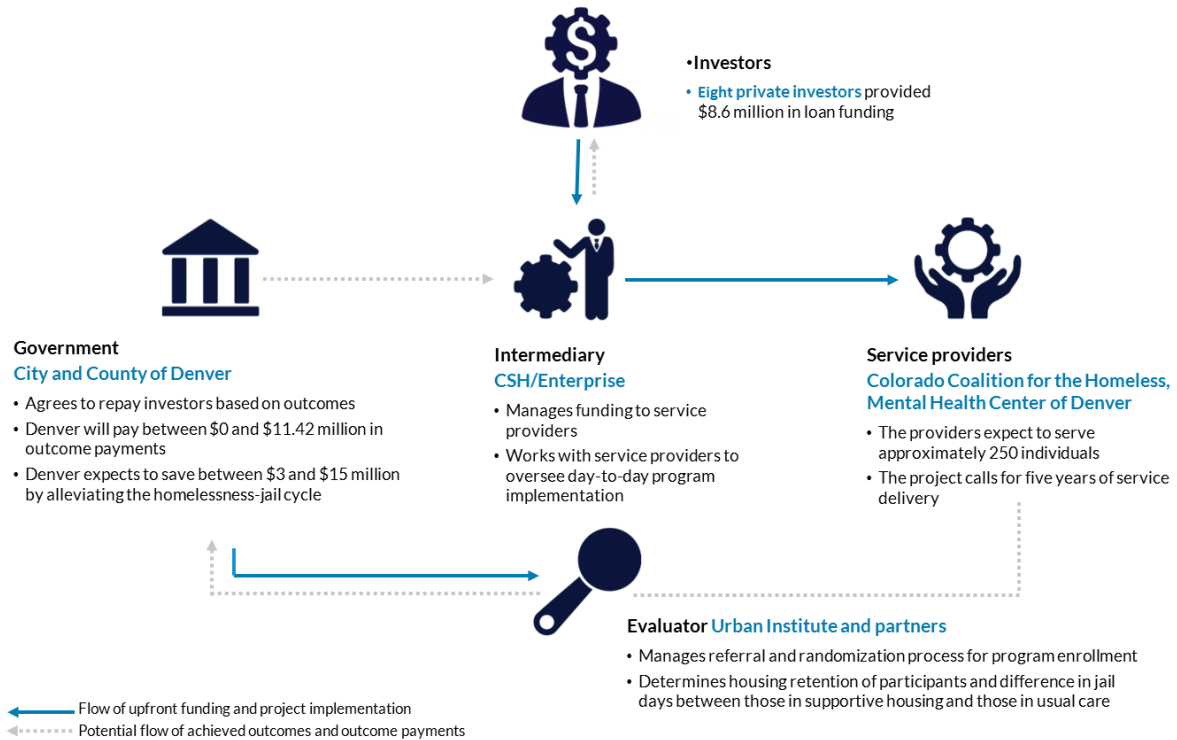
+ Significance is based on a chi-squared test.

/ Significant at the 0.10/0.05/0.01 level.

Appendix B. Denver SIB Framework

FIGURE B.1

Denver Supportive Housing Social Impact Bond Initiative Framework



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Source: Adapted from US Government Accountability Office (GAO), “Pay for Success: A Look at a New Way for Government to Finance Prevention Programs Based on Measured Results” (Washington, DC: GAO, n.d.) and the Urban Institute Pay for Success Initiative.

Note: The Denver SIB lenders are Arnold Ventures, the Ben and Lucy Ana Walton Fund of the Walton Family Foundation, the Colorado Health Foundation, the Denver Foundation, Living Cities Blended Catalyst Fund LLC, Nonprofit Finance Fund, the Northern Trust Corporation, and the Piton Foundation.

Appendix C. Denver SIB Service Providers' Revenues and Expenses

Revenue

- Interest income
- Federal, state, and local grants
- Medicaid and Medicare revenue
- Program income
- Property management and rental income
- Miscellaneous revenue
- Foundation and contribution revenue
- Social impact bond revenue
- Gain/loss on sale/investment
- Housing development fees

Expenses

- Salaries
- Benefits
- Other personnel and contracts
- Rental assistance
- Medical and pharmaceutical supplies
- Facility repair and maintenance
- Bank and interest expense
- Depreciation and amortization
- Equipment rental and maintenance

- Food
- Miscellaneous expenses
- Office supplies and office expenses
- Professional fees
- Program expenses
- Administrative expenses allocation
- Special events and fundraising
- Staff development, meetings, and travel
- Supplies and equipment
- Information technology

Notes

- ¹ Mayor's office, City and County of Denver, "Mayor Hancock Announces Plans to Connect Hundreds of Homeless to Supportive Housing," June 25, 2014, <https://denverfireonline.com/mayor-hancock-announces-plans-to-connect-hundreds-of-homeless-to-supportive-housing/>.
- ² Metro Denver Homeless Initiative, "2020 Point in Time Data," accessed June 28, 2021, https://www.mdhi.org/2020_pit_reports.

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