Health Care Utilization Patterns of Homeless Individuals in Boston: Preparing for Medicaid Expansion Under the Affordable Care Act

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Several million Americans experience being homeless every year, and the majority of them cannot afford health insurance.[1] These individuals live on the periphery of society, struggling in abject poverty. They must prioritize basic shelter, safety, and food, and therefore often forgo medical care until conditions become urgent or irreversible. Unmanaged and worsening medical conditions can further extend the duration of homelessness and associated economic problems (e.g., unemployment). Additionally, many homeless individuals are held in the grip of addiction and have mental illness.[2] Given this complex set of circumstances, often compounded by a lack of health insurance coverage, providing medical care for these individuals can be challenging. Care often remains fragmented, taking place in emergency departments (EDs) and multiple inpatient and outpatient settings.

The Medicaid expansion through the Affordable Care Act (ACA) will be an unprecedented opportunity to improve access to health services for poor and homeless individuals around the country. Starting in 2014, individuals with incomes up to 138% of the federal poverty level will be eligible for Medicaid in states that choose to expand their Medicaid program. Given the high uninsured rate and low incomes among homeless people, they stand to benefit immensely from this expansion.

Although expanded coverage will almost certainly increase access to health care for many, little information is available on what types of services homeless patients will use when insurance is available. Homeless individuals have high rates of mental illness (e.g., depression) and certain medical illnesses (e.g., HCV or diabetes mellitus).[3–5] Previous investigations have shown a high level of health care utilization.[6–8] For example, in a survey of 2578 homeless patients, Kushel

et al.[9] found that 40% of respondents had 1 or more ED visit in the last year, and 7.9% had 3 or more visits in the last year. These previous studies mainly used survey data, relied on self-reported data, or examined medical records of a single clinic, and many of the study populations were uninsured. Although these studies provide important information on the homeless population, the disease profiles obtained this way are not always complete, and there is incomplete information on health care utilization. Furthermore, they do not show utilization patterns for an insured homeless population. With health insurance, homeless individuals may have greater access to medications and preventive care that could reduce use of EDs and inpatient care. In the context of high rates of addiction, mental illness, and cognitive impairment, these crisis-driven utilization patterns may also persist in insured patients while expanding access to a wider range of services.

Objectives. We studied 6494 Boston Health Care for the Homeless Program (BHCHP) patients to understand the disease burden and health care utilization patterns for a group of insured homeless individuals.

Methods. We studied merged BHCHP data and MassHealth eligibility, claims, and encounter data from 2010. MassHealth claims and encounter data provided a comprehensive history of health care utilization and expenditures, as well as associated diagnoses, in both general medical and behavioral health services sectors and across a broad range of health care settings.

Results. The burden of disease was high, with the majority of patients experiencing mental illness, substance use disorders, and a number of medical diseases. Hospitalization and emergency room use were frequent and total expenditures were 3.8 times the rate of an average Medicaid recipient.

Conclusions. The Affordable Care Act provides a framework for reforming the health care system to improve the coordination of care and outcomes for vulnerable populations. However, improved health care coverage alone may not be enough. Health care must be integrated with other resources to address the complex challenges presented by inadequate housing, hunger, and unsafe environments. (*Am J Public Health.* 2013;103:S311–S317. doi:10.2105/AJPH. 2013.301421)

In Massachusetts, early Medicaid expansions since the 1990s have allowed a high percentage of homeless individuals to be insured under Medicaid, perhaps higher than most states in the country. Although Massachusetts is perhaps best known for its 2006 Medicaid expansion, unaccompanied homeless men and women were most beneficially affected by its 1115 waiver expansion in 1996. This expansion opened MassHealth (Massachusetts Medicaid) to chronically unemployed residents, and doubled the percentage of unaccompanied adults with Medicaid benefits from 30% to 60%. This expanded access to a variety of services for homeless men and women. The 2006 expansion built on this base and increased the percentage of insured homeless men and women; internal Boston Health Care for the Homeless Program (BHCHP) data demonstrated nearly 80% of patients have Medicaid or Medicare coverage.

Therefore, Massachusetts served as a unique environment in which to identify patterns of

medical care utilization in the Medicaid enrolled homeless population. We examined Massachusetts Medicaid claims data in 2010 for a large cohort of homeless individuals seen at BHCHP. The program provides care to approximately 40% of the homeless population in Massachusetts.[10] Augmenting previous studies, this study provided a unique perspective by analyzing claims data for a large sample of homeless people with health insurance coverage. In addition to providing a comprehensive understanding of the disease burden among homeless individuals, this data set included both behavioral health services for mental illness and substance use disorders (SUDs) and general medical care. This provided an opportunity to understand current service use across these sectors in preparation for the integrated care envisioned in future care models.

METHODS

BHCHP was established in 1985 under a Robert Wood Johnson Foundation grant to improve access to high quality medical care to homeless individuals in and around Boston. Since then, the program has become a federally qualified neighborhood health center and now serves more than 12 000 individuals in an outreach model, at dozens of different sites. The model of care is a person-centered multidisciplinary and culturally competent holistic approach to patients. Clinic visits are a mix of urgent care, episodic care, chronic disease management, and preventive health care. Services include outreach directly to the street, soup kitchens, and adult and family shelters. The program also runs a 104-bed medical respite unit, providing 24-hour medical care for homeless individuals who are too sick for the shelter or street but do not meet criteria for admission into an acute hospital bed. The program is integrated into the medical community, providing critical health care to homeless individuals in Boston.[11]

We studied merged BHCHP data and MassHealth eligibility, claims, and encounter data from 2010. MassHealth claims and encounter data provided a comprehensive history of health care utilization and expenditures, as well as associated diagnoses, in both general medical and behavioral health services sectors

and across a broad range of health care settings.

Study Population

The final study population included 6494 BHCHP patients with Medicaid in 2010. Although the BHCHP database showed 6846 potential Medicaid recipients, 343 individuals were excluded because they were not eligible for Medicaid and 9 individuals were enrolled in Medicaid managed care programs (Program for All-inclusive Care for Elderly and Senior Care Option); we did not have access to their health care utilization records.

The analysis followed the framework of the Andersen Health Care Utilization model, which classifies variables associated with health care utilization and expenditures into 3 sets of factors: predisposing, enabling, and need factors.[12] We incorporated population characteristics in the domains of predisposing and enabling factors, and included disability and disease burden for need factors. We obtained demographic characteristics information from MassHealth data, including member age, gender, disability status, and Medicare enrollment. Race/ethnicity was derived from BHCHP data, which provided more comprehensive information than MassHealth data. Disability status was determined by the Social Security Administration or Massachusetts Disability Evaluation Services. Major MassHealth coverage types included standard coverage with full Medicaid benefits and basic and essential coverage that were similar to the standard coverage, except for long-term support and services.

Disease Burden

We identified members with mental illness, and selected physical conditions using the *International Classification of Diseases, Ninth Revision, Clinical Modifications*[13] (*ICD-9-CM*) diagnosis codes in MassHealth claims and encounter data. The grouping of *ICD-9-CM* codes for diseases was based on the Clinical Classification Software developed by the Agency for Healthcare Research and Quality.[14]

Mental illness diagnoses included schizophrenia and other psychosis, bipolar disorders, depression, anxiety, and other mental illness. SUDs included alcohol abuse or dependence

and drug abuse or dependence. In some instances, behavioral health disorder was used and referred to mental illness or SUDs. Members with co-occurring mental illness and SUDs were identified. We specifically identified patients with several prevalent medical diseases, including HCV, HIV, cirrhosis, asthma or chronic obstructive pulmonary disease (COPD), hypertension, congestive heart failure, ischemic heart disease, and diabetes.

We used the DxCG score to evaluate the overall disease burden for the study population. DxCG is a subsidiary of Verisk Analytics and is a provider of predictive modeling software. The DxCG score is a predictive modeling tool that uses the Diagnostic Cost Group (DCG) methodology and benchmark data to estimate a populations' disease rate.[15,16] In the DxCG model for the Medicaid population, the DxCG score is set to 1.0 for its original development sample of the general Medicaid population. In other words, DxCG scores greater than 1.0 indicate higher disease burden and scores less than 1.0 indicate that the disease burden is less than the average disease burden.

Health Care Utilization and Expenditures

We based the analysis of health care utilization and expenditures on paid MassHealth fee-for-service claims and those reported in managed care encounter data by MassHealth contracted managed care plans. Medicare services that generated "cross-over" Medicaid claims (for supplementing Medicare services) were included in the analysis. However, Medicare Part D pharmacy utilization and expenditures were not available for this analysis. General medical care and behavioral health services were reported, then analyzed separately and combined. Major health service categories and settings included hospitals, EDs, ambulatory care visits, prescriptions, dental, and outpatient detoxification. Inpatient detoxification was embedded in the overall hospitalization numbers. To assess the distribution of total annual expenditures, we ranked individuals by annual expenditures per person and then classified them into 5 expenditure groups.

Homeless individuals are at increased risk for exposure to HCV, and previous studies have shown increased prevalence rates. Therefore, we included a separate analysis of utilization among patients with HCV.[17]

Additionally, previous studies showed that treatment complexity increases for individuals with mental illness and SUDs[18,19]; therefore, we also conducted a separate analysis of utilization for this group. Finally, we compared the overall health care utilization between those with and without co-occurring mental illness and SUDs and between those with and without HCV. The χ^2 test was used for comparisons for categorical variables, and the t-test was used for continuous variables.

All analyses were performed with SAS statistical software, version 9.2 (SAS Institute, Inc., Cary, North Carolina).

RESULTS

We focused on results from the combined analysis for the 6494 BHCHP patients included in the study regardless of their dual eligibility for Medicare and Medicaid. (Data available as a supplement to the online version of this article at http://www.ajph.org provide detailed results from separate analyses for dual eligibles and Medicaid-only members.) The majority of BHCHP MassHealth patients were male (71%), and the mean age was 45.5 years. Forty-four percent were non-Latino White, 32% non-Latino African American, and 15% Latino; 58% had disabilities, and 27% were eligible for both Medicare and Medicaid (Table 1). On average, homeless individuals were enrolled in MassHealth for at least 11 months in 2010.

Homeless individuals experienced a high disease burden, including chronic diseases, infections, mental illness, and SUDs (Table 1). More than two thirds of the study population had some form of mental illness, with depression being the most prevalent diagnosis. SUDs were also highly prevalent (60%). Furthermore, almost half of homeless individuals (48%) had co-occurring mental illness and SUDs. The study population also had a high prevalence of several selected medical illnesses. There was a high prevalence of infectious diseases, including HCV (23%) and HIV (6%). Chronic diseases were also prevalent; 37% of the study population had a diagnosis of hypertension, 26% had COPD or asthma, and 18% had diabetes mellitus. The overall disease burden represented by the DxCG score was 3.8, which indicated

TABLE 1—Population Characteristics: Boston Health Care for the Homeless Program (BHCHP) Users With Medicaid, 2010

Characteristic[a]	No. (%) or Mean $\pm$SD
Age, y	45.5 $\pm$13.3
Male	4587 (71)
Race/ethnicity	
Non-Latino White	2868 (44)
Non-Latino African American	2058 (32)
Latino	986 (15)
Others	214 (3)
Unknown	368 (6)
Disability status[b]	3734 (58)
Dually eligible for Medicare and Medicaid	1761 (27)
Behavioral health disorders[c,d]	5139 (79)
Any mental illness	4384 (68)
Schizophrenia	1264 (19)
Bipolar disorders	1889 (30)
Depression	3068 (47)
Anxiety	2627 (40)
Others	1765 (27)
Any substance use disorders	3890 (60)
Alcohol use disorder	2628 (40)
Drug use disorder	3118 (48)
Co-occurring mental illness and substance use disorders	3135 (48)
Selected physical conditions[c,d]	4177 (64)
HCV	1473 (23)
HIV	410 (6)
Cirrhosis	254 (4)
Asthma/COPD	1712 (26)
Hypertension	2395 (37)
Congestive heart failure	265 (4)
Ischemic heart disease	560 (10)
Diabetes	1191 (18)
Overall disease burden[e]	3.8 $\pm$3.8

Note. COPD = chronic obstructive pulmonary disease. The sample size was n = 6494.
[a]Based on the last segment of MassHealth eligibility or enrollment data in 2010, except for race/ethnicity, which was based on BHCHP data.
[b]Determined by the Social Security Administration or Massachusetts Disability Evaluation Services.
[c]Both MassHealth claims data and managed care encounter data were used for the prevalence analysis; however, laboratory claims and radiology claims were not included.
[d]Diseases listed are not mutually exclusive.
[e]Disease burden is represented by the DxCG score. A DxCG score of 1 equals average expected expenditures or average disease burden in DxCG's original development sample of the general Medicaid population. Scores > 1 indicate higher than average disease burden and scores < 1 indicate lower than average disease burden. The median disease burden was 2.6.

a substantially higher burden than the general Medicaid population.[16]

On average, this homeless population had 10 ambulatory care visits annually. They also used EDs frequently, with an annual average of 4 visits and were hospitalized, on average, at least once a year. Notably, 20% of the

population had 6 or more ED visits and 12% had 3 or more hospitalizations in a year. Moreover, approximate one third of ED visits and half of hospitalizations were attributable to behavioral health disorders (Table 2).

Homeless individuals with co-occurring mental illness and SUDs and those with HCV

TABLE 2—Health Care Utilization: Boston Health Care for the Homeless Program Users With Medicaid, 2010

Types of Health Services[a]	Behavioral Health Services, No. (%) or Mean ±SD	General Medical Care, No. (%) or Mean ±SD	Both, No. (%) or Mean ±SD
Ambulatory care visits	1.0 ±3.2	9.0 ±10.4	10.0 ±11.0
None	4503 (69)	356 (5)	262 (4)
1–2	1394 (21)	1244 (19)	1089 (17)
3–5	320 (5)	1520 (24)	1433 (22)
>5	277 (4)	3374 (52)	3710 (57)
ED visits	1.3 ±4.2	2.7 ±4.7	4.0 ±7.3
None	4464 (69)	2292 (35)	1990 (31)
1–2	1157 (18)	2126 (33)	1932 (30)
3–5	454 (7)	1139 (18)	1168 (18)
>5	419 (6)	937 (14)	1404 (21)
Hospitalizations[b]	0.5 ±1.5	0.5 ±1.6	1.0 ±2.4
None	5369 (83)	4958 (76)	4287 (66)
1–2	765 (12)	1143 (18)	1436 (22)
>2	360 (5)	393 (6)	771 (12)
Hospital length of stay, d[c]	8.0 ±12.4	5.7 ±9.5	7.0 ±11.4
Outpatient detoxification[d]			
None	4952 (76)	NA	4952 (76)
1	391 (6)	NA	391 (6)
≥2	1151 (18)	NA	1151 (18)
Mean ±SD	1.4 ±4.6	NA	1.4 ±4.6

Note. ED = emergency department. The sample size was n = 6494.
[a]Based on MassHealth fee-for-service claims and managed care encounter data.
[b]Including acute inpatient, psychiatric inpatient, semiacute hospitals, chronic inpatient hospital, and state hospitals.
[c]For members with at least 1 hospitalization in 2010. Median hospital length of stay was 4.0 for both behavioral health and general medical care.
[d]Inpatient detoxifications are included in hospitalizations.

had high health care utilization (Table 3). More than one third of them had 6 or more ED visits and more than 20% of them had 3 or more hospitalizations. Except for hospital length of stay, health care utilization for these 2 groups was substantially higher than among those without these conditions ($P<.001$).

Homeless individuals had high health care expenditures—$2036 per member per month compared with $568 per month for all Mass-Health members.[20] Almost half of total annual expenditures were incurred by 10% of the study population (Table 4). The 2 highest categories of health care expenditure were hospitalizations and ED visits, which represented 40% and 11% of total expenditures, respectively.

DISCUSSION

Medicaid expansion under the ACA could improve access to care for homeless individuals across the country. This study was a unique analysis of a Medicaid claims database for homeless individuals in Boston, Massachusetts, who already had health insurance. Our findings reinforced the understanding that homeless individuals have a great deal of physical illness, mental illness and addictions. This high disease burden adds to the existing life stress created by unsafe and uncertain housing and the daily search for food and clothing.[21,22] In this context, conditions that could be managed in stably housed patients become life threatening.

Diabetes mellitus was an example of a disease made much worse by the social circumstances of homelessness, including limited access to nutritious food, an irregular meal schedule, inability to refrigerate insulin, and challenges of carrying needles. The prevalence of diabetes mellitus was extremely high in this population (18%) compared with the

general population (8.3%).[23] HCV was another example of a disease made worse by the social circumstances of homelessness. The prevalence in this cohort was 24% compared with 1.8% of the general population.[24] Treatment and management of HCV typically requires access to sophisticated technology and medications and management of multiple medical appointments and procedures. Adherence to treatment regimens are complicated by being homeless. Mental illness and substance use disorders, prevalent in staggering proportions in this group of patients, further complicate management of chronic physical illness. Previous studies showed that these behavioral health disorders are associated with lower quality indicators, lower adherence with prescribed treatment, and higher health care expenditures.[19,25-27] In this analysis, we found that the presence of HCV resulted in higher utilization of many services, including the ED, hospitals, and outpatient services.

Overall, our findings showed that homeless individuals used the ED 4 times a year on average, and 20% of the cohort had 6 or more ED visits per year. In comparison, only 1% of the general population and 5% of Medicaid recipients used the ED 4 or more times a year.[28] Hospitalization rates were also high, with these individuals using the hospital more than domiciled patients. Hospital stays averaged 1 per year with an average length of stay of 7 days. Additionally, 12% of the study population had 3 or more hospitalizations in a year. Previous studies of homeless individuals showed that lack of health insurance was associated with more use of acute hospital facilities and fewer ambulatory services,[6] but in this insured cohort, rates of ED and hospitalization remained high.

Behavioral health disorders appeared to be a factor associated with higher utilization. One third of ED visits and half of all hospitalizations were attributable to behavioral health disorders. This was consistent with previous studies that showed that behavioral health disorders were associated with increased Medicaid expenditures.[19] High use of the medical system was reflected in health care costs, including a per-member-per-month expenditure of $2036, of which one third were for services directly related to mental illness or SUDs.

TABLE 3—Overall Health Care Utilization: Subgroups of Boston Health Care for the Homeless Program Users With Medicaid, 2010

Types of Health Services[a]	Co-Occurring Mental Illness and SUDs,[b] No. (%) or Mean ±SD		HCV,[c] No. (%) or Mean ±SD	
	With (n = 3135)	Without (n = 3359)	With (n = 1473)	Without (n = 5021)
Ambulatory care visits	11.6 ±11.5	8.5 ±10.1	13.5 ±12.6)	9.0 ±10.2
None	2	5	1	5
1–2	11	22	9	19
3–5	20	24	17	24
> 5	67	48	73	52
ED visits	6.3 ±9.1	1.8 ±3.6	6.3 ±9.5	3.3 ±6.2
None	15	46	19	34
1–2	26	33	23	32
3–5	23	13	23	17
> 5	35	8	35	17
Hospitalizations[d]	1.8 ±3.1	0.3 ±0.9	2.0 ±3.4	0.7 ±1.8
None	48	83	45	82
1–2	31	14	30	5
> 2	22	3	25	13
Hospital length of stay, d[e]	6.8 ±11.0	7.4 ±12.7	6.7 ±12.4	7.0 ±10.9
Outpatient detoxification[f]	2.7 ±6.1	0.3 ±1.6	2.9 ±6.4	1.0 ±3.7
None	58	93	58	82
1	10	2	10	5
≥ 2	32	5	32	13

Note. ED = emergency department; SUDs = substance use disorders.
[a]Based on MassHealth fee-for-service claims and managed care encounter data.
[b]Homeless individuals with co-occurring mental illness and SUDs had significantly higher health care utilization than those without co-occurring mental illness and SUDs ($P < .001$ from the χ^2 test for categorical variables and the t-test for interval variables), except for hospital length of stay.
[c]Homeless individuals with HCV had significantly higher health care utilization than those without HCV ($P < 0.0001$ from the χ^2 test for categorical variables and the t-test for interval variables), except for hospital length of stay.
[d]Including acute inpatient, psychiatric inpatient, semiacute hospitals, chronic inpatient hospital, and state hospitals.
[e]For members with at least 1 hospitalization in 2010.
[f]Inpatient detoxifications are included in hospitalizations.

Even among this population with higher than average costs, there was a subgroup of very high service users (n = 650; 10%) who were responsible for 48% of total expenditures (Table 4). The greater flexibility in payment and service delivery provided by the ACA could be used to provide intensive, targeted services to high need groups.

In implementing the ACA, which is designed to profoundly enhance access to care, states must determine how to incorporate the new recipients of Medicaid into the health care delivery system in the most effective way. Our findings provided a window into the health care utilization patterns of one of the most vulnerable subgroups for Medicaid expansion. There are several implications to these findings.

First of all, states that begin to enroll homeless individuals in Medicaid systems should understand that these individuals will have many unmet needs and require enhanced coordination of services. There might be concern about the costs of medical care for this population. As our findings suggested, the burden of medical and behavioral health needs are high. Therefore, it is not surprising that costs are consequently higher because the burden of disease is up to 4 times that of the general Medicaid population. However, states are already likely to be paying for services for homeless individuals in less effective and fragmented systems. In a recent policy paper from the Kaiser Family Foundation, Holahan et al.[29] evaluated the cost of coverage under

ACA Medicaid expansion and found that extending coverage could actually reduce costs, and some states might see a net savings with Medicaid expansion.

Enrolling and caring for this population in an effective manner can be challenging, and health care for the homeless programs can be crucial partners in outreach and engagement efforts. Specialized health care programs, such as BHCHP, work to improve the fragmented use of the medical system by assisting in Medicaid enrollment and providing integrated care that follows the Institute of Medicine's core principles of public health, including identifying community health problems, mobilizing community partners, linking people to needed health services, and promoting health and safety.[11] Following this framework has allowed many homeless individuals to start to access the medical care and services that they need in a timelier manner. Furthermore, integration of care under patient-centered and integrated behavioral health and medical service models hold future promise.

Second, as more homeless individuals obtain needed health insurance under the ACA Medicaid expansion, it will be critical for providers to establish care models that take into account the high prevalence of behavioral health disorders. Our findings confirmed that a majority of individuals have mental illness and SUDs, either alone or co-occurring. Better integration of behavioral health services with primary care will be critical. Although BHCHP improved the integration of primary care and behavioral health services through co-location of providers, shared medical records, and shared case conferencing, the development of Health Homes under the ACA could further provide additional funding to better align health care financing and delivery.

Third, our findings showed that, even within this cohort of high users of the medical system, there was a group of super-high users. The top 10% people incurred almost half of health care expenditures for homeless people, and a significant proportion of the study population had frequent ED visits or hospitalizations. This group needs to be targeted with new programs and more efficient payment models based on community outreach and engagement. Current efforts on targeting

TABLE 4—Health Care Expenditures for Boston Health Care for the Homeless Program Users With Medicaid, 2010

Variable	Behavioral Health Services, No. (%) or Mean ±SD	General Medical Care, No. (%) or Mean ±SD	Both, No. (%) or Mean ±SD
Overall expenditures[a]			
PMPM, $	653	1383	2036
Annual expenditures[b], $	7355 ±15 502	15 579 ±31 071	22 934 ±36 510,
Distribution of total annual expenditures[b]			
Total annual expenditures, $	47 756 358	101 156 508	148 912 866
Population ranked by annual expenditures per person, $			
Lowest 25% (n = 1623)	739 (0)	1 310 109 (1)	2 058 769 (1)
25%–50% (n = 1623)	668 020 (1)	5 136 725 (5)	9 737 568 (7)
50%–75% (n = 1623)	6 277 094 (13)	14 654 616 (15)	27 727 537 (19)
75%–90% (n = 974)	12 786 808 (27)	23 631 322 (23)	37 979 192 (26)
90%–100% (n = 650)	28 023 698 (59)	56 423 736 (56)	71 409 801 (48)
Total annual expenditures by type of service			
Hospitalizations	18 797 235 (39.4)	39 412 510 (39.0)	58 209 745 (39.1)
ED visits	3 428 304 (7.2)	12 589 927 (12.4)	16 011 738 (10.8)
Ambulatory care visits	642 807 (1.3)	9 278 497 (9.2)	9 921 304 (6.7)
Outpatient detoxification	6 291 717 (13.2)	NA	6 291 717 (4.2)
Prescription	2 973 794 (6.2)	6 655 325 (6.6)	9 629 119 (6.5)
Dental visits	NA	1 642 729 (1.6)	1 642 729 (1.1)
Others[c]	15 622 501 (33.0)	31 577 520 (31.4)	47 206 514 (31.6)

Note. ED = emergency department; NA = not applicable; PMPM = per member per month. One member was excluded from the calculation because of extremely high payments. The sample size was n = 6493.
[a]Includes MassHealth fee-for-service payments, managed care payment amount to their contracting providers, Medicare payments, third-party payments, and out-of-pocket payments reported in MassHealth fee-for-service claims and managed care encounter data.
[b]Median annual expenditure for both behavioral health and general medical care was 10 172
[c]Includes expenditures for intensive alcohol or drug services, psychotherapy, crisis intervention, drug screen, methadone treatment, skilled nursing in home health setting, and nonemergent transportation.

high users tend to focus at the practice level and result in improved quality of care but do not address the more systemic issues that require better alignment of incentives and data integration across different sectors of the health care system. The ACA is an important step towards more systemic improvement across the spectrum of health services. As the ACA promotes investigation of alternative models of care, there will need to be a focus on data-driven coordination of care across the medical care system.

Fourth, although out of the scope of this study, it is difficult to address the health care needs and disparities of this population without addressing their housing needs. Studies show that housing homeless individuals results in lower health care utilization and improvement in health.[4,5,30,31] Housing should be considered as a benefit that improves health and is a potential cost-saving intervention.

There were several limitations to this study. One limitation was the use of *ICD-9-CM* codes instead of chart reviews because claims-based *ICD-9-CM* codes might not capture the entire clinical picture because of underreporting or underdiagnosis.[32] The high burden of disease identified might still be understated. Furthermore, these analyses were based on analysis from a single year and did not allow comparisons over a longer period of time. The Massachusetts Medicaid expansion has been a slow process since the 1990s, and made a pre-expansion cohort difficult to discern. Additionally, since 2010, several new interventions have been initiated at BHCHP, including a patient-centered medical home initiative, which might change utilization patterns. We did not have access to utilization data on the 20% of homeless patients who did not have Medicaid. They might exhibit a different pattern of health care utilization, but we were not able to comment on this. Additionally, because of data availability, this study focused on 1 city in Massachusetts, and therefore, we could not comment on any regional variations. Given these limitations, these baseline data could be used for comparison purposes for future investigations. Future studies should focus on further clarifying the effects of being homeless on health status and risk stratification, as well as controlled trials on the use of housing interventions and integrated care models.

This study demonstrated the clinical characteristics and medical use patterns in a homeless population with Medicaid coverage. Medicaid expansion will provide a unique opportunity and will significantly improve access to care for homeless individuals. However, it will take extensive collaboration across different state offices, provider networks, community and human service organizations to manage the care for this population in a cost-effective manner while ensuring high quality of care. The data provided in our analysis should provide clinicians, administrators, and policymakers with important information on an understudied and vulnerable population with a high burden of illness and need for coordinated, high-quality care. ∎

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Contributors

M. Bharel conceptualized the study and developed the article, including writing, statistical analysis, and interpretation. W-C. Lin helped conceptualize the study, led the study design and statistical analysis, and

References

1. Kaiser Commission on Medicaid and the Uninsured. Medicaid coverage and care for the homeless population: key lessons to consider for the 2014 Medicaid expansion. 2012. Available at: http://www.kff.org/medicaid/upload/8355.pdf. Accessed on December 21, 2012.

2. Koegel P, Sullivan G, Burnam A, Morton SC, Wenzel S. Utilization of mental health and substance abuse services among homeless adults in Los Angeles. *Med Care*. 1999;37(3):306–317.

3. O'Toole TP, Pollini R, Gray P, Jones T, Bigelow G, Ford DE. Factors identifying high-frequency and low-frequency health service utilization among substance-using adults. *J Subst Abuse Treat*. 2007;33(1):51–59.

4. Basu A, Kee R, Buchanan D, Sadowski LS. Comparative cost analysis of housing and case management program for chronically ill homeless adults compared to usual care. *Health Serv Res*. 2012;47(1 Pt 2):523–543.

5. Larimer ME, Malone DK, Garner MD, et al. Health care and public service use and costs before and after provision of housing for chronically homeless persons with severe alcohol problems. *JAMA*. 2009;301(13):1349–1357.

6. Kushel MB, Vittinghoff E, Haas JS. Factors associated with the health care utilization of homeless persons. *JAMA*. 2001;285(2):200–206.

7. Yoon C, Ju YS, Kim CY. Disparities in health care utilization among urban homeless in South Korea: a cross sectional study. *J Prev Med Pub Health*. 2011;44(6):267–274.

8. Poulin SR, Maguire M, Metraux S, Culhane DP. Service use and costs for persons experiencing chronic homelessness in Philadelphia: a population based study. *Psychiatr Serv*. 2010;61(11):1093–1098.

9. Kushel MB, Perry S, Bangsberg D, Clark R, Moss AR. Emergency department use among the homeless and marginally housed: results from a community-based study. *Am J Public Health*. 2002;92(5):778–784.

10. Department of Housing and Urban Development, Office of Community Planning and Development. The 2010 annual homeless assessment report to Congress. Available at: https://www.onecpd.info/resources/documents/2010HomelessAssessmentReport.pdf. Accessed on December 19, 2012.

11. O'Connell JJ, Oppenheimer SC, Judge CM, et al. The Boston Health Care for the Homeless Program: a public health framework. *Am J Public Health*. 2010;100(8):1400–1408.

12. Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1–10.

13. *International Classification of Diseases, Ninth Revision, Clinical Modification*. Hyattsville, MD: National Center for Health Statistics; 1980. DHHS publication PHS 80–1260.

14. Agency for Healthcare Research and Quality. Clinical classification software for ICD-9-CM. Available at: http://www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp. Accessed December 1, 2012.

15. Pope GC, Kautter J, Ellis RP, et al. Risk adjustment of Medicare capitation payments using the CMS-HCC model. *Health Care Financ Rev*. 2004;25(4):119–141.

16. Verisk Health. DxCG intelligence site. Available at: http://www.veriskhealth.com/solutions/enterprise-analytics/dxcg-intelligence. Accessed December 1, 2012.

17. Beijer U, Wolf A, Fazel S. Prevalence of tuberculosis, hepatitis C virus and HIV in homeless people: a systematic review and meta-analysis. *Lancet Infect Dis*. 2012;12(11):859–870.

18. Dickey B, Normand SL, Weiss RD, Drake RE, Azeni H. Medical morbidity, mental illness, and substance use disorders. *Psychiatr Serv*. 2002;53(7):861–867.

19. Clark RE, Samnaliev M, McGovern MP. Impact of substance disorders on medical expenditures for medicaid beneficiaries with behavioral health disorders. *Psychiatr Serv*. 2009;60(1):35–42.

20. Seifert R, Anthony S. The basics of MassHealth. 2011. Available at: http://www.umassmed.edu/uploadedFiles/CWM_CHLE/Included_Content/Right_Column_Content/MassHealth%20Basics%202011-FINAL.pdf. Accessed December 26, 2012.

21. Hwang SW, Orav EJ, O'Connell JJ, Lebow JM, Brennan TA. Causes of death in homeless adults in Boston. *Ann Intern Med*. 1997;126(8):625–628.

22. Hwang SW, Wilkins R, Tjepkema M, O'Campo PJ, Dunn JR. Mortality among residents of shelters, rooming houses, and hotels in Canada: 11 year follow-up study. *BMJ*. 2009;339:b4036.

23. CDC National Diabetes Fact Sheet. 2011. Available at: http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf. Accessed December 26, 2012.

24. Alter MJ, Kruszon-Moran D, Nainan OV, et al. The prevalence of hepatitis C virus infection in the United States, 1988 through 1994. *N Engl J Med*. 1999;341(8):556–562.

25. Clark RE, Weir S, Ouellette RA, Zhang J, Baxter JD. Beyond health plans: behavioral health disorders and quality of diabetes and asthma care for Medicaid beneficiaries. *Med Care*. 2009;47(5):545–552.

26. Druss BG, Rosenheck RA, Desai MM, Perlin JB. Quality of preventive medical care for patients with mental disorders. *Med Care*. 2002;40(2):129–136.

27. Bartels SJ, Clark RE, Peacock WJ, Dums AR, Pratt SI. Medicare and Medicaid costs for schizophrenia patients by age cohort compared with costs for depression, dementia, and medically ill patients. *Am J Geriatr Psychiatry*. 2003;11(6):648–657.

28. Garcia TC, Bernstein AB, Bush MA. Emergency department's visitors and visits: who used the emergency room in 2007? 2007. Available at: http://www.cdc.gov/nchs/data/databriefs/db38.pdf. Accessed December 19, 2012.

29. Kaiser Family Foundation Commission on Medicaid and the Uninsured. The cost and coverage implications of the ACA Medicaid expansion. National and state-by-state analysis. 2012. Available at: http://www.kff.org/medicaid/upload/8384.pdf. Accessed December 26, 2012.

30. Sadowski LS, Kee RA, VanderWeele TJ, Buchanan D. Effect of housing and case management program on emergency department visits and hospitalizations among chronically ill homeless adults: a randomized trial. *JAMA*. 2009;301(17):1771–1778.

31. Buchanan D, Doblin B, Sai T, Garcia P. The effect of respite care for homeless patients. A cohort study. *Am J Public Health*. 2006;96(7):1278–1281.

32. Quan H, Parsons GA, Ghali WA. Validity of information on comorbidity derived from ICD-9-CCM administrative data. *Med Care*. 2002;40(8):675–685.