

Health Care Utilization in Homeless People: Translating Research into Policy and Practice

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Health Care Utilization in Homeless People: Translating Research into Policy and Practice

ABSTRACT

Homelessness is a major problem across North America: Approximately 3 million Americans have experienced homelessness within the last year, and parents accompanied by children account for about one-fifth of the U.S homeless population. Homeless people suffer from high rates of illness and frequently encounter barriers to accessing care. Comprehensive information on health care utilization for homeless people will help to guide the development of health policy, however, these data have not been attainable through administrative databases in the U.S., because only one-third of the homeless have Medicaid and more than half are uninsured.

The Agency for Healthcare Research and Quality (AHRQ) has funded investigator-initiated research projects for promoting developments related to Translating Research into Policy and Practice. This research study describes and summarizes the background, objectives, methods, research findings and implications for policy and practice from an AHRQ grant entitled “Health Care Utilization in Homeless People” (1 R01 HS04129-01), Stephen W. Hwang, M.D., M.P.H., Principal Investigator, St. Michael’s Hospital, University of Toronto.

The aims and primary objectives of this study were as follows: 1) To enroll a representative sample of homeless men, women, and families to obtain baseline data on these individuals, including demographic characteristics, history of homelessness, physical and mental health status, health conditions, usual source of health care, mental health problems, alcohol and drug problems, health beliefs, social supports, self-reported health care utilization, unmet needs for health care, and self-reported barriers to accessing health care; 2) To precisely quantify these homeless individuals’ total and annualized health care utilization (office-based visits, emergency department visits and hospitalizations) and health care costs over a 4-5 year (2004-2009) follow-up period within a system of universal health insurance; 3) To compare the intensity of health care utilization among homeless individuals in the general population of Toronto; 4) To identify individual characteristics that are predictive of high levels of health care utilization among the population; 4) To determine whether the use of office-based services by homeless people is associated with a likelihood of emergency department visits and/or hospitalization, after adjustment for baseline characteristics. The study was conducted in Toronto, Ontario, where there is both a large homeless population and comprehensive administrative databases that capture the delivery of all health services for every resident.

The study enrolled a random sample of 1,190 homeless individuals in Toronto, Canada, in 2004-2005. Sampling was stratified by sex and family status, resulting in the enrollment of 603 single men, 303 single women, and 284 heads of families (plus 421 children in these 284 families). Homeless participants were matched 1:1 to low income controls from the general population based on year of birth and sex. Data for the control group were obtained from the Registered Persons Database (RPDB) which includes all persons in Toronto, Ontario. The research team constructed a survey instrument that focused on factors likely to be associated with future health care utilization. These factors included demographic characteristics, history of

homelessness, health status, health conditions, propensity to seek healthcare, competing priorities, mental health problems, alcohol use problems, drug use problems, usual sources of health care, recent experiences with health care providers, barriers to accessing health care, and health locus of control.

Health care costs were estimated using data from the 2006 Medical Expenditure Panel Survey (MEPS), sponsored by The Agency for Healthcare Research and Quality (AHRQ). MEPS is a national longitudinal study that collects data on health care utilization and expenditures, health insurance, health status, and social, demographic, and economic characteristics for a representative sample of the non-institutionalized U.S. civilian population, their employers, and medical providers. National health care expenses in the U.S. civilian non-institutionalized population were obtained for the following event-level outcomes: hospital inpatient services, emergency room services and office-based medical provider services (restricted to physicians only) for 2006. The mean weighted expense per episode for each outcome was calculated from public use data files. Per episode expenses were multiplied by the total number of events for each type of health care utilization within each demographic group in order to estimate the costs associated with health care utilization in the sample of homeless participants and their matched controls.

This study will highlight important new research findings which have substantial policy implications. Knowledge from this research can inform the development of more effective strategies to deliver health care for homeless individuals and families in the U.S. The results from this study produced two important outcomes; 1) A detailed description of three separate categories of homeless people; and 2) Testing of the impact of office-based care on utilization of emergency department use. Documenting the burden of illness and the prevalence of diseases and conditions in the homeless population is critical to understanding the patterns of /primary care utilization and its relationship with utilization of emergency departments.

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EXECUTIVE SUMMARY

KEY FINDINGS AND IMPLICATIONS

- Among a representative sample of homeless individuals and age-and sex-matched low-income controls, all of whom had health insurance, rates of office-based care were 1.7 to 1.9 times higher among homeless individuals compared to controls.
- Rates of emergency department encounters were 9 times higher among homeless single men, 12 times higher among homeless single women, and 3.4 times higher among homeless adults in families, compared to controls.
- Rates of hospitalization were 8.5 times higher among homeless single males, 4.6 times higher among homeless single women, and 2.1 times higher among homeless adults in families, compared to controls.
- Health care utilization “outliers” were far more prevalent and more extreme among homeless participants than controls, particularly for non-ambulatory care. The maximum annual number of emergency department encounters was 108 per year in the homeless group, compared to 14 per year in the control group. The maximum annual number of hospitalizations was 14.9 per year in the homeless group, compared to 2.5 in the control group.
- Based on MEPS data on health care costs in the US, the observed levels of health care utilization in a representative sample of homeless individuals with health insurance would result in average annual costs of \$1815, \$1436, and \$2448 per person for office-based care, emergency department visits, and hospitalizations, respectively. The

corresponding average annual costs for an insured group of age- and sex-matched low-income controls would be \$1014, \$175, and \$517 per person.

- A major implication of these findings is that despite the fact that individuals who are homeless and have full health insurance have substantially higher rates of office-based care use than comparable non-homeless individuals, their use of emergency departments and hospitals remains much higher than that of controls. These differences are driven to a substantial extent by a small subset of homeless individuals who are extremely high utilizers of emergency departments and hospitals.

GENERALIZABILITY

These findings are relevant to the US for a number of reasons:

- Homelessness is a serious and common problem in cities across the US and Canada.
- The homeless population of Toronto is similar to that of homeless populations in the US in terms of age and sex distribution, reasons for homelessness, and physical and mental health comorbidities.
- The relationship between office-based physician care visits and emergency department visits among individuals with health insurance is expected to be comparable across different jurisdictions, because the phenomenon under investigation is not dependent on the mechanisms by which the insurance plans are funded.
- Cost estimates for office-based care visits, emergency department visits, and hospital admissions among homeless individuals were obtained using data on health care expenses in the U.S. civilian non-institutionalized population from the 2006 Medical

Expenditures Panel Survey (MEPS). This approach provides cost estimates that are applicable to the US.

IMPLICATIONS FOR QUALITY OF CARE

Findings from this study have a number of implications for the quality of care for homeless individuals.

- The provision of health insurance eliminates many but not all barriers to care for homeless people. After health insurance coverage has been established for homeless individuals, a number of major factors often associated with inequities in access to care (race, education, income, and drug, alcohol, and mental health problems) diminish in importance. However, even if insurance barriers were stripped away, additional barriers would need to be overcome.
- Among homeless individuals who have health insurance, lack of a primary care provider is a persistent problem and has a negative impact on access to needed care. This finding suggests that even if every homeless individual in the United States were to obtain health insurance, access to primary care providers would remain an issue.
- The novel finding of extremely high rates of pre-existing traumatic brain injury (TBI) among homeless individuals opens the door to improved quality of care for these individuals through improved recognition of previous TBI and resultant neuropsychological impairment in this population. Future research may help determine if TBI is a risk factor for homelessness, and whether improved quality of rehabilitative care for individuals with moderate to severe TBI might reduce the incidence of subsequent homelessness.

- Efforts to reduce the health care costs of homeless individuals who are high users of emergency departments and frequently admitted to hospitals may require targeted interventions, such as supportive housing, rather than depending primarily on efforts to improve access to or quality of ambulatory health care.

1. Introduction

Homelessness is a serious problem that affects large numbers of persons across North America. Approximately 3 million Americans have experienced homelessness within the last year,¹ and parents accompanied by children account for about one-fifth of the U.S. homeless population.² Although homeless people suffer from high rates of physical and mental illness, they are an extremely marginalized group whose needs are often neglected by the health care system.³

In order to effectively address the needs of the homeless, two types of information are required. The first is for accurate and comprehensive data on health care utilization by homeless people. This information has been difficult to obtain in the past. Specifically, there is a need for a detailed understanding of differences in health care utilization among homeless families, single women, and single men. These groups differ significantly in their health profile, with single women having a higher prevalence of mental illness, single men having a higher prevalence of substance abuse, and parents in homeless families having relatively lower rates of these conditions.^{3 4} The second information need is for high-quality data that can help guide the effective organization and delivery of health care for homeless people. Relatively sparse data is available on the effectiveness of various models of primary care delivery for homeless people.

This research project took advantage of a unique opportunity in Toronto, Canada, to track health care utilization in a homeless population at an unprecedented level of detail. The study was possible due to two facts: Toronto has a large homeless population that is similar in many respects to homeless populations in the U.S., and comprehensive administrative databases are available to ascertain all ambulatory visits, emergency department visits, and hospitalizations among every resident, including individuals who are homeless. As a result, this study can determine patterns of health care utilization and predictors of high health care use in a representative sample of homeless individuals, in a setting where all of these individuals have health insurance. In addition, this study can address the question of whether the provision of health insurance and primary care to homeless individuals decreases the likelihood of subsequent emergency department visits and hospitalizations.

This study generates important new findings that have substantial policy implications. Knowledge from this project will be useful in developing strategies to deliver health care for homeless individuals and families in the U.S. In particular, the findings from this study are relevant to health care organizations and insurers that serve homeless populations, such as health care systems in urban areas, state Medicaid Programs, and federally funded Health Care for Homeless Programs. This study's findings allow policy makers to understand the utilization patterns that drive health care costs in the homeless population, to identify which homeless people are likely to utilize these services, and to determine whether high-cost health care settings (such as emergency departments) are being used instead of, or in addition to, ambulatory care. This study is also the first to characterize the barriers to obtaining health care that persist for homeless people within a system where all of these individuals have health insurance. Thus, this

research provides a wealth of important new knowledge with enormous potential for translation into practice and policy.

2. Background of the Problem

Homelessness in the United States

Homelessness has been a persistent social problem in the United States for more than 25 years. People who are homeless live in a variety of locations: many sleep at emergency shelters, while others live on the street, or in parks, encampments, abandoned buildings, and vehicles. Less visible are those homeless individuals who stay temporarily in motels or with friends or family, moving frequently from place to place. Many factors put people at risk of homelessness, and individuals and families often become homeless due to the confluence of multiple adverse events and circumstances. Important systemic issues include a lack of affordable rental housing, low wages, unemployment, diminished benefit payments for the poor and disabled, lack of health insurance, racial discrimination, and the deinstitutionalization of people with mental illness. The recent financial crisis may be spurring a new wave of homelessness in America through mortgage foreclosures and job losses.⁵ These social and economic factors often interact with individual-level vulnerabilities such as alcohol and drug abuse, serious mental and physical illnesses, victimization by domestic violence, and childhood experiences of neglect and abuse. The net result is the loss of stable housing and the onset of homelessness.⁶

For most Americans, homelessness is a temporary state, not a permanent condition, and thus it is probably more appropriate to consider these individuals as “people experiencing homelessness” rather than “the homeless.” Nationwide, single men comprise about 50% of the homeless

population, whereas families with children make up about 25%, single women about 20%, and unaccompanied youth less than 5% of the homeless population.² Individuals experiencing homelessness in the United States are estimated to be 42 percent African-American, 39 percent white, 13 percent Hispanic, 4 percent Native American and 2 percent Asian.² Because of the frequent transitions of individuals into and out of homelessness, estimates of the size of the homeless population have to consider both the number of people who are homeless at a single point in time, as well as the much larger number of people who experience homelessness at some point during a year. The best estimate to date, which is now more than a decade old, is that between 444,000 to 842,000 Americans experience homelessness each night.^{1 7} Over a one year period, an estimated 2.3 to 3.5 million people, or approximately 1% of the U.S. population, experience homelessness.¹ A number of reports suggest that the prevalence of homelessness has risen over the last 10 to 20 years.²

Homelessness in Toronto

Toronto, Ontario, is Canada's largest city (population, 2.5 million) and the fifth most populous metropolitan area (population, 5.5 million) in North America. Located 70 miles north of Buffalo, New York, Toronto has a climate similar to that of many U.S. cities in the Northeast and Midwest. About 20% of Toronto's residents live in poverty. The city receives a large number of immigrants and is ethnically diverse, with almost 50% of the population belonging to minority groups.

Toronto has a sizeable homeless population that is very similar to the homeless population in the U.S. in terms of demographic characteristics and health conditions. About

5,000 individuals experience homelessness in Toronto on any given night, and approximately 29,000 people use emergency shelters over the course of one year.⁸ Parents accompanied by children account for 17% of Toronto's homeless population, compared to 15-25% of the U.S. homeless population.^{2 9} In Toronto, 71% of the homeless are single men and 12% are single women; in the U.S., these proportions are 67% and 20%, respectively. Among single women and men who are homeless in Toronto, the lifetime prevalence of mental illness is 67% and the lifetime prevalence of substance abuse or dependence is 68%.¹⁰ These figures are very similar to those reported for homeless people in the U.S.

People become homeless for similar reasons in the U.S. and Canada.¹¹ The deinstitutionalization of people with mental illness occurred almost simultaneously in the U.S. and Canada; a classic study documented how this practice contributed to urban homelessness in both California and Ontario.¹² The surge of crack cocaine use that took place in the U.S. in the mid-1980's was seen in Canadian cities 5 to 10 years later. As in many U.S. cities, Toronto experienced a dramatic decline in single-room occupancy hotels and "skid-row" type housing over the last few years.¹³ The economy and labor market of Canada is closely linked to that of the U.S., and stable full-time employment for unskilled workers has declined in both countries.¹³ Funding for the social safety net is comparable in the U.S. and Canada, with public expenditures for social services as a percentage of GDP of 15% and 18%, respectively (in contrast to far more disparate values in other countries, such as 8% in Mexico and 31% in Sweden).¹⁴

A unique research opportunity exists in Toronto because a highly accurate health care utilization database is available for all residents of the province Ontario, including individuals

who are homeless. This database is available within the context of a single-payer system of universal health insurance. Thus, Toronto is the ideal setting in which to obtain data on health care utilization in a representative sample of homeless people, data that are relevant to the American setting but which would be difficult if not impossible to obtain in the U.S.

Health Problems among People Experiencing Homelessness

The burden of illness and disease is extremely high among people experiencing homelessness.⁴ In a nationwide US survey of homeless adults, 39% had current mental health problems, 50% had current alcohol and/or drug problems, and 23% had concurrent mental health and substance use problems. Common psychiatric diagnoses include major depression, post-traumatic stress disorder, bipolar disorder, and schizophrenia. Homeless youth suffer from high rates of drug use and suicide attempts.

Many infectious diseases, including tuberculosis, HIV infection, and hepatitis B and C, occur at greatly elevated prevalence rates in the homeless population. Sexually transmitted infections are a particularly serious problem among street youth. Chronic diseases, including hypertension, diabetes, chronic obstructive pulmonary disease, seizures, and musculoskeletal disorders, are often undiagnosed or inadequately treated in homeless adults. Middle-aged and older adults who are homeless have high rates of heart disease and cancer. Unintentional injuries, physical assault, and sexual assault are common experiences.

Foot problems are very common and range from mild blisters and fungal infections to debilitating chronic venous stasis ulcers, cellulitis, diabetic foot infections, and frostbite. Other

common skin problems include sunburn and bites due to infestations by head lice, body lice, scabies, or bedbugs. Dental problems such as advanced caries, periodontal disease, and ill-fitting or missing dentures are extremely prevalent but often-neglected.

Given the high prevalence of illness among people experiencing homelessness and the adverse health effects of homelessness itself, it is not surprising that adults who are homeless have very high mortality rates. Men using homeless shelters are 2 to 8 times more likely to die than age-matched men in the general population.¹⁵ Homeless women 18 to 44 years old have mortality rates that are 5 to 31 times higher than women in the general population.¹⁶ Common causes of death in the homeless population include unintentional injuries, drug overdoses, AIDS, suicide, and homicide (for those under age 45 years), and cancer and heart disease (for those age 45 years and over).^{15 16}

The health of homeless mothers and children is of great concern. The prevalence of physical health limitations, major depressive illness, and post-traumatic stress disorder appears to be rising among homeless female heads of household.¹⁷ Some (but not all) studies of children in homeless families have found an increased prevalence of behavioral and mental health problems compared to children in housed low-income families.⁴ In a study conducted in New York City, up to 40% of children in homeless families suffered from asthma, a rate six times higher than the national rate in children.¹⁸

Barriers to Obtaining Health Care for Homeless People: Theoretical Framework & Research Data

While homeless people suffer from extremely high levels of illness, they also face numerous barriers to obtaining health care. The Behavioral Model of health services utilization, which is the dominant schema for classifying the factors that affect health care utilization in the general population, also provides a useful theoretical framework of barriers to obtaining health care among homeless people.¹⁹ In the Behavioral Model, factors are classified as characteristics of the health care delivery system or characteristics of the individual or population (**Table 1**). Characteristics of the individual or population are grouped into 3 categories: predisposing factors (attributes that affect the propensity to use services), enabling factors (resources that facilitate the use of services), and need factors (symptoms or health conditions that precipitate health service use).

Financial barriers to care, which can be considered primarily a feature of the health care system, are especially problematic for homeless people in the US, more than half of whom lack any form of health insurance.²⁰ Among homeless individuals, being uninsured is associated with lower use of ambulatory care, more frequent hospitalization, and an almost three-fold increase in self-reported inability to obtain needed care.^{20 21} Surprisingly, almost no published studies on barriers to care among homeless people have come from countries with systems of universal health insurance, such as the United Kingdom, other European countries, or Canada.

Table 1. Behavioral Model of Health Services Utilization. Examples of specific barriers relevant to homeless persons are shown in *italics*.

Characteristics of the Health Care Delivery System

1. Density (number per 1,000 population) of physicians, nurses, hospitals
2. Organization
 - a. Geographic distribution and location (*clinic or hospital located far from homeless shelter*)
 - b. Availability (*waiting time exceeds patient's planning horizon, long waiting times at health care facility, appointments conflict with time when patient must seek food or shelter, difficulty negotiating complex system*)
3. Provider Characteristics
 - a. Language/Cultural competence (*provider lacks understanding of homelessness*)
 - b. Bias (*health care site creates unwelcoming environment for homeless patients*)
4. Financial Factors/Health insurance (*lack of health insurance, lack of proof of insurance coverage, lack of coverage for dental services, eyeglasses, or prescription drugs*)

Characteristics of the Individual / Population

1. Predisposing Factors (Attributes affecting the propensity to use services)
 - a. Age/Sex/Ethnicity/Race/Culture
 - b. Education/Literacy (*low educational attainment, low health literacy*)
 - c. Mental illness/Substance abuse (*poor insight into health needs, addictive behavior preempts seeking health care*)
 - d. Health Beliefs (*belief that health controlled by external events, distrust of hospitals/doctors*)
2. Enabling Factors (Resources that facilitate the use of services)
 - a. Usual source of care (*emergency department as usual source of ambulatory care*)
 - b. Familiarity with local health care resources (*unaware of where to go for health care*)
 - c. Competing priorities (*struggle to obtain basic necessities of life result in lower priority for obtaining health care*)
 - d. Telephone (*inability to receive calls from health care providers*)
 - e. Transportation (*inability to afford travel to health care sites*)
3. Need Factors (Health conditions or illnesses that are immediate cause of health service use)
 - a. Perceived physical or mental health status
 - b. Perceived symptoms or illness episode

Homeless people also face non-financial barriers to obtaining care that persist even among those with health insurance. Commonly reported barriers include not knowing where to go to seek care, lack of transportation, lack of child care, and excessive waits for appointments and to be seen.^{22 23} “Competing priorities” refers to the fact that homeless people who spend a large proportion of their time meeting basic survival needs are likely to place a lower priority on obtaining health care and are more likely to go without needed medical care.^{24 25}

Distrust of physicians or the health care system is another particularly important factor for homeless individuals. Research suggests that much of this distrust is rooted in previous negative experiences with health care providers.^{26 27} Homeless individuals often report feeling unwelcome in health care settings, and they perceive their negative experiences to be the result of discrimination by health care providers on the basis of their homelessness or low social class.²⁸ Intense emotional responses to these experiences can greatly decrease homeless individuals' desire to seek health care in the future.²⁸ To address this barrier, advocates have proposed focused efforts to assess and improve health care providers' attitudes towards homeless people.^{29 30}

Federal Programs for Homeless Health Care

In recognition of the many barriers to obtaining care faced by homeless people, a number of U.S. Federal programs provide targeted support for homeless health care. The Health Care for the Homeless Program (administered by HRSA) makes grants to 205 community-based organizations in all 50 states, the District of Columbia, and Puerto Rico, to allow them to deliver health care to people experiencing homelessness.³¹ These programs provide access to primary

health care, mental health care, addiction services, outreach, and case management. Services are delivered at health clinics, homeless shelters and soup kitchens, mobile medical units, and by street outreach teams. In Fiscal Year 2008, the Health Care for the Homeless Program received \$174 million and served more than more than 750,000 people.

The Treatment of Homeless Persons Program (administered by SAMHSA) provides funds to community-based nonprofit organizations to provide mental health and substance abuse services for homeless individuals. These targeted programs reflect the fact that mainstream addiction and mental health services are often unable to adequately address the needs of the homeless population. This program is currently funded at \$43 million per year. The Projects for Assistance in Transition from Homelessness Program (administered by SAMHSA) provides funding for outreach, case management, and support services for people who are homeless or at risk of becoming homeless and who have serious mental illness or concurrent mental illness and substance use disorders. In Fiscal Year 2008, this program was funded at \$54 million.

The Department of Veterans Affairs operates many programs specifically designed to assist homeless veterans. In addition to providing outreach, housing supports, and employment assistance, a number of these programs deliver a range of health care services. These VA services include clinical assessment, case management, and referral to medical treatment for physical psychiatric disorders, and substance abuse.

The Impact of Homelessness on the Health Care System

As presented, people who are homeless tend to have poor health. Not surprisingly, some of these individuals are frequent users of health care, and very high-intensity service use by a relatively small number of homeless individuals can have a substantial impact on the health care system. In a national survey of homeless individuals, respondents were less likely to report at least 1 ambulatory care visit in the past year than the general population (63% vs. 75%), but their hospitalization rates in the past year were 4 times higher than U.S. norms.²⁰ These hospitalizations are associated with very high health care costs. A study conducted in New York City compared homeless patients and housed low-income patients who were admitted to public general hospitals.³² After adjusting for mental illness, substance abuse, and demographic characteristics, homeless patients stayed 4.1 days (36%) longer per admission than other low-income patients. The average additional cost per admission was \$2,414 for each patient who was homeless. Homeless persons represented only 10% of discharges, but accounted for 26% of public hospital expenditures for inpatient mental health and substance abuse treatment.

Individuals who are homeless are also frequent users of emergency department services. In a study of homeless persons in San Francisco, 40% had visited an emergency department at least once in the previous year, a rate 3 times the US norm.³³ Individuals who reported 4 or more emergency department visits in the past year represented less than 8% of the total sample, but accounted for 55% of emergency department visits by study participants. A study comparing homeless patients and a control group of housed patients presenting to an emergency department in New York City found that patients who were homeless were far less likely to have a primary care physician (8% vs. 82%) or a regular source of ambulatory care (28% vs. 83%), and had a

significantly higher median number of emergency department visits per year (6.0 vs. 1.6 visits) compared to the control group.³⁴ A similar study conducted in Denver found that patients who were homeless spent more time in the emergency department per visit (4.4 vs. 3.8 hours) and were more likely to use ambulance services (51% vs. 29%) compared to non-homeless patients.³⁵

Emergency Department Use & Access to Ambulatory Care

More than half of all people experiencing homelessness in the U.S. do not have health insurance, and 55-73% of clients of the federally-funded Health Care for the Homeless Program are uninsured.^{20 36 37} It is therefore tempting to hypothesize that homeless people's inadequate access to ambulatory care due to lack of health insurance is responsible for their high rates of emergency department visits. Surprisingly, currently available data do not provide strong support for this concept.

For the US population in general, visits to emergency departments are on the rise.³⁸ However, research studies do not support the assumption that uninsured patients are the primary cause of increased emergency department (ED) visits, or the assumption that uninsured patients present with less acute conditions than insured patients.³⁸ On the contrary, two major contributors to the rise in ED visits between 1996 and 2003 were increases in visits by non-poor persons and patients whose usual source of care was a physician's office.³⁹ Other studies have demonstrated that uninsured adults and privately insured adults have the same risk of being frequent ED users, and that poor health, not insurance status, is the main driver of frequent ED utilization.^{40 41 42}

It is not entirely certain whether these observations in the US general population also hold true for homeless individuals. What is clear is that homeless persons who are uninsured, just like other uninsured individuals, lack adequate access to primary care.³⁸ In a national sample of homeless individuals, having health insurance was associated with greater use of ambulatory care (odds ratio, 2.5), suggesting that the provision of health insurance would have a favorable impact on the ability of people who are homeless to obtain ambulatory care.²⁰ However, having health insurance was not associated with a decreased likelihood of emergency department visits among homeless individuals (odds ratio, 0.9). This finding suggests that utilization of the emergency department may not be sensitive to insurance status.²⁰ In fact, in another study of homeless people in San Francisco, having Medicaid or Medicare insurance was associated with an *increased* likelihood of frequent visits (>3 per year) to an emergency department.³³ This finding could be explained in part by the fact that homeless individuals with serious medical conditions may be more likely to obtain Medicaid or Medicare coverage than healthier individuals.

In a case-control study of homeless adults identified at soup kitchens in U.S communities, individuals who had ≥ 2 visits to a Health Care for the Homeless Program had a decreased likelihood of "inappropriate" emergency department use during the past 6 months (odds ratio, 0.4) after controlling for demographic covariates.⁴³ However, neither having health insurance nor the total number of primary care visits was associated with a decrease in "inappropriate" emergency department use.

Homeless individuals may also visit emergency departments due to food, shelter, and safety needs, rather than to seek health care. A recent study found that 29% of homeless patients, compared to 10% of non-homeless patients, stated that hunger, safety concerns, and lack of shelter were reasons they had presented to the emergency department.⁴⁴ If offered a place that ensured them food, shelter, and safety, 24% of homeless individuals stated that they would not have come to the emergency department.

The findings from these studies indicate that the provision of health insurance to individuals who are homeless would very likely increase their use of ambulatory care. Despite this fact, the evidence also suggests that the provision of health insurance may be insufficient to reduce the frequency of emergency department visits or the likelihood of inappropriate emergency department visits by homeless individuals. Instead, homeless people's high use of emergency departments may in fact be driven by poor general health, acute illnesses, and the need for food, shelter, and safety. This issue has important implications for urban health care systems. If the use of primary care services reduces emergency department visits, enhancing homeless people's access to ambulatory care would, in addition to improving health at the individual level, benefit the health care system by reducing the use of a relatively expensive setting for health care delivery and alleviating overcrowding in inner city emergency departments. On the other hand, if homeless people's use of emergency departments remains high despite access to and use of ambulatory care, solutions would need to look beyond the simple availability of primary care and focus instead on meeting basic human needs for food, shelter, and safety, and improving the severely compromised health of individuals experiencing homelessness.

This question cannot be answered through a controlled trial, since it would be both unfeasible and unethical to assign homeless individuals to receive or not receive health insurance. An alternate approach to obtaining a definitive answer is the one undertaken in this research: conducting an observational study in a health care system where all homeless individuals have health insurance.

Meeting the Challenge of Chronic Homelessness

In recent years, efforts to address the problem of homelessness have been revolutionized by the recognition that individuals who are chronically homeless represent a small proportion of the homeless population, yet account for a large proportion of service utilization in both emergency shelters and health care facilities.⁴⁵ In particular, individuals with severe mental illness (with or without substance abuse) are over-represented among people who are chronically homeless. The Housing First approach has been shown to be an effective intervention for this population.⁴⁶ Housing First, which based on a philosophy of consumer choice, offers chronically homeless individuals immediate housing in subsidized independent dwelling units and regular contact with an assertive community treatment team which offers them non-compulsory mental health services and social supports. The U.S. Interagency Council on Homelessness has strongly supported the Housing First model in its drive to promote the development of state and local 10-year plans to end chronic homelessness.⁴⁷

A major argument in favor of the Housing First model is that program costs are largely or at least partially offset by reductions in health care costs when individuals become housed and

subsequently decrease their use of emergency departments and hospital stays. These savings are particularly likely to occur when Housing First programs target severely ill, chronically homeless individuals who are health care utilization “outliers” with extremely high numbers of emergency department visits. Two important studies, both recently published in the *Journal of the American Medical Association*, provide evidence on this issue.

A randomized controlled trial conducted in Chicago enrolled 407 homeless adults with chronic medical illnesses who had been admitted to hospital. Participants were assigned to usual care or placement in long-term housing with case management services. After adjustment for baseline covariates, the intervention group had a relative reduction of 29% in hospitalizations, 29% in hospital days, and 24% in emergency department visits, compared to the usual care group.⁴⁸ A quasi-experimental study conducted in Seattle examined the effects of a Housing First intervention for chronically homeless individuals with severe alcohol problems. In 95 Housing First participants, total median health care costs decreased from \$4,066 per person per month before housing to \$1,492 and \$958 after 6 and 12 months in housing, respectively.⁴⁹ A similar study of 236 homeless individuals with mental illness, substance use disorder, and/or HIV infection in San Francisco found significant reductions in emergency department utilization after the provision of permanent supportive housing.⁵⁰

These studies raise important questions regarding the generalizability and economic benefits of Housing First as an intervention to end homelessness.⁵¹ There is little doubt that when this approach is applied to a highly selected subgroup of individuals who are chronically homeless and extremely frequent users of emergency departments and hospital care, substantial

reductions in health care costs may result. However, if Housing First initiatives are expanded to serve a broader range of the homeless population, including those who are not intensive users of the health care system, the degree of societal benefit in terms of decreased health care costs may diminish markedly. Although ending homelessness for these individuals would remain a worthy goal in and of itself, the economic argument that such a program practically "pays for itself" because of accompanying reductions in health care costs would be greatly weakened. At the present time, it is uncertain exactly what proportion of the homeless population are extremely high, high, or moderate users of the emergency department and hospital services. By delineating the magnitude of health care utilization in a random sample of homeless individuals, this study provides information that is of great use in determining the economic benefits of Housing First programs in terms of potential cost savings.

Measurement of Health Care Utilization by Homeless People

Accurate and comprehensive data on health care utilization by homeless people are difficult to obtain. Many previous studies are characterized by one or more of the following limitations: (1) reliance on self-reports, (2) lack of information on the frequency and exact dates of service use, (3) assessment of only one type of health service (e.g., hospitalizations, or mental health services), and (4) an exclusive focus on homeless individuals who have had contact with the health care system (e.g., those who are frequent users of the emergency department), rather than the use of a population-based sample of homeless people.

Numerous studies have measured the health care utilization of homeless men, women, and adolescents through self-reports that were not confirmed independently.^{20 23 52 53 54}

Unfortunately, there are grounds for concern regarding the accuracy of homeless people's self-reported health care utilization. In a study of homeless individuals in Pittsburgh who stated they had used health care in the last 6 months, review of records at four major health care sites failed to confirm 17% of self-reported visits.⁵² Among homeless people in Los Angeles who reported a visit to a specific homeless clinic in the last 12 months, chart review revealed that 22% had not been seen.⁵⁵ Among respondents who accurately reported that they had attended the clinic in the last 12 months, 49% under-reported their total number of visits. These findings suggest that homeless persons are less accurate than the general public in their recall of health care utilization.⁵⁵

Health Care Databases & Applications to Homelessness Research

The use of health care databases has clear advantages for measuring health care utilization in homeless populations. A handful of recent studies have applied these methods to homeless people who are participants in observational studies or randomized controlled trials of specific interventions. The most important recent studies of this type have examined programs such as long-term housing and case management services for hospitalized homeless adults with and without HIV infection,^{48 56} a Housing First intervention for chronically homeless individuals with severe alcohol problems,⁴⁹ and respite care for hospitalized homeless adults.⁵⁷ In all of these studies, utilization of health care services was a primary outcome and was ascertained by searching health care databases at a defined set of public health care institutions.

None of these studies have examined health care utilization in a representative sample of the homeless population using administrative databases. In fact, this would be an impossible

undertaking in the US, where health insurance databases fail to capture the majority of the homeless population. In contrast, Ontario has a single-payer system of universal health insurance. Almost all homeless people in Toronto are registered with the health insurance system. Databases at a central research center, the Institute for Clinical Evaluative Sciences (ICES), contain information on all acute-care hospitalizations, emergency department visits, and physician visits for every resident of Ontario. These databases enable researchers to obtain detailed and comprehensive measures of health care utilization over a period of many years in a cohort of study participants, even those for whom long-term in-person follow-up would be difficult or impossible. This system creates an unparalleled opportunity to track health care utilization in a homeless population at a level of detail never achieved in the U.S.

3. Research Objectives

The research study “Health Care Utilization in Homeless People” had the following primary objectives:

- To enroll a representative sample of homeless men, women, and families and obtain baseline data on these individuals, including demographic characteristics, history of homelessness, physical and mental health status, health conditions, usual source of health care, mental health problems, alcohol and drug problems, health beliefs, social supports, self-reported health care utilization, unmet needs for health care, and self-reported barriers to accessing health care;
- To precisely quantify these homeless individuals’ total and annualized health care utilization (office-based visits, emergency department visits, and hospitalizations) and health care costs over a 4.5-year (2004-2009) follow-up period within a system of universal health insurance;
- To compare the intensity of health care utilization among homeless individuals and a comparison group of age-and sex-matched low-income individuals in the general population of Toronto;
- To identify individual characteristics that are predictive of high levels of health care utilization among the homeless population;
- To determine whether the use of office-based care services by homeless people is associated with a reduced likelihood of emergency department visits and/or hospitalization, after adjustment for baseline characteristics;

4. Methods

Study Participants

The study enrolled a random sample of 1,190 homeless individuals in Toronto, Canada, in 2004-2005. Homelessness was defined as living within the last 7 days at a shelter, public place, vehicle, abandoned building, or someone else's home, and not having a home of one's own. Based on a pilot study, it was determined that about 90% of homeless people in Toronto slept at shelters, and that 10% did not use shelters but used meal programs.⁵⁸ Therefore, 90% of the study participants were recruited at shelters and 10% at meal programs.

Every homeless shelter in Toronto was contacted and permission to enroll participants at 58 (91%) of 64 shelters was obtained. Of these 58 shelters, 20 were for men, 12 were for women, 6 were for men and women, 12 were for youths aged 16-25 years, and 8 were for adults accompanied by dependent children. The number of beds at each shelter ranged between 20 and 406. Recruitment at meal programs took place at 18 sites selected at random from 62 meal programs in Toronto that served homeless people. The meal programs varied in the gender composition of the population served, with some sites serving exclusively males or females, while others served both males and females. Because the goal of recruiting at meal programs was to enroll homeless people who did not use shelters, individuals at meal programs who had used a shelter within the last 7 days were excluded.

Recruitment took place over a 1-year period to minimize the effect of seasonal fluctuations in the composition of the homeless population. Each month, approximately 15 site visits were conducted. An average of 6-7 individuals were recruited at each visit, for a total of about 100

participants recruited each month. At smaller sites, targeted recruitment was completed in a single visit, whereas many larger shelters required multiple visits scattered throughout the year to achieve their recruitment target. To reduce bias, the order of visits during the year was established using a random number generator. The number of participants recruited at each site was proportionate to the number of homeless individuals served monthly. Participants were recruited at random from bed lists or meal lines (using a random number generator) and then screened for eligibility.

Individuals who did not meet the study definition of homelessness, who were unable to communicate in English, and who were unable to give informed consent were excluded from the study. Other exclusions included homeless shelter users who were encountered at meal programs and those who did not have a valid Ontario health insurance number, which was required for tracking of health care use subsequent to the recruitment interview.

Of 2,515 individuals screened at homeless shelters and meal programs, 882 (35%) were ineligible: 442 individuals (18%) did not have an Ontario health insurance number, 229 (9%) did not meet our definition of homelessness, 104 (4%) were unable to communicate in English, 54 (2%) were homeless shelter users encountered at meal programs, and 53 (2%) were unable to give informed consent. Most of the 442 individuals who did not have an Ontario health insurance number were refugees, refugee claimants, or recent migrants to the province of Ontario. Of 1,633 eligible individuals, 443 declined to participate. This resulted in a final study population of 1,190 individuals (response rate among eligible individuals, 73%).

Sampling was stratified by sex and family status, resulting in the enrollment of 603 single men, 303 single women, and 284 heads of families (plus 421 children in these 284 families). In instances where two heads of family were present, we randomly selected either the mother or the father's interview. All participants gave written informed consent to participate in the study, and received \$15 for completing the survey. This study was approved by the research ethics board at St. Michael's Hospital.

Matched Controls

Homeless participants were matched 1:1 to low income controls from the general population based on year of birth and sex. Data for the control group were obtained from the Registered Persons Database (RPDB). The RPDB provides basic demographic information (including personal health numbers) for all individuals who had ever possessed an Ontario Health Insurance Plan card number, which serves as proof of health insurance coverage in the province of Ontario. Eligible controls were restricted to individuals who live in Toronto (based on postal code) and who lived in the lowest neighborhood income quintile according to 2006 Canadian census data (Statistics Canada, 2006) as of July 1, 2005 (the approximate mid-point of our study) and who were alive and registered in the RPDB during the study enrollment period. Eligible controls were grouped according to sex and birth year and matched to homeless participants using an algorithm that randomly assigned each case a matched control. Matching was performed for all homeless participants who provided consent for data linkage and who possessed a valid personal health number (n=1,165).

Survey Instrument and Measures

The research team constructed a survey instrument that focused on factors likely to be associated with future health care utilization. These factors included demographic characteristics, history of homelessness, health status, health conditions, propensity to seek healthcare, competing priorities, mental health problems, alcohol use problems, drug use problems, usual sources of health care, recent experiences with health care providers, barriers to accessing health care, and health locus of control.

The SF-12, a generic measure of health status that has been validated in homeless populations,⁵⁹ was used to generate a physical component subscale score and mental component subscale score.⁶⁰ These scores range continuously from 13 to 69 for physical health and 10 to 70 for mental health, and are standardized so that a mean score of 50 and a standard deviation of 10 is achieved in the general U.S. population.⁶⁰ The health status of children in homeless families was assessed using the SF-10 for Children Health Survey (formerly known as the CHQ-10), which is a validated instrument that relies on information provided by the child's parent or guardian.⁶¹

Health conditions were identified using a list of conditions taken from the U.S. National Survey of Homeless Assistance Providers and Clients (NSHAPC).⁶² Propensity to seek healthcare was derived from a set of previously validated questions asking if the individual would seek care in specific clinical scenarios.⁶³ The presence or absence of competing profiles (difficulty in obtaining basic survival needs, which may interfere with one's ability to seek care) was assessed using a series of questions from a study conducted by Gelberg and colleagues.⁶⁴

Mental health problems, alcohol problems, and drug problems in the past month were assessed using the Addiction Severity Index (ASI),^{65 66} which has been validated with homeless people and has been used in numerous studies^{67 68 69 70} Problems were dichotomized as present or absent using cut-off scores for each subscale based on criteria used in a federally-sponsored survey of homeless persons across the United States.⁶² These criteria included the classification of participants as having mental health problem if their ASI mental health score was ≥ 0.25 , alcohol problem if their ASI alcohol score was ≥ 0.17 , and drug problem if their ASI drug score was ≥ 0.10 .⁶²

Data on usual sources of health care, recent experiences with health care providers and barriers to assessing health care were obtained using items adapted from the NSHAPC and the Commonwealth Fund's 2001 Health Care Quality Survey.^{62 71} Locus of control was assessed using the Multidimensional Health Locus of Control (MHLC) scale.^{72 73} Social supports were assessed using instruments adapted from Rosenheck and colleagues.⁷⁴ History of TBI among participants was ascertained using a series of questions adapted from a study of lifetime prevalence of TBI among prison inmates.⁷⁵

Assessment of Health Care Utilization

Health care utilization was assessed through a linkage with Ontario health care databases at the Institute for Clinical and Evaluative Services (ICES) in Toronto. All included study participants gave written informed consent to perform this linkage. The linkage was achieved using each participant's health insurance number, a unique 10-digit number assigned to every

insured individual in Ontario. This number does not change over an individual's lifetime. The province of Ontario issues each insured individual a "health card" which displays the individual's photograph, name, date of birth, and health insurance number. Almost all health care providers require patients to present this card at every clinical encounter as proof of insurance. At the time of recruitment, all participants were asked to produce their health card. Those without a health card in their possession provided consent for the research team to obtain their health insurance number by contacting previous health care providers. As a result of these efforts, health insurance numbers were obtained for 97% of study participants.

An exact match between the health insurance number obtained and the ICES registry of valid health insurance numbers (referred to as a "deterministic linkage") was achieved for 94% of participants. A deterministic linkage was not possible for 6% of study participants because the participant's health insurance number could not be obtained (3%) or the health insurance number that the participant provided was not valid (3%). For these individuals, an effort was made to link the participant to the ICES registry of health insurance numbers based on the participant's first name, last name, sex, and date of birth. This procedure, which is termed a "probabilistic" linkage, resulted in a match for 4% of study participants. Thus, we were able to obtain health care utilization data for 98% (n=1,165) of study participants (94% using deterministic linkage plus 4% using probabilistic linkage). Personal health card numbers for matched controls were obtained from the RPDB.

Five health care databases were used in this study: the Ontario Health Insurance Plan (OHIP) database, the National Ambulatory Care Reporting System (NACRS), the Canadian

Institute for Health Information Discharge Abstract Database (CIHI-DAD), the Ontario Mental Health Reporting Systems (OMHRS) database, and the Registered Persons Database (RPDB).

The OHIP database contains information on physician billings related to ambulatory care encounters. Physicians obtain patient information at the time of the encounter and submit the data to the OHIP. As a result, virtually all visits for insured health services that result in a charge by a physician are captured in the OHIP database. Data on service date, ICD-10CA diagnosis codes, physician specialty, physician number, OHIP fee code and total fee paid to the physician were obtained from this database for study analyses. This database allows for the identification of encounters with physicians at physician offices, emergency departments, inpatient hospital settings, and long-term and home-based care settings as well as phone consultations. In Toronto, the vast majority of these encounters for homeless individuals occur in the physician's office. For this reason, study analyses were restricted to include only office-based physician billings.

In Ontario, a number of Community Health Centres (CHCs) have been established to provide care in certain disadvantaged neighborhoods. CHCs are often the main source of ambulatory care for individuals who lack health insurance. Physicians at CHCs are salaried and do not bill on a fee-for-service basis. As a result, ambulatory care encounters at CHCs do not appear in the OHIP database (even if the patient has health insurance). In Toronto, five CHCs are specially mandated to provide primary care for homeless individuals in their catchment area. To capture these ambulatory care visits, electronic searches were conducted on the patient encounter databases at the 5 CHCs in Toronto with health care programs specifically targeting homeless people.

The NACRS acquires data on every outpatient encounter with hospital and community-based ambulatory care. Each emergency department transmits data directly to NACRS. Study analyses were restricted to include only emergency department encounters. Meanwhile, encounters for dialysis, same day surgery and oncology outpatients were excluded from the analysis. Data on participants' registration/triage date, registration/triage time, ICD-10CA diagnosis codes and triage level were extracted from this dataset.

The CIHI-DAD contains demographic, administrative and clinical data for general hospital discharges (inpatient acute, chronic, rehabilitation) and day surgeries. Hospital reporting to CIHI is mandated, which permits capturing all hospital discharges in the province of Ontario. Data on admission date, discharge date, length of stay, ICD10-CA diagnosis codes and diagnosis type were collected from the CIHI database for study analyses.

The OMHRS database captures information such as medical diagnoses and mental disorders for all adult inpatient mental health beds in Ontario from 2006 onwards. Data on admission date, discharge date, length of stay, and primary and secondary provisional diagnoses at admission are available in this database.

Assessment of Health Care Costs

Health care costs were estimated using data from the 2006 Medical Expenditure Panel Survey (MEPS), sponsored by the Agency of Health Care Research and Quality (AHRQ). MEPS is a national, longitudinal study that collects data on health care utilization and expenditures,

health insurance, health status, and social, demographic, and economic characteristics for a representative sample of the non-institutionalized U.S. civilian population, their medical providers, and employers.¹ It includes three components: (i) the Household Component, which collects data from individual households and their members; (ii) the Insurance Component, which collects data from private- and public-sector employers on their health insurance plans; and (iii) the Medical Provider Component, which collects data on health care providers (e.g. hospitals, physicians, home care providers, and pharmacies) that are identified by household participants.

National health care expenses in the U.S. civilian non-institutionalized population were obtained for the following event-level outcomes: hospital inpatient services, emergency room services and office-based medical provider services (restricted to physicians only) for 2006. Ambulatory care expenditures were restricted to office-based medical services, as the majority of physician encounters for homeless people occur in physician offices. Contributions from more costly outpatient care settings for this population are minimal. Health care expenses represent payments to hospitals, physicians, and other health care providers according to health care utilization data obtained from the Household Component and payment information obtained from the Household and Medical Provider Components. The mean weighted expense per episode for each outcome was calculated from public use data files. Per episode expenses were multiplied by the total number of events for each type of health care utilization within each demographic group in order to estimate the costs associated with health care utilization in our sample of homeless participants and their matched controls.

Analytic Technique

¹ More information is available from: http://www.meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp.

A summary of total and annualized rates of health care utilization over the follow-up period (2004-2009) was examined using summary statistics (frequencies, mean, median, SD, and range) for both homeless participants and their matched controls by demographic group (single males, single females, and adults in families). Health care utilization rates were calculated by dividing the total number of health care encounters (per demographic group) for each source of health care (office-based care, emergency department visits, and hospitalizations) by the total amount of time under observation during the study period (person-time at risk). Person-time at risk represents the difference in time between the cases' enrollment date into the study and the end of the observation period (March 31, 2009). Death data for both cases and controls were obtained from the RPDB and were used to adjust (if necessary) the person-time at risk. Health care utilization rates were compared between the homeless participants and the control group using risk ratios, the ratio of healthcare utilization rates among the homeless participants divided by the utilization rates among the matched controls, for each source of healthcare by demographic group.

5. Results

Successful linkage of health care utilization data was conducted for 1,165 (98%) of the 1,190 enrolled adult participants: 587 single males, 296 single females, and 282 adults in families, as well as their matched controls. Summary statistics of health care utilization among the study sample during the 4.5 year study period (2004-2009) are provided in **Table 1 for participants and in Table 3 for controls**. **Table 2** displays the annualized rate of health care utilization among the study sample and **Table 4** displays the annualized rates among the controls.

Office-based Encounters

During the entire study period, a total of 1,079 (92.6%) of the homeless study participants had encounters with office-based care (**Table 1**). By demographic group, 88.1% of single males, 96.6% of single females, and 97.9% of adults in families had office-based encounters. The number of office-based care encounters totaled 43,888 and the range was 0 to 561. Based on mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical providers services (physicians only), the total cost of office-based care encounters over the study period was \$7,912,129 USD or \$6,792 USD per person (**Table 1**).

The mean annual rate of office-based care encounters during the study period was 10.1 per person (SD 14.0) (**Table 2**). Single women had the highest mean annual rate of office-based care (12.2 per person), followed by adults in families (11.3 per person), and single men (8.4 per person). Individuals with extremely high numbers of health care utilization were apparent, with the maximum mean annual number of office-based care encounters being 141.3. The estimated total annual cost of office-based care encounters was \$2,114,754USD, or an average of \$1,815 USD per person (**Table 2**).

In comparison, 976 (83.8%) of matched controls had office-based care encounters during the study period (**Table 3**). Matched controls had 18,511 fewer encounters with office-based care during the study period in comparison to homeless participants, resulting in a total of 25,377 encounters among controls. Based on mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical providers services (physicians only),

the total cost of office-based care encounters over the study period was \$4,574,966 USD among controls, which equates to about 60% of the total cost for homeless participants (**Table 3**).

By demographic group, the mean annual rate of office-based care encounters during the study period for controls (**Table 4**) was: 4.9 per person (SD=7.9) for single males, 6.4 per person (SD=7.2) for single females and 6.4 per person (SD=6.0) for family adults. In comparison to matched controls, the office-based care utilization rates for homeless study participants were 1.7 times higher among single males, 1.9 times higher among single females and 1.8 times higher among family adults. The estimated total annual cost of office-based care encounters among matched controls was \$1,181,187 USD (**Table 4**).

Emergency Department Encounters

During the study period, 900 (77.3%) homeless participants had encounters with a hospital emergency department (ED). By demographic group, 76.5% of single males, 85.8% of single females, and 69.9% of adults in families had ED encounters. Participants had a total of 8,898 ED encounters and a range of 0 to 417 ED encounters during the study period. Based on the mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for emergency room services, the total ED cost was \$6,118,087 USD or \$5,252 per person (**Table 1**).

The mean annual rate of ED encounters for homeless participants was 2.1 per person (SD 5.2). Single women had the highest mean annual rate of ED encounters (2.8 per person), followed by single men (2.2 per person), and adults in families (1.1 per person). Individuals with extremely high numbers of ED encounters were apparent with the maximum mean annual

number of ED encounters being 107.7. The estimated total annual cost of ED encounters was \$1,673,353 USD, or an average of \$1,436 USD per person (**Table 2**).

In comparison, 426 (36.6%) of matched controls had emergency department encounters during the study period. Matched controls had 7,767 fewer emergency department visits during the study period in comparison to homeless participants, resulting in a total of 1,131 encounters among controls. Based on mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for emergency department visits, the total cost of emergency department encounters over the study period was \$777,653 USD among controls, which equates to about 13% of the total cost for homeless participants (**Table 3**).

By demographic group, the mean annual rate of office-based care encounters during the study period for controls was: 0.2 per person (SD=0.8) for single males, 0.2 per person (SD=0.5) for single females and 0.3 per person (SD=0.9) for family adults. In comparison to matched controls, the emergency department utilization rates were 9.3 times higher among single males, 12.0 times higher among single females and 3.4 times higher among family adults. The estimated total annual cost of emergency department encounters among matched controls was \$204,263 USD (**Table 4**).

Hospitalizations

During the study period, a total of 361 (31.0%) homeless participants had been hospitalized. By demographic group, 24.7% of single males, 38.9% of single females, and 35.8% of adults in families had been hospitalized. These 361 participants had a total of 819

hospitalizations and a range of 0 to 39 hospitalizations. Based on the mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for hospital inpatient services, the total hospitalization costs over the study period were \$8,640,794 USD, or an average of \$7,417 USD per person (**Table 1**).

The mean annual rate of hospitalizations among the homeless during the study period was relatively low with 0.2 per person-year (SD 0.8), and were similar among the three demographic groups; single males, single females, and adults in families. The annual rate of hospitalizations ranged from 0 to 14.9 per person. The estimated annual hospitalization cost was \$2,851,568 USD, or an average of \$2,448 USD per person (**Table 2**).

In comparison, 145 (12.4%) of matched controls were hospitalized during the study period. Matched controls had 608 fewer hospitalizations during the study period in comparison to homeless participants, resulting in a total of 211 hospitalizations among controls. Based on mean weighted cost estimates from the Medical Expenditure Panel Survey (MEPS) for hospitalizations, the total cost of hospitalization over the study period was \$2,226,139 USD among controls, which equates to about 26% of the total cost of hospitalization for homeless participants (**Table 3**).

The estimated total annual cost of hospitalizations among matched controls was \$602,270 USD (**Table 4**).

6. Research Results from Published Papers: Translating Research Into Practice and Policy (TRIPP)

A number of papers resulting from this study have been published or are in print. These papers and their implications for policy and practice are detailed below.

*The Effect of Traumatic Brain Injury on the Health of Homeless People*⁷⁶

Canadian Medical Association Journal.2008; 179(8):779-84.

Full text available at: <http://www.cmaj.ca/cgi/reprint/179/8/779>

Summary: The objectives of this study were to determine the lifetime prevalence of traumatic brain injury and its association with current health conditions in a representative sample of homeless individuals in Toronto. Traumatic brain injury was defined as any self-reported head injury that left the person dazed, confused, disoriented, or unconscious. Injuries resulting in unconsciousness >30 minutes were defined as moderate/severe. Lifetime prevalence rates were 53% for any traumatic brain injury and 12% for moderate/severe traumatic brain injury. First traumatic brain injury occurred *before* the onset of homelessness in 70% of those injured. After adjustment for demographic characteristics and lifetime duration of homelessness, a history of moderate/severe traumatic brain injury was associated with significantly increased likelihood of seizures (odds ratio [OR] 3.2; 95% confidence interval [CI], 1.8, 5.6), mental health problems, (OR 2.5; 95% CI, 1.5, 4.1), drug problems (OR 1.6; 95% CI, 1.1, 2.5), poorer SF-12 physical health status (-8.3 points; 95% CI, -11.1,-5.5), and poorer SF-12 mental health status (-6.0 points, 95% CI, -8.3, -3.7). Prior traumatic brain injury is very common among homeless people and is associated with poorer current health.

Translating Research Into Policy and Practice (TRIPP): Since its publication, this paper has generated an enormous amount of interest among health care providers who work with homeless patients. The National Health Care for the Homeless Council (NHCHC) is a national organization of clinicians, agencies, advocates, and consumers who work to improve the health of homeless people and who seek adequate housing, health care, and income for everyone.⁷⁷ NHCHC has contacted Dr. Hwang to help co-lead a proposed study of the prevalence of TBI among homeless individuals in the US through the NHCHC's Practice-Based Research Network (PBRN). This project will involve Health Care for the Homeless Programs in 10 cities across the US. The study will be conducted in collaboration with Dr. Pam Diamond in Houston, Texas, who has developed a new TBI Questionnaire (the TBIQ) that has been validated with prison populations.⁷⁸ This knowledge translation effort has the potential to allow practitioners to develop new paradigms about the causes of homelessness and new interventions that may help prevent or end homelessness for some individuals.

*The Health of Homeless Immigrants.*⁷⁹

Journal of Epidemiology and Community Health. 2009;63:943-8.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/19654122>

Summary: What is already known about this subject:

- Homeless people have much poorer health status than the general population.
- Immigrants tend to be healthier than their native-born counterparts in the general population (the “healthy immigrant effect”).

What this study adds:

- Compared to other homeless people, homeless recent immigrants have fewer physical and mental health problems and more likely to report economic and housing issues as barriers preventing them from getting out of homelessness.
- The “healthy immigrant effect” can be generalized to highly marginalized groups such as the homeless.
- About one-fourth of homeless recent immigrants have had mental health problems in the past 30 days.

This study examined the association between immigrant status and current health in a representative sample of 1,189 homeless people in Toronto, Canada. Multivariate regression analyses were performed to examine the relationship between immigrant status and current health status (assessed using the SF-12) among homeless recent immigrants (≤ 10 years since immigration), non-recent immigrants (> 10 years since immigration), and Canadian-born individuals. After adjusting for demographic characteristics and lifetime duration of homelessness, recent immigrants were significantly less likely to have chronic conditions (RR 0.7, 95% CI 0.5 to 0.9), mental health problems (OR 0.4, 95% CI 0.2 to 0.7), alcohol problems (OR 0.2, 95% CI 0.1 to 0.5), and drug problems (OR 0.2, 95% CI 0.1 to 0.4) compared to non-recent immigrants and Canadian-born individuals. Recent immigrants were also more likely to

have better mental health status (+3.4 points, SE \pm 1.6) and physical health status (+2.2 points, SE \pm 1.3) on scales with a standard deviation of 10 in the general population.

Translating Research Into Policy and Practice (TRIPP): This study has two major implications for practice. First, recent immigrants who become homeless are a distinct group who are generally much healthier than other homeless individuals and presumably have very different set of service needs. Specifically, they are much less likely to need treatment for substance abuse. Thus, interventions that specifically focus on job skills, training, and employment may be especially advantageous for this group. Second, although homeless recent immigrants have lower levels of mental health problems than other homeless people, their prevalence of mental health problems is still quite high (23%). The authors conclude that these findings suggest the need for access to culturally appropriate mental health services for recent immigrants who become homeless. Finally, the authors argue that their findings indicate that further efforts are needed to develop strategies to prevent recent immigrants from becoming homeless due to primarily economic reasons.

*Universal Health Insurance and Health Care Access for Homeless People*⁸⁰

American Journal of Public Health. 2010; 100(8) :xx. (to be published July 2010)

Summary: Studies of homeless people in the United States have identified lack of insurance as a major barrier to accessing health care. This study examines the extent of unmet needs that persist among homeless people within a system of universal health insurance. The study determined the prevalence of and factors associated with self-reported unmet needs for

health care in the past 12 months among a random sample of 1,172 homeless single men, single women, and women with dependent children in Toronto, Canada. Unmet needs for health care in the past 12 months were reported by 17% of study participants. Single women reported the highest rate of unmet needs (22%), followed by women with dependent children (17%), and single men (14%). Compared to the general population of Toronto, unmet needs for health care was significantly more common in all three demographic groups, with age-adjusted standardized morbidity ratios (SMR) of 146 (95% CI, 114-184) for homeless single women; 227 (95% CI, 168-301) for homeless women with dependent children, and 136 (95% CI, 109-168) for homeless single men (an SMR of 100 indicates a level of unmet needs equivalent to that of the general population). Only 27% of the individuals who reported unmet needs for care stated that they or their doctor thought they needed to see a specialist in the past 12 months but they were not able to. This finding strongly suggests that the majority of reported unmet needs for care were related to needs for primary care.

A multivariate model identified 4 factors significantly associated with an increased likelihood of unmet needs for health care: younger age, having been a victim of physical assault in the past 12 months, having a poorer SF-12 mental health score, and having a poorer SF-12 physical health score. The following characteristics were associated with a trend towards unmet needs for care, but did not reach statistical significance at the $p < 0.05$ level: being a single woman, longer lifetime duration of homelessness, not having a primary care provider, and higher propensity to underseek health care. Variables that were not associated with unmet health care needs were race, immigrant status, education level, income, and a history of drug, alcohol, or mental health problems in the past 30 days.

Translating Research Into Policy and Practice (TRIPP): . This study demonstrates that the provision of health insurance eliminates many but not all barriers to care for homeless people. Specifically, the study's findings support the concept that once health insurance coverage is established for individuals who are homeless, a number of major factors often associated with inequities in access to care (race, immigrant status, education, income, and drug, alcohol, and mental health problems) diminish in importance. The study also provides insights into what happens when financial barriers are stripped away, revealing another set of barriers which will need to be overcome. It is anticipated that this information will be of particular interest to practitioners working in federally-funded Health Care for the Homeless Programs.

The strong association between recent history of physical assault and unmet health care needs indicates the major impact of violence in the lives of individuals who are homeless. The authors argue that this finding suggests a need for programs and services that specifically intervene with homeless individuals who may avoid needed health care due to fear based on their experiences of violence or ongoing victimization.

A policy-relevant factor is the importance of having a primary care provider. In this study, 32% of homeless individuals in Toronto did not have a primary care provider, whereas only 10% of Ontario residents aged 12 years or older do not have a regular medical doctor. Not having a primary care provider was associated with unmet needs for care in univariate analysis, and this relationship approached significance even when all other covariates were included in the model. Thus, even when individuals who are homeless benefit from universal health insurance,

disparities in primary care persist, and not having a primary care provider has a negative impact on access to care. The authors argue this finding suggests that even if every homeless individual in the United States were to obtain health insurance, targeted Federal programs such as the Health Care for the Homeless Program would need to continue to play a key role in ensuring that these individuals had access to a primary care provider.

*Multidimensional Social Support and the Health of Homeless Individuals*⁸¹

Journal of Urban Health. 2009 Sep;86(5):791-803.

Abstract: <http://www.ncbi.nlm.nih.gov/pubmed/19629703>

Summary: Homeless individuals often suffer from serious health problems. It has been assumed that the homeless are socially isolated and have low levels of social support and social functioning, and that this lack of social resources contributes to their ill health. These observations suggest the need to further explore the relationship between social networks, social support, and health among persons who are homeless. The purpose of this study was to examine the association between multidimensional (cognitive/perceived and behavioural/received) social support and health outcomes, including physical health status, mental health status, and recent victimization, among a representative sample of homeless individuals in Toronto, Canada. Multivariate regression analyses were performed on social support and health outcome data from a sub-sample of 544 single, homeless adults. Results indicated that participants perceived moderately high levels of access to financial, emotional, and instrumental social support in their social networks. These types of perceived social supports were related to better physical and mental health status and lower likelihood of victimization.

Translating Research Into Policy and Practice (TRIPP): These findings suggest a need for more services that encourage the integration of homeless individuals into social networks and the building of specific types of social support within, in addition to more research into social support and other social contextual factors (e.g., social capital) and their influence on the health of homeless individuals.

*Drug problems among homeless individuals in Toronto, Canada: Prevalence, drugs of choice, and relation to health status.*⁸²

BMC Public Health. 2010;10:94.

Abstract: <http://www.biomedcentral.com/1471-2458/10/94>

Summary: The objective of this study was to determine the prevalence and characteristics of drug use among a representative sample of homeless individuals and to examine the association between drug problems and physical and mental health status. Recruitment of 603 single men, 304 single women, and 284 adults with dependent children occurred at homeless shelters and meal programs in Toronto, Canada. Information was collected on demographic characteristics and patterns of drug use. The Addiction Severity Index was used to assess whether participants suffered from drug problems. Associations of drug problems with physical and mental health status (measured by the SF-12 scale) were examined using regression analyses. Forty percent of the study sample had drug problems in the last 30 days. These individuals were more likely to be single men and less educated than those without drug problems. They were also more likely to have become homeless at a younger age (mean 24.8 vs. 30.9 years) and for a longer duration (mean 4.8 vs. 2.9 years). Marijuana and cocaine were the

most frequently used drugs in the past two years (by 40% and 27% of respondents, respectively). Drug problems within the last 30 days were associated with significantly poorer mental health status (-4.9 points, 95% CI -6.5 to -3.2) but not with poorer physical health status (-0.03 points, 95% CI -1.3 to 1.3). These findings indicate drug use is common among homeless individuals in Toronto. Current drug problems are associated with poorer mental health status but not with poorer physical health status.

Translating Research Into Policy and Practice (TRIPP): The study highlights that drug use is associated with a substantial negative impact on mental health, as well as earlier onset and longer duration of homelessness. This suggests the need for early interventions aimed at preventing initiation of street drug use, and improved access to drug treatment programs for homeless individuals.

7. Implications for Policy: Managing Health Care Utilization & Health Care Costs

This analysis delineates the high total health care utilization (office-based care, emergency department visits, and hospitalizations) over a 4.5-year period (2004-2009) among homeless men, women, and adults in families with health insurance. Of the 1,165 participants for whom health care utilization data were available, 92.6% had office-based care, 77.3% had emergency department visits, and 31% had been hospitalized over the study period. In comparison, only 84.2% of their matched controls had healthcare encounters during the study period: 83.8% had office-based care, 36.6% had emergency department visits, and 12.4% had been hospitalized. Individuals who are health care utilization “outliers” with extremely high numbers of office-based care, emergency department visits, and/or hospitalizations were evident

among both cases and controls. However, examination of the range of encounters per person (see Tables 1 and 3) suggests that health care utilization “outliers” were more prevalent among homeless participants relative to controls, particularly for emergency department use and hospitalizations. For example, the number of emergency department encounters per person during the study period among homeless participants ranged to a maximum of 417 encounters per person, compared to controls where the maximum was only 60 encounters per person.

Health care utilization rates among Toronto’s homeless population were considerably higher than age- and sex-matched low income controls from the general population. Particularly, risk ratios for emergency department use and hospitalizations were 2 to 12 times higher than controls, depending on the demographic group. The annual mean rate of office-based care encounters was 8.4 per person among single males, 12.2 per person among single females and 11.3 per person among adults in families. These rates are 1.7, 1.9, and 1.8 times higher, respectively, than the rates among matched controls. The annual mean rate of emergency department encounters was 2.2 per person among single males, 2.8 among single females, and 1.1 among adults in families, which equate to rates 9.3, 12.0, and 3.4 times higher, respectively, than matched controls. The annual mean rate of hospitalizations was 0.2 per person among single males, 0.3 per person among single females, and 0.2 among adults in families. These rates are 8.5, 4.6, and 2.1 times higher, respectively, in comparison to matched controls.

Relevance to the US

These results have important policy implications given the recent legislative changes to the U.S. health care system, which expand Medicaid eligibility in the U.S. ns. Traditionally, lack of health insurance has been identified as the primary barrier to obtaining ambulatory care

among homeless populations in the United States.²⁰ However, these findings demonstrate, within a system of universal health insurance coverage, homeless individuals not only have higher rates of ambulatory health care utilization compared to the general population, but also higher emergency department use and hospitalizations. The high rates of utilization likely reflect the increased burden of acute and chronic health conditions, lack of preventative care, and the need for food, shelter, and safety among homeless populations.^{10 19 44} Extending beyond the increased need factors, the disproportionate use of emergency department and hospital services may also suggest that non-financial barriers to accessing appropriate ambulatory care exist among homeless populations, even where there exists a system of universal health insurance.³³ The provision of health insurance alone is not likely to be sufficient to reduce the frequency of emergency department visits or the likelihood of inappropriate emergency department visits by homeless individuals.¹⁹ Rather, governments and policy makers may need to go beyond simply providing health insurance, for example by addressing housing and subsistence deficits that contribute to poor health outcomes and increased health care burden among this population.

These research results also demonstrate differing health care utilization rates by demographic group, with the highest rates occurring among single adult males and single adult females, particularly for emergency department use and hospitalizations. Health care utilization rates among adults in families, while considerably higher than matched controls from the general population, were somewhat lower than homeless single adults for emergency department and hospital services. These differences by demographic group likely reflect an increased need for care among homeless single adults: single women have a higher prevalence of mental illness,

single men have a higher prevalence of substance abuse, and adults in families have relatively lower rates for both of these conditions.^{3 4}

Finally, , this study provides policy-relevant information on the potential degree to which decreased health care costs are possible if initiatives such as Housing First are expanded to serve a broader range of the homeless population.

8. Implications for Practice: Health Care for Individuals Experiencing Homelessness

Health Care Costs & Use of MEPS Data

Data on health care utilization by study participants and a matched low-income comparison group were converted to U.S. cost estimates using national weighted averages from the 2006 Medical Expenditure Panel Survey (MEPS) for hospital inpatient services, emergency room services and office-based medical provider services (restricted to physicians only). These data provide policy-relevant information on the expected cost implications of providing health insurance for a population of individuals who are homeless. They also provide valuable insights into the degree to which persistently high rates of emergency department visits and inpatient hospitalization could be expected to persist if homeless individuals obtained health insurance in the U.S. Based on the MEPS event-level cost estimates during the study period, homeless individuals in the sample accounted for over \$22 million USD in inpatient hospitalizations, office-based physician visits and emergency department visits, which equates to an annual cost of approximately \$5,700 USD per person. In comparison, estimated costs for the control group equated to under \$8 million USD during the study period, or approximately one-third the cost of

health care utilization among the homeless participants. . These findings have important implications given recent changes to the U.S. health care system and suggest that according to these estimates, insurance companies can expect to pay more than average, an additional \$4,000 per person per year to insure individuals who are homeless and/or vulnerably housed, a population that has traditionally had low rates of health insurance coverage.²⁰

Quality of Care

Measuring and improving the quality of health care is a major focus of health services research in the U.S. The quality of health care may be defined as “how well a doctor, hospital, health plan, or other provider of health care, keeps its members healthy or treats them when they are sick. Good quality health care means doing the right thing at the right time, in the right way, for the right person and getting the best possible results.”⁸³ In contrast to the issue of the cost of health care for the homeless population, the issue of quality of care has been understudied in this population. Only a handful of studies have examined the quality of care for patients experiencing homelessness.^{84 85 86}

Research from this project is ongoing in this area, and hopefully will provide insights into quality of care from the perspective of individuals who are homeless. In particular, future publications will document the experiences of a representative sample of homeless patients in terms of the quality of their doctor-patient communications (whether the doctor listened to what they had to say, whether they understood what the doctor said, whether they had questions about their care or treatment that they wanted to discuss but did not); the level of confidence and trust that they have in their doctor; whether the doctor treated them with respect and dignity; whether

the doctor involved them in decisions about their care as much as they wanted; and whether the doctor spent as much time with them as they wanted. Analyses will examine to what extent homeless individuals feel that their doctors or health care staff who have seen them judged them unfairly or treated them with disrespect because of gender, sexual orientation, race or ethnic background, English fluency, use of alcohol or drugs, and homeless status, as well as on overall satisfaction with health care received over the past year. These analyses should lead to insights into the quality of care for individuals who are homeless and who have health insurance, and point the way towards areas in which there is a need for improvement. These analyses should be relevant to all practitioners who see patients who are homeless, and may help guide future quality measurement and quality improvement efforts in homeless health care.

9. Summary and Conclusions

This study of health care utilization and costs in a representative sample of homeless individuals and age- and sex-matched low income controls from the general population in Toronto provides important policy-relevant information.

These findings are relevant to the US for a number of reasons:

- Homelessness is a serious and common problem in cities across the US and Canada.
- The homeless population of Toronto is similar to that of homeless populations in the US in terms of age and sex distribution, reasons for homelessness, and physical and mental health comorbidities.
- Recent legislative changes will greatly expand Medicaid coverage for low-income Americans, which is likely to result in an increase in the proportion of homeless

individuals in the US with health insurance. The effects of this policy change on patterns of health care use may be anticipated by examining the health care utilization of homeless individuals in Toronto, where universal health insurance is already in place.

- The relationship between office-based physician care visits and emergency department visits among individuals with health insurance is likely to be comparable across different jurisdictions, because the phenomenon under investigation is not dependent on the mechanisms by which the insurance plans are funded.
- Cost estimates for office-based care visits, emergency department visits, and hospital admissions among homeless individuals were obtained using data on health care expenses in the U.S. civilian non-institutionalized population from the 2006 Medical Expenditures Panel Survey (MEPS). This approach provides cost estimates that are applicable to the US.

Key findings and implications include:

- Among a representative sample of homeless individuals and age-and sex-matched low-income controls, all of whom had health insurance, rates of office-based care were 1.7 to 1.9 times higher among homeless individuals compared to controls.
- Rates of emergency department encounters were 9 times higher among homeless single men, 12 times higher among homeless single women, and 3.4 times higher among homeless adults in families, compared to controls.
- Rates of hospitalization were among 8.5 times higher among homeless single males, 4.6 times higher among homeless single women, and 2.1 times higher among homeless adults in families, compared to controls.

- Health care utilization “outliers” were far more prevalent and more extreme among homeless participants than controls, particularly for emergency department use and hospitalization. The maximum annual number of emergency department encounters was 108 per year in the homeless group, compared to 14 per year in the control group. The maximum annual number of hospitalizations was 14.9 per year in the homeless group, compared to 2.5 in the control group.
- Based on MEPS data on health care costs in the US, the observed levels of health care utilization in a representative sample of homeless individuals with health insurance equated to average annual costs of \$1815, \$1436, and \$2448 per person for office-based care, emergency department visits, and hospitalizations, respectively. The corresponding average annual costs for an insured group of age- and sex-matched low-income controls were \$1014, \$175, and \$517 per person.
- A major implication of these findings is that despite the fact that individuals who are homeless and have full health insurance have substantially higher rates of office-based care than comparable non-homeless individuals, their use of emergency departments and hospitals remains much higher than that of controls. These differences are driven to a substantial extent by a small subset of homeless individuals who are extremely high users of emergency departments and hospitals, and to poorer health status of homeless individuals.

Findings from this study have a number of implications for the quality of care for homeless individuals.

- The provision of health insurance eliminates many but not all barriers to care for homeless people. After health insurance coverage has been established for homeless individuals, a number of major factors often associated with inequities in access to care (race, education, income, and drug, alcohol, and mental health problems) diminish in importance. However, even after insurance barriers are stripped away, additional barriers remain.
- Among homeless individuals who have health insurance, lack of a primary care provider is a persistent problem and has a negative impact on access to needed care. This finding suggests that even if every homeless individual in the United States were to obtain health insurance, targeted Federal programs such as the Health Care for the Homeless Program, may be needed to ensure that these individuals have access to a primary care provider.
- The finding of extremely high rates of pre-existing traumatic brain injury (TBI) among homeless individuals opens the door to improved quality of care for these individuals through improved recognition of previous TBI and resultant neuropsychological impairment in this population. Future research may help determine if TBI is a risk factor for homelessness, and whether improved quality of rehabilitative care for individuals with moderate to severe TBI might reduce the incidence of subsequent homelessness.
- Efforts to reduce the health care costs of homeless individuals who are high users of emergency departments and frequently admitted to hospital may require targeted interventions such as supportive housing, rather than depending primarily on efforts to improve access to or quality of ambulatory health care.

10. Tables

Table 1. Summary statistics on health care utilization (office-based care visits, emergency department visits and hospitalizations) during study period, Dec. 2004 to Mar. 2009, among homeless participants

Type of Health Care	Encounters with Health Care	Demographic Group			Total (n=1,165)
		Single Males (n=587)	Single Females (n=296)	Adults in Families (n=282)	
Office-based Care Visits³	No. (%) of participants with encounter	517 (88.1)	286 (96.6)	276 (97.9)	1,079 (92.6)
	Total no. of encounters ¹	18,350	13,718	11,820	43,888
	Mean (SD) no. of encounters per person ¹	35.5 (51.4)	48.0 (61.5)	42.8 (51.0)	40.7 (54.4)
	Median no. of encounters per person ¹	19	28	27	23
	Range of no. of encounters per person	0 to 561	0 to 379	0 to 335	0 to 561
	Estimated total cost (USD) ²	\$3,308,138	\$2,473,081	\$2,130,910	\$7,912,129
Emergency Department Visits⁴	No. (%) of participants with encounter	449 (76.5)	254 (85.8)	197 (69.9)	900 (77.3)
	Total no. of encounters ¹	4,724	3,063	1,111	8,898
	Mean (SD) no. of encounters per person ¹	10.5 (19.0)	12.1 (31.4)	5.6 (12.6)	9.9 (22.3)
	Median no. of encounters per person ¹	4	5	3	4
	Range of no. of encounters per person	0 to 146	0 to 417	0 to 141	0 to 417
	Estimated total cost (USD) ²	\$3,248,128	\$2,106,058	\$763,901	\$6,118,087
Hospitalizations⁵	No. (%) of participants with encounter	145 (24.7)	115 (38.9)	101 (35.8)	361 (31.0)
	Total no. of encounters ¹	354	289	176	819
	Mean (SD) no. of encounters per person ¹	2.4 (2.4)	2.5 (3.8)	1.7 (1.6)	2.3 (2.8)
	Median no. of encounters per person ¹	1	2	1	1
	Range of no. of encounters per person	0 to 15	0 to 39	0 to 11	0 to 39
	Estimated total cost (USD) ²	\$3,734,849	\$3,049,071	\$1,856,874	\$8,640,794

¹ Among participants with encounters with health care during study period

² Based on mean event-level costs estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical provider services (physicians only), emergency room services and hospital inpatient services, 2006

³ Data source: Office-based physician billings, Ontario Health Insurance Plan (OHIP) database

⁴ Data source: Emergency department visits, National Ambulatory Care Records System (NACRS) database

⁵ Data source: General hospital discharges and day surgeries, Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD)

Table 2. Annual rates for health care utilization (office-based care visits, emergency department visits and hospitalizations) during study period, Dec. 2004 to Mar. 2009, among homeless participants

Type of Health Care	Annual Rate (per person-year)	Demographic Group			Total (n=1,165)
		Single Males (n=587)	Single Females (n=296)	Adults in Families (n=282)	
Office-based Care²	Mean (SD)	8.4 (12.8)	12.2 (16.0)	11.3 (13.7)	10.1 (14.0)
	Median	4.1	7.1	7.1	5.7
	Interquartile Range	1.1 to 10.3	3.3 to 15.2	3.3 to 14.0	1.9 to 12.4
	Range	0.0 to 141.3	0.0 to 110.0	0.0 to 91.0	0.0 to 141.3
	Estimated cost (USD) per person per year ¹	\$1,512	\$2,201	\$2,041	\$1,815
	Estimated total cost (USD) per year ¹	\$887,549	\$651,614	\$575,599	\$2,114,754
Emergency Department³	Mean (SD)	2.2 (4.6)	2.8 (7.5)	1.1 (3.0)	2.1 (5.2)
	Median	0.7	1.1	0.3	0.7
	Interquartile Range	0.2 to 2.1	0.3 to 2.4	0.0 to 1.1	0.2 to 2.0
	Range	0.0 to 39.5	0.0 to 107.7	0.0 to 41.1	0.0 to 107.7
	Estimated cost (USD) per person per year ¹	\$1,537	\$1,903	\$737	\$1,436
	Estimated total cost (USD) per year ¹	\$902,067	\$563,354	\$207,858	\$1,673,353
Hospital⁴	Mean (SD)	0.2 (1.0)	0.3 (0.8)	0.2 (0.3)	0.2 (0.8)
	Median	0.0	0.0	0.0	0.0
	Interquartile Range	0.0 to 0.0	0.0 to 0.3	0.0 to 0.3	0.0 to 0.2
	Range	0.0 to 14.9	0.0 to 10.1	0.0 to 2.8	0.0 to 14.9
	Estimated cost (USD) per person per year ¹	\$2,500	\$3,007	\$1,772	\$2,448
	Estimated total cost (USD) per year ¹	\$1,467,764	\$890,033	\$499,837	\$2,851,568

¹ Based on mean event-level costs estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical provider services (physicians only), emergency room services and hospital inpatient services, 2006

² Data source: Office-based physician billings, Ontario Health Insurance Plan (OHIP) database

³ Data source: Emergency department visits, National Ambulatory Care Reporting System (NACRS) database

⁴ Data source: General hospital discharges and day surgeries, Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD)

Table 3. Summary statistics on health care utilization (office-based care visits, emergency department visits and hospitalizations) during study period, Dec. 2004 to Mar. 2009, among age- and sex-matched low income controls

Type of Health Care	Encounters with Health Care	Demographic Group			Total (n=1,165)
		Single Males (n=587)	Single Females (n=296)	Adults in Families (n=282)	
Office-based Care Visits³	No. (%) of participants with encounter	485 (82.6)	245 (82.8)	246 (87.2)	976 (83.8)
	Total no. of encounters ¹	11,178	7,342	6,857	25,377
	Mean (SD) no. of encounters per person ¹	23.0 (32.8)	30.0 (29.3)	27.9 (22.1)	26.0 (29.7)
	Median no. of encounters per person ¹	14	21	23.5	17
	Range of no. of encounters per person	0 to 380	0 to 254	0 to 130	0 to 380
	Estimated total cost (USD) ²	\$2,015,170	\$1,323,616	\$1,236,180	\$4,574,966
Emergency Department Visits⁴	No. (%) of participants with encounter	204 (34.8)	107 (36.1)	115 (40.8)	426 (36.6)
	Total no. of encounters ¹	541	255	335	1,131
	Mean (SD) no. of encounters per person ¹	2.7 (5.0)	2.4 (2.3)	2.9 (4.3)	2.7 (4.3)
	Median no. of encounters per person ¹	1	2	2	2
	Range of no. of encounters per person	0 to 60	0 to 17	0 to 42	0 to 60
	Estimated total cost (USD) ²	\$371,981	\$175,333	\$230,339	\$777,653
Hospitalizations⁵	No. (%) of participants with encounter	38 (6.5)	48 (16.2)	59 (20.9)	145 (12.4)
	Total no. of encounters ¹	62	64	85	211
	Mean (SD) no. of encounters per person ¹	1.6 (1.5)	1.3 (0.6)	1.4 (1.0)	1.5 (1.1)
	Median no. of encounters per person ¹	1	1	1	1
	Range of no. of encounters per person	0 to 9	0 to 3	0 to 7	0 to 9
	Estimated total cost (USD) ²	\$654,126	\$675,227	\$896,786	\$2,226,139

¹ Among participants with encounters with health care during study period

² Based on mean event-level costs estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical provider services (physicians only), emergency room services and hospital inpatient services, 2006

³ Data source: Office-based physician billings, Ontario Health Insurance Plan (OHIP) database

⁴ Data source: Emergency department visits, National Ambulatory Care Records System (NACRS) database

⁵ Data source: General hospital discharges and day surgeries, Canadian Institute for Health Information Discharge Abstract Database (CIHI-DAD)

Table 4. Annual rates for health care utilization (office-based care visits, emergency department visits and hospitalizations) during study period, Dec. 2004 to Mar. 2009, among age- and sex-matched low income controls

Type of Health Care	Annual Rate (per person-year)	Demographic Group			Total (n=1,165)
		Single Males (n=587)	Single Females (n=296)	Adults in Families (n=282)	
Office-based Care²	Mean (SD)	4.9 (7.9)	6.4 (7.2)	6.4 (6.0)	5.6 (7.3)
	Median	2.6	4.5	5.3	3.5
	Interquartile Range	0.7 to 6.0	1.2 to 9.1	1.7 to 9.6	0.9 to 7.6
	Range	0.0 to 104.5	0.0 to 58.9	0.0 to 37.8	0.0 to 104.5
	Estimated cost (USD) per person per year ¹	\$875	\$1,151	\$1,158	\$1,014
	Estimated total cost (USD) per year ¹	\$513,671	\$340,935	\$326,539	\$1,181,187
Emergency Department³	Mean (SD)	0.2 (0.8)	0.2 (0.5)	0.3 (0.9)	0.3 (0.7)
	Median	0.0	0.0	0.0	0.0
	Interquartile Range	0.0 to 0.3	0.0 to 0.3	0.0 to 0.3	0.0 to 0.3
	Range	0.0 to 14.0	0.0 to 4.9	0.0 to 12.2	0.0 to 14.0
	Estimated cost (USD) per person per year ¹	\$163	\$159	\$218	\$175
	Estimated total cost (USD) per year ¹	\$95,655	\$47,014	\$61,466	\$204,263
Hospital⁴	Mean (SD)	0.0 (0.1)	0.0 (0.2)	0.1 (0.2)	0.0 (0.1)
	Median	0.0	0.0	0.0	0.0
	Interquartile Range	0.0 to 0.0	0.0 to 0.0	0.0 to 0.0	0.0 to 0.0
	Range	0.0 to 2.5	0.0 to 1.7	0.0 to 2.0	0.0 to 2.5
	Estimated cost (USD) per person per year ¹	\$295	\$654	\$855	\$517
	Estimated total cost (USD) per year ¹	\$173,407	\$193,621	\$240,993	\$602,270

¹ Based on mean event-level costs estimates from the Medical Expenditure Panel Survey (MEPS) for office-based medical provider services (physicians only), emergency room services and hospital inpatient services, 2006

² Data source: Office-based physician billings, Ontario Health Insurance Plan (OHIP) database

³ Data source: Emergency department visits, National Ambulatory Care Reporting System (NACRS) database

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