CHCS Center for Health Care Strategies, Inc.

Cross-Sector Service Use and Costs among Medicaid Expansion Enrollees in Minnesota's Hennepin County

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FOREWORD

Low-income, non-elderly adults are often served by an array of public sector services. Yet, little is known about patterns of use across multiple public sectors. This cross-sector study was conducted by the Hennepin County Center of Innovation and Excellence through support from the *Complex Care Innovation Lab*, a national effort made possible by Kaiser Permanente Community Benefit and led by the Center for Health Care Strategies. The analysis integrates data on health care, human services, criminal justice, and housing among Medicaid expansion enrollees in Hennepin County, Minnesota, a large urban county including Minneapolis. Among the findings:

- Health care services (\$344 million) accounted for more than half of the \$600 million spent annually in the public sector for Medicaid expansion enrollees.
- Medicaid is a major source of health insurance coverage for individuals who use other publicly funded services and 93 percent of individuals had contact with at least one of the four analyzed sectors.
- Substance use disorder and mental illness diagnoses were much more common than the national average.
 Enrollees with these diagnoses made up 21 percent of Medicaid expansion enrollees, but incurred 53 percent of all public costs among the expansion population.

This analysis suggests numerous policy opportunities to improve care for this subset of individuals. The unique cross-sector lens that this analysis provides offers an important opportunity to better understand how a subset of high-need Medicaid beneficiaries experience and receive care, and what can be done to improve outcomes and reduce costs at a county and state-wide level.

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mproved cross-sector collaboration requires a deeper understanding of total public sector involvement and associated costs. In this study, the Hennepin County Center of Innovation and Excellence integrated data on health care, human services, criminal justice, and housing encounters between March 2011 and December 2014 among Hennepin County Medicaid expansion enrollees (i.e., low-income, non-elderly, childless adults). Findings describe involvement patterns and related costs, as well as policy recommendations to enhance cross-sector collaboration.

Background

Social determinants, such as unstable housing, justice involvement, and poverty often interact in significant ways to influence health and health care. For example, following implementation of the Affordable Care Act (ACA), many incarcerated individuals are eligible for Medicaid upon release from jail or prison, but they may lack housing and other resources necessary to achieve optimal health. Similarly, individuals who are homeless may have high emergency department (ED) use due to the challenges of managing their physical and behavioral health needs on the streets or in emergency shelters. In this way, unmet physical, behavioral and social needs may drive involvement and costs across the public system, creating unmanaged feedback loops among historically separate sectors (Exhibit 1).

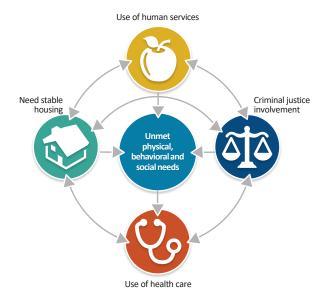
Communities that integrate services to support the physical, behavioral, and social needs of complex populations may reduce unnecessary use and cost across all public sectors. Such systems require cross-sector, integrated data to evaluate multi-service use and coordinate interventions. In the United States, however, multiple layers of administrative, jurisdictional, and technical barriers often hinder linkage of

data across public sectors. In recent years, recognition of the benefits of integration have increased, but system-level change remains slow.

In Hennepin County, Minnesota, state and local government have made substantial progress in integrating services and data across health care, social services, and criminal justice sectors. Hennepin County runs a managed care organization and oversees a health system. Beginning in 2006, Hennepin County combined multiple public health and human service functions (e.g., health care programs, food and cash support, case management and public health) to create a single Human Services and Public Health Department (HSPHD).

More recently, Hennepin County HSPHD has worked with criminal justice agencies to support court diversions and transitions from the criminal justice system to the community. Hennepin County also created Hennepin Health, a nationally recognized, publicly managed accountable care organization that integrates housing and social services into its health care model to support low-income adults who often have multiple physical, behavioral, and social needs.

Exhibit 1. Interaction of Use of Health Care and Other Public Sectors



Service integration has demonstrated the need for data sharing and technology has made it feasible to link large datasets. For this report, we linked multiple administrative datasets to examine utilization and direct public costs across health care, housing, criminal justice, and human service sectors among the Hennepin County Medicaid expansion population. This study is descriptive — it is not intended to comment on the merit of programs or their outcomes. Our goal is simply to describe total involvement in multiple public sectors among this newly insured group. Findings are intended to inform future design of cross-sector interventions in Hennepin County and highlight "high impact" opportunities that may exist for such collaboration. Hennepin's experiences can also inform cross-sector opportunities in similar communities across the nation.

Data and Methods

Study Cohort

The study cohort includes Hennepin County Medicaid enrollees with at least one month of expansion enrollment between March 2011 and December 2014. To qualify for Medicaid under the ACA expansion, individuals had to be age 21 to 64 years with no dependent children and have income of no more than 75 percent of the federal poverty level. This income limit was raised to 138 percent beginning January 1, 2014 when the federal Medicaid expansion took effect. [†] By definition, enrollees were not recognized as disabled at the time of enrollment according to state or federal criteria. However, it was

Medicaid Expansion in Minnesota

In March 2011, Minnesota expanded Medicaid to non-disabled adults without dependent children via optional state provisions within the Affordable Care Act (ACA). During this early period, Medicaid expansion eligibility in Minnesota was limited to 75 percent of poverty.

[†] The Affordable Care Act raised the threshold to 133 percent, but the new method of calculating income eligibility includes a five percent set aside, meaning that individuals up to 138 percent of the poverty line will qualify.

possible that enrollees in this cohort were later designated as disabled after their initial expansion enrollment or had a disability that had not been formally assessed.

Data and Methods

The dataset was developed through comprehensive integration of administrative data from four public sectors: (1) health care; (2) human services; (3) criminal justice; and (4) housing. Statewide data was used wherever possible to account for frequent movement across county boundaries (Exhibit 2).[‡]

Exhibit 2: Public Sector Services Analyzed in Hennepin County§

Health Care	Human Services	Criminal Justice	Housing
 Medical assistance (Medicaid) MinnesotaCare Other public programs* 	Food supportCash supportCase management	 Court Adult detention centers and jails Supervision (probation) Adult corrections facilities State prison 	 Emergency shelter Group residential housing Permanent supportive housing

^{*}Includes Refugee Medical Assistance, Institutes for Mental Disease, Qualified Medicare Beneficiary and Specified Low-Income Medicare Beneficiary.

All available data across multiple sectors during the 46-month study period were included. While the study cohort was selected based on Medicaid expansion eligibility, the comprehensive nature of the data sources allowed public sector involvement to be included regardless of whether a resident was enrolled in Medicaid at the time.

Common identifiers were used to match data whenever possible. When common identifiers were unavailable, software** was used to match on other available identifiers such as name and date of birth. The matching strategy was conservative, seeking to minimize the possibility of false positive matches. ** All cost estimates are standardized to 2014 dollars. For a summary of data collection and cost estimation procedures, **see Appendix**.

Acknowledgements

Thank you to the following individuals for providing additional research support: Tamra Boyce, Hennepin County Center of Innovation and Excellence; Rob Kreiger, Applied Data Strategies; and Azra Thakur and Melissa Adkins, Minneapolis Medical Research Foundation.

A special thank you to Ross Owen, Hennepin County Health Administration, for sponsoring this research project.

[‡] The Twin Cities metro area is divided into seven central counties (Hennepin, Ramsey, Anoka, Dakota, Washington, Carver and Scott). Minneapolis and St. Paul are the main population centers and are divided into Hennepin and Ramsey counties, respectively, by the Mississippi River.

⁵ See the Glossary on page 14 for definitions to terms used throughout this brief that may be unfamiliar to readers and/or specific to Minnesota.

^{**} RegistryPlus LinkPlus probabilistic matching software, https://www.cdc.gov/cancer/npcr/tools/registryplus/lp.htm.

^{††} Datasets were too large to adjudicate partial matches individually. Probabilistic thresholds were set where matches were subjectively observed to be consistently accurate. It is likely that valid matches were discarded in the course of maximizing sensitivity.

Results

Profile of Medicaid Expansion Enrollees

Medicaid expansion enrollees accounted for approximately 13 percent of non-elderly adults in Hennepin County (ages 21 to 64). Expansion enrollees were disproportionately men, English-speaking, single, Black/African-American, American Indian and young (**Exhibit 3**; full details **Appendix**, **Exhibit A**). Rates of behavioral health diagnoses were substantially higher among expansion enrollees than non-elderly adults in the general U.S. population.

Exhibit 3. Demographics of Hennepin Expansion Enrollees Compared to County and National Populations (Age 21-64)

	Hennepin Expansion	Hennepin County *	U.S.**
	n=98,282	n=777,524	n=200,985,313
Gender			
Male	61%	50%	49%
Female	39%	50%	51%
Race/ethnicity			
White	42%	78%	64%
Black or African-American	36%	8%	12%
Asian or Pacific Islander	5%	7%	6%
American Indian	3%	<1%	1%
Hispanic	3%	5%	16%
Multiracial****	2%	2%	1%
Unknown	9%	<1%	<1%
Behavioral health			****
Mental illness (MI) diagnosis	41%	Not available	18%
Substance use disorder (SUD) diagnosis	27%	Not available	10%
Both MI and SUD diagnoses	21%	Not available	3%

^{*}Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2011-2015.

Hennepin Medicaid expansion enrollees were relatively young. The median age (37) was five years younger than the county and national non-elderly adult populations (42 and 42 years, respectively). The highest concentration of enrollees (32 percent) were under 30 years old at the end of the study period.

Health Care Involvement

Minnesota's early expansion of Medicaid in March 2011 dramatically increased publicly funded health care access for low-income single adults without dependent children in Hennepin County. Before the expansion, an average of 17 percent of the 98,282 enrollees in our study had access to a Minnesota health care program at any given time (**Appendix, Exhibit B**).

In the first phase of the Medicaid expansion from March 2011 to December 2013, overall enrollment in Minnesota health care programs increased dramatically. In January 2014, when the income limit increased to 138 percent of poverty, there was a second influx of enrollees.

Hennepin County Medicaid expansion enrollees frequently used health care services. Medicaid expansion enrollees were admitted to the hospital and visited the ED at a rate nearly three times higher than non-elderly adults in the general U.S. population (Exhibit 4).

^{**}Source: American Community National Health Interview Survey (NHIS) 2011-2014.

^{***}Client identified more than one race/ethnicity on eligibility application (non-Hispanic).

^{****}SAMSHA 2014 National Survey on Drug Use and Health survey data 2014. Represents adults ages 18+ and indicates occurrence in the past year.

Exhibit 4. Rates of Inpatient and Emergency Department Use for Hennepin Expansion Enrollees and U.S. Population

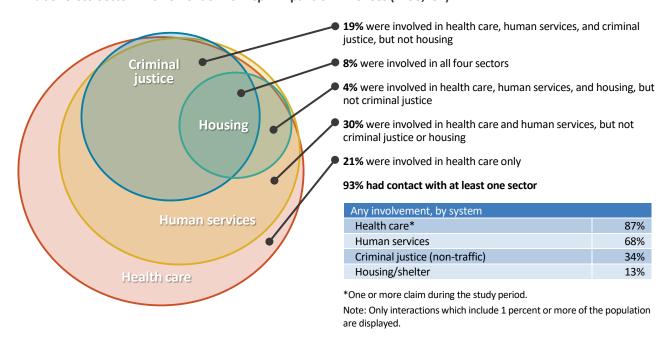
		Hennepin Medicaid Expansion	U.S.* (Ages 21-64)
Percent of enrollees	Any hospital admission	23%	8%
	Any ED visit	49%	18%
Rate of utilization per	Inpatient hospital admissions	23.7	9.9
	Inpatient hospital days	226.5	40.0
	Emergency department visits	112.0	31.1

^{*}National Health Information Survey (NHIS) 2011-2014. For NHIS data, rates were calculated from the weighted average of yearly service utilization rates for the survey population from 2011 to 2014. Those averaged rates were then divided by 12 for a monthly average, then multiplied by 1,000 enrollment months.

Human Services, Housing, and Criminal Justice Involvement

Many Medicaid expansion enrollees had encounters with multiple parts of the public sector. During the 46-month study period, 93 percent of the cohort had contact with at least one of the four sectors. Eighty-seven percent had at least one health care claim, 68 percent were involved in human services (most often food support), 34 percent had criminal justice involvement, ^{‡‡} and 13 percent spent at least one night in emergency shelter or supportive housing (**Exhibit 5**). Eight percent of enrollees had contact with all four sectors. Nearly all enrollees with criminal justice or housing involvement had encounters with health care and human services. Further, a majority of enrollees with housing involvement had contact with criminal justice as well.

Exhibit 5. Cross-Sector Involvement of Hennepin Expansion Enrollees (n=98,282)



The Medicaid expansion was an important source of health insurance for Hennepin County clients across sectors. While Medicaid expansion enrollees made up just 13 percent of county residents, they made up a large share of emergency shelter (43 percent), adult detention center (ADC) (jail) (29 percent), and adult corrections facility (ACF) (48 percent) clients in

^{‡‡} Includes all detention, consequences and convictions except traffic and petty misdemeanor convictions.

Hennepin County (**Appendix, Exhibit C**). Medicaid expansion enrollees were disproportionate users of county resources, accounting for at least half of all bed days in emergency shelter (58 percent), the ADC (50 percent) and the ACF (57 percent).

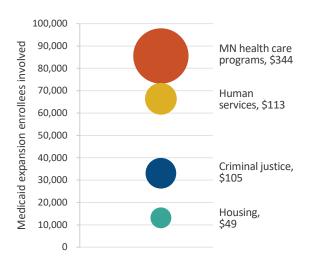
Total Public Costs

Hennepin County Medicaid expansion enrollees incurred more than \$600 million per year in total public costs. Over half of these costs were for Minnesota health care programs (\$344 million), followed by human services (\$113 million), criminal justice (\$105 million), and housing (\$49 million) (**Exhibit 6**).

Per capita spending varied considerably between sectors. While total criminal justice costs were roughly equal to human services costs, they were incurred by half as many people. Further, while housing expenditures were relatively low, they were highly concentrated among a small segment of Medicaid expansion enrollees.

Several factors contributed to the accumulation of total costs within each sector. First, costs were affected by the unit-cost of each service within a sector. For example, within criminal justice, one night in an average ADC or jail in Minnesota cost approximately \$135, while one day in an average ACF in Minnesota cost \$101. Second, total costs were influenced by the number of people who used services within a sector. **Exhibits 7.1 and 7.2** illustrate the relationship between unit costs and service enrollment. The size of each circle represents the total cost over the study period, color coded by sector. The position of each circle on the x-axis demonstrates the daily or per diem cost for each encounter. The position of each circle on the y-axis demonstrates how many total enrollees had at least one encounter or used the service.

Exhibit 6. Total Annualized Cost (2014, in millions) for Expansion Enrollees*



The exhibits illustrate three overarching patterns:

- *Note: Size of circle is relative to total expenditures in each sector
- 1. **Low-cost, frequently used services:** In the upper left corner are a series of low-cost encounters or services used by many expansion enrollees including food support and health care services such as prescriptions, primary care, and outpatient medical visits (**Exhibit 7.1**). Because of high levels of participation over long periods of time, these low-cost encounters and services accounted for a large proportion of total costs.
- 2. **High-cost, infrequently used services:** To the lower-right are high-cost encounters involving a small number of people. By far the highest cost encounters in this group were ED visits and inpatient (IP) admissions. Likewise, relatively few people had encounters with ADCs, ACFs, and state prisons, but these encounters had relatively high per-diem costs (some, like prison, accumulated over a long time). These high-cost, infrequently used services contributed substantially to total costs.
- 3. **Low-cost, infrequently used services:** To the lower left are lower-cost encounters and services used by few people, including shelter, supportive housing, case management, and supervised probation (**Exhibit 7.2**). As a group, these encounters and services contributed relatively little to total costs.

Exhibit 7.1. Total Costs by Number of Hennepin Expansion Enrollees Involved and Cost Per Day of Involvement

Legend A. General assistance **B.** Adult detention centers and jails C. Supportive housing D. State prison E. Adult corrections facilities F. MN Family Investment program (TANF) **G.** Hennepin supervised probation H. Hennepin case management **I.** Hennepin shelter Key Health care **Human services** Criminal justice Housing = \$100 million

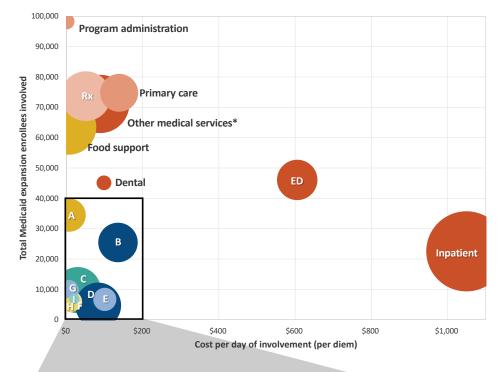


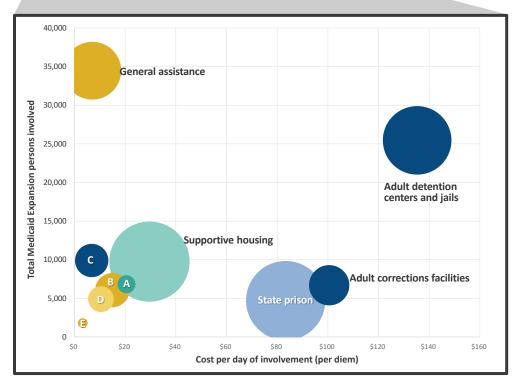
Exhibit 7.2. Hennepin Expansion Enrollees Involved and Cost Per Day of Involvement

(expanded detail from Figure 7.1)

Legend

A. Hennepin shelter

B. MN Family Investment program (TANF) C. Hennepin supervised probation D. Hennepin case management E. MN Supplemental Assistance Key Human services Criminal justice Housing = \$150 million

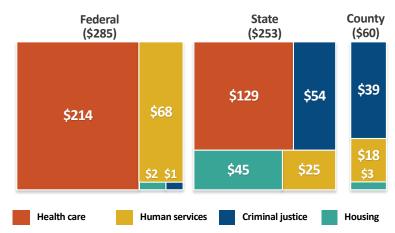


^{*}Other medical services consisted of non-prescription medical costs not included in an inpatient, emergency department, primary care or dental visit.

Who Pays for Public Services?

Costs in each sector were spread unevenly across multiple levels of government. Federal, state, and local government had different roles within each sector. Overall, federal and state governments bore the majority of direct public costs for Hennepin Medicaid expansion enrollees, mostly in the form of public health care costs (Exhibit 8). The state had responsibility for substantial expenditures in all four sectors, but spent the least on human services (\$25 million). Federal, state, and county government each contributed to human service costs, while the state was the primary payer for housing supports. The state's share of criminal iustice costs (\$54 million) exceeded county criminal justice costs (\$39 million) and consisted primarily of prison and court

Exhibit 8. Total Annualized Costs for Hennepin Expansion Enrollees by Sector and Level of Government (2014, in millions)*



^{*}Based on pre-expansion allocation. Per the Affordable Care Act, the federal government paid 100 percent of reimbursements for individuals eligible for Medicaid under the expansion between 2014 and 2016, phasing down to 90 percent by 2020.

expenditures. The county's share of total costs was heavily weighted toward criminal justice spending on corrections and detention.

Substance Use Disorders and Mental Illness

Enrollees with a mental illness (MI) or substance use disorder (SUD) diagnosis made up a substantial portion of the Medicaid expansion population (41 percent and 27 percent, respectively) (Exhibit 3). More than one-fifth (21 percent) of our cohort had both MI and SUD diagnoses. Those with both MI and SUD accumulated disproportionate costs across all sectors, and accounted for 53 percent of all public costs among Medicaid expansion enrollees.

Cross-sector involvement

Enrollees with diagnosed MI and/or SUD had high levels of involvement across all sectors. They had inpatient and ED utilization rates over three times higher than those without a behavioral health diagnosis (**Appendix, Exhibit D**). The highest utilization rates were among those with SUD, especially those with both MI and SUD. Enrollees with both MI and SUD diagnoses were admitted to the hospital at six times the rate of enrollees with no behavioral health diagnosis and were four times more likely to visit the ED.

Enrollees with MI and SUD diagnoses also had high cross-sector involvement: 39 percent spent at least one night in emergency shelter or supportive housing; 62 percent had a criminal justice encounter; and 90 percent received food support, cash assistance, or case management (Exhibit 9).

11% were involved in health care, human services, and housing, but not criminal justice 28% were involved in all four sectors 31% were involved in health care, human services, and criminal justice, but not housing 21% were involved in health care and human services only 100% had contact with at least one sector Criminal Any involvement, by system Health care 100% **Human services** 90% Criminal justice 62% Housing 39% *One or more claim during the study period. Health car Note: Only interactions that include 1 percent or more of the population are displayed.

Exhibit 9. Cross-Sector Involvement of Hennepin Expansion Enrollees with SUD and MI Diagnoses

Costs

Enrollees with MI and/or SUD diagnoses also incurred high per capita public costs (**Exhibit 10**). Health care was the most costly public sector per capita, accounting for half of all expenditures in these groups. For those with MI diagnoses, human services was the second most expensive sector, but those with SUD diagnoses incurred more costs in the criminal justice system. Per capita total costs were highest among individuals with both MI and SUD diagnoses and were nearly eight times higher than those with no behavioral health diagnosis. This pattern held for each of the four sectors, where enrollees with behavioral health diagnoses incurred more than double the costs per person compared to enrollees with no behavioral health diagnoses.

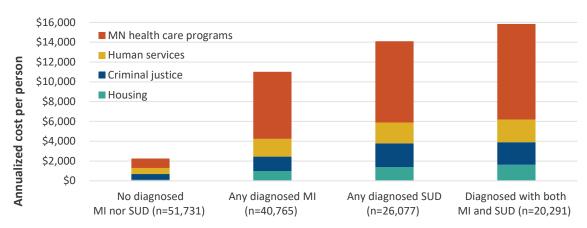


Exhibit 10. Annualized Per Person Costs for Hennepin Expansion Enrollees with SUD or MI Diagnoses

Diagnosis of mental illness or substance use disorder

These disproportionate per capita costs added up. Individuals with co-occurring SUD and MI represented 21 percent of Medicaid expansion enrollees, but accumulated 53 percent of total public costs.

Summary

Medicaid expansion enrollees had substantially higher levels of health care utilization than the general public. Cross-sector involvement among a minority of enrollees accounted for about half of all days spent in emergency shelter, jail, and corrections facilities. High levels of cross-sector utilization resulted in large public expenditures at county, state, and federal levels. More was spent on health care than all other sectors combined, and more was spent on housing and criminal justice services than on human services. Twenty-one percent of our sample had MI and SUD diagnoses; these enrollees had especially high levels of cross-sector utilization, accounting for more than half of all public expenditures incurred by our cohort.

Limitations

We acknowledge a number of limitations. This study was broadly descriptive across a four-year period. It does not examine sequential or time-variant involvement and thus we do not know the extent to which characteristics or involvement were co-occurring or directly linked.

Probabilistic matching was conducted conservatively to minimize the risk of false positive matches. This matching method was used most often with criminal justice data. Thus, actual criminal justice involvement was likely *higher* than figures reported in this study.

Our data describes the majority of public sector involvement among our cohort, however some data were incomplete or unavailable. Emergency shelter, community supervision, and case management data were only available within Hennepin County. Based on observed rates of criminal justice involvement outside of Hennepin County, up to one-third of our enrollees may have received these services in other counties. This phenomenon was exacerbated by the proximity of the adjoining Twin Cities of Minneapolis and Saint Paul, which are located in different counties. Also, we were unable to include data for other public functions, including police activities, federal criminal justice involvement and public housing (e.g. Section 8, Minneapolis Housing Authority). These limitations lead to under-estimation of our utilization and total costs estimates.

We chose to make no exclusions based on enrollment duration in order to provide policymakers with a more complete picture of the Medicaid expansion. With no exclusions, cost and diagnosis rates were related both to incidence and utilization. This means that someone with no health care enrollment could not record a health care encounter, and someone with no health care encounters could not receive a diagnosis. Enrollment on and off health insurance (churn) is known to occur at high rates in low-income groups, is associated with higher use of health care, and therefore likely affected our results.

Most cost estimates were approximations based on existing per diem averages. While privacy limitations prevented us from using actual reimbursement costs for health care claims, our approximations produced reasonable population-level estimates compared to other analyses of health care costs.

Implications

High levels of cross-sector involvement among Medicaid expansion enrollees suggests that Medicaid partnerships with human services, criminal justice, and housing supports may improve care and save costs. For example, individuals with behavioral health diagnoses had high levels of both supportive housing needs and criminal justice involvement. Linking health care delivery with housing and criminal justice interventions may improve care while reducing utilization and costs across all sectors.

Our findings also illustrate that it is feasible to reliably integrate data across sectors and that cross-sector involvement is common enough to make integration worth the effort. This data integration could be used to design and evaluate future cross-sector interventions. As a first step toward this end, our study has pioneered a common framework and vocabulary for synthesizing and analyzing cross-sector data to create a more total view of public sector spending.

While we cannot comment on the cost-effectiveness or appropriateness of interventions we examined, we were able to show that costs across sectors were concentrated among an identifiable subset of Medicaid enrollees. This implies that effective interventions could target this population and may reduce costs across multiple public sectors.

Further research will be required to evaluate cross-sector impact and cost-effectiveness. We found that many low-income adults enrolled in Medicaid had encounters across multiple sectors, however we have much to learn about how these encounters interact and how policy changes in one sector affects outcomes in another. Additionally, since many human services and housing interventions are means-tested and disproportionately involve historically disadvantaged populations, future work should also consider how cross-sector involvement interacts with poverty, education, employment and racial disparities.

Taken together, our results support a more unified approach to service delivery, including:

- Integrated service delivery, with housing and behavioral health as particularly promising areas of focus. Public sector involvement patterns among Medicaid expansion enrollees suggest that housing and behavioral health are important social determinants of involvement across sectors. Cross-sector collaboration to combine housing with behavioral health treatment has been shown to improve outcomes and save costs across multiple sectors.
- Integrated data systems. Data integration is a basic requirement for designing and evaluating cross-sector approaches. Timely access to reliable cross-sector data could improve how each sector understands the broader impact of their interventions, deepen knowledge of shared social determinants, and lead to more thoughtful, collaborative service delivery.
- A unified vision. Data and service integration would be best implemented under a unified vision for public services. Currently, health care, human services, criminal justice and housing operate with separate assessments and outcome metrics despite shared social determinants and many shared clients with cross-cutting needs. A unified vision would create a shared framework for success, including shared assessments, analytics and outcome metrics. The vision must be measurable and operationalized with funding aligned across sectors and levels of government to promote collaboration.

The Medicaid expansion has provided a new opportunity to broadly address the needs of low-income, non-elderly adults across multiple public sectors. We believe that service collaboration, data integration and a unified vision shared among the health sector and other sectors may improve design, implementation, and evaluation of interventions for low-income adults and better support overall well-being.

ABOUT THE CENTER FOR HEALTH CARE STRATEGIES

The Center for Health Care Strategies (CHCS) is a nonprofit policy center dedicated to improving the health of low-income Americans. It works with state and federal agencies, health plans, providers, and consumer groups to develop innovative programs that better serve people with complex and high-cost health care needs. For more information, visit www.chcs.org.

HENNEPIN COUNTY CENTER OF INNOVATION AND EXCELLENCE

The Center of Innovation and Excellence (CIE) is a division of operations at Hennepin County whose mission is to drive excellence by aligning strategies, leading change, sharing knowledge and supporting decision-making across the organization. The CIE combines diverse tools including research, evaluation, continuous improvement, strategic planning, customer service, innovation and technology expertise to meet the needs of Hennepin County lines of business and residents.

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Glossary

The definitions below are provided to help explain terms used throughout the brief that may be unfamiliar to readers and/or specific to Minnesota.

- Adult detention center (ADC): Pre-trial detention facility also referred to as "jail."
- Adult corrections facility (ACF): Provides custody and programming for adult offenders with sentences up to one year.
- General assistance: Minnesota state cash assistance program for very low-income residents with disabilities.
- Group residential housing: Minnesota state income housing assistance program for very low-income residents with disabilities. State
 funds pay for accommodations at licensed, registered settings meeting state qualifications, or for Long Term Homeless participants,
 unlicensed or unregistered settings.
- Felony: Crime for which a prison sentence of more than one year may be imposed.*
- Gross misdemeanor: Crime which is not a felony or misdemeanor, where the maximum fine is \$3,000.*
- Misdemeanor: Crime for which sentences may not exceed 90 days and fines may not exceed \$1,000.
- MinnesotaCare: State health care program for low-income Minnesotans not eligible for Medicaid.

*SOURCE: 609.02 Definitions, 2017 Minnesota Statutes, The Office of the Revisor of Statutes. Available at www.revisor.mn.gov/statutes/?id=609.02.

Appendix

Summary of Data Collection and Cost Estimation Procedures

Health Care

Health care claims included all final claims reimbursed through Minnesota state health care programs^{§§} during the study period. Claims were matched to eligibility and other human service records via a common person identifier maintained by the Minnesota Department of Human Services (DHS). International Statistical Classification of Diseases and Related Health Problems (ICD-9) codes were grouped according to the Healthcare Utilization and Cost Project (HCUP) Chronic Condition Indicator (CCI) to create diagnostic categories. Claim-level cost data were unavailable for analysis, so we estimated costs using Medicaid fee schedules, hospital per diem averages, and average unit costs adjusted for diagnosis or procedure.***

Human Services

Human service data included a variety of supportive programs. We used state-level food and cash support data, which included General Assistance (state cash assistance), *** the Minnesota Family Investment Program (Temporary Assistance for Needy Families, or TANF), Food Support (Supplemental Nutritional Assistance Program, or SNAP), Emergency Assistance, Title IV-E Foster Care, and Refugee Cash Assistance. Case management included Hennepin County involvement only. All human services involvement were matched via DHS' common identifier. Administrative costs were calculated from state cost averages. *** Food and cash support costs were calculated from recorded payments and adjusted for household size. Case management costs were calculated from paid Hennepin County service authorizations and time reporting estimates.

Criminal Justice

Criminal justice data included publicly available statewide conviction, detention, and incarceration data. Adult field services (e.g., probation) data were available for Hennepin County only, and federal involvement (e.g., federal court, federal prison) and police encounters (e.g., arrest) were not directly observed. Data were matched on name, date of birth, and gender for each dataset separately. Costs were calculated using per diem estimates maintained by county and state corrections and law enforcement agencies.

Housing

Housing data included emergency shelter and supportive housing data. Emergency shelter data covered approximately 75 percent of Hennepin County shelter beds and were matched on name, date of birth, and social security number. Shelter costs were calculated using per diem estimates. Supportive housing data included Group Residential Housing (GRH) data from statewide records and Hennepin County permanent supportive housing (PSH) stays. GRH costs were calculated from recorded payments and non-GRH PSH costs were estimated from a fixed average cost supplied by the Hennepin County Office to End Homelessness.

⁵⁶ Includes Medical Assistance (Medicaid), Minnesota Care, Refugee Medical Assistance, Institutes for Mental Disease, Qualified Medicare Beneficiary and Specified Low-Income Medicare Beneficiary.

^{***} Claim reimbursement figures for managed care claims are considered private by the state of Minnesota and were unavailable for analysis. Minnesota state fee schedule values for fee for service maximum reimbursement by procedure code were used to impute outpatient, professional and dental claim costs. Cost-to-charge ratio-adjusted per diem values by DRG calculated from HCUP's State Inpatient Database (SID) for Minnesota were used to impute inpatient costs. Prescription drug costs were estimated from per unit averages published by the Centers for Medicare and Medicaid Studies (CMS).

^{†††} Cash assistance for very low-income childless adults with disabilities.

^{***} Public health care program administrative costs were categorized as a human services activity.

^{§§§} Some of these encounters were observed indirectly, e.g. many arrests result in jail bookings.

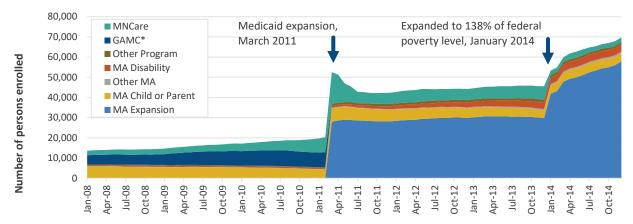
Appendix Exhibits

Exhibit A. Demographic Characteristics of Hennepin Expansion Enrollees Compared to County and National Populations (age 21-64)

	Hennepin Expansion	Hennepin County *	U.S.**
	n=98,282	n=777,524	n=200,985,313
Gender			
Male	61%	50%	49%
Female	39%	50%	51%
Preferred spoken language***			
English	89%	85%	96%
African languages	5%	1%	Not available
Somali	4%	Not available	Not available
East Asian languages	2%	4%	Not available
Hmong	1%	1%	Not available
Spanish	1%	3%	4%
Other	1%	1%	<1%
Unknown	3%	6%	
Marital status			
Not married	90%	55%	44%
Married	9%	45%	56%
Unknown	1%		>1%
Race/ethnicity			
White	42%	78%	64%
Black or African-American	36%	8%	12%
Asian or Pacific Islander	5%	7%	6%
American Indian	3%	<1%	1%
Hispanic	3%	5%	16%
Multiracial****	2%	2%	1%
Unknown	9%	<1%	<1%
Age			
Median as of 12/31/2014	37	42	42
Behavioral health			****
Mental illness (MI) diagnosis	41%	Not available	18%
Substance use disorder (SUD) diagnosis	27%	Not available	10%
Both MI and SUD diagnoses	21%	Not available	3%

^{*}Source: U.S. Census Bureau, American Community Survey 5-Year Estimates, 2011-2015

Exhibit B. Timeline of Minnesota Public Health Care Program Enrollment for Hennepin Expansion Enrollees



^{*}General Assistance Medical Care (GAMC) was a state-funded public health insurance program for very low income childless adults eligible for GA, GRH or with income not exceeding 75 percent of poverty. Note: Minnesota's Medicaid program is called "Medical Assistance" and often abbreviated as "MA".

^{**}Source: American Community National Health Interview Survey (NHIS) 2011-2014

^{***}National data represents the language in which the interview was conducted, whereas the study cohort data represents preferred spoken language.

^{****}Client identified more than one race/ethnicity on eligibility application (non-Hispanic).

^{*****}SAMSHA 2014 National Survey on Drug Use and Health survey data 2014. Represents adults ages 18+ and indicates occurrence in the past year.

Exhibit C. Hennepin Expansion Enrollee Share of All Shelter and Criminal Justice Involvement 2011-2014

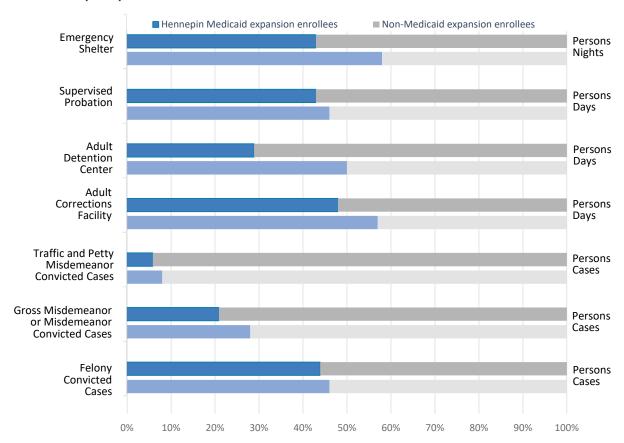


Exhibit D. Cross-Sector Involvement of Hennepin Expansion Enrollees with MI or SUD diagnoses

	Any mental illness diagnosis (MI)	Any substance use disorder diagnosis (SUD)	Both MI and SUD diagnoses	No diagnosed MI or SUD		
Health care use (Rate per 1,000 health care enrollment months)						
Inpatient hospital admissions	37.4	50.3	56.8	9.1		
Inpatient hospital days	380.8	554.8	632.0	46.5		
Emergency department visits	147.3	190.3	211.8	50.4		