

Mortality Among Men Using Homeless Shelters in Toronto, Ontario

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HOMELESS PERSONS SUFFER from a high prevalence of physical disease, mental illness, and substance abuse.¹⁻¹¹

Homelessness is associated with exposure to the elements¹² and an increased risk of infections such as tuberculosis and human immunodeficiency virus (HIV) disease.¹³⁻¹⁸ Among the homeless, access to health care is often suboptimal.¹⁹⁻²³ Homeless persons also experience severe poverty and often come from disadvantaged minority communities, factors that are independently associated with poor health.²⁴⁻²⁹ The finding that mortality among homeless persons is much higher than among their counterparts in the general population is therefore not surprising.

Data on deaths among homeless people are available from a number of US cities. Early studies from Atlanta, Ga,³⁰ and San Francisco, Calif,³¹ reported causes of death but not mortality rates. Three more recent studies have reported mortality rates in homeless populations. In Philadelphia, Pa, homeless adults had an age-adjusted mortality rate 3.5 times higher than that of the general population.³² In a study of clients of the Health Care for the Homeless Program in Boston, Mass, mortality rates were 5.9, 3.0, and 1.6 times higher than in the general population among men aged 18 to 24, 25 to 44, and 45 to 64 years, respectively.³³ The leading causes of death were homicide among young men, the acquired immunodeficiency syndrome (AIDS) among 25- to 44-year-old men, and cancer and heart disease among older men. A study of homeless shelter users in

Context Homeless persons in US cities have high mortality rates. However, few comparison data exist for death rates among homeless persons in other developed countries.

Objectives To compare mortality rates among men using homeless shelters and the general population in Toronto, Ontario, and to determine whether mortality rates differ significantly among men using homeless shelters in Canadian and US cities.

Design Cohort study conducted from 1995 through 1997, with a mean follow-up of 2.6 years.

Participants Men aged 18 years or older who used homeless shelters in Toronto in 1995 (n=8933).

Main Outcome Measure Mortality rate ratios comparing age-specific mortality rates among men using homeless shelters in Toronto with those of men in the general population of Toronto and of men using homeless shelters in New York, NY; Boston, Mass; and Philadelphia, Pa.

Results Men using homeless shelters in Toronto were more likely to die than men in the city's general population. Mortality rate ratios were 8.3 (95% confidence interval [CI], 4.4-15.6) for men aged 18 to 24 years, 3.7 (95% CI, 3.0-4.6) for men aged 25 to 44 years, and 2.3 (95% CI, 1.8-3.0) for men aged 45 to 64 years. In most cases, however, the risk of death was significantly lower for men using homeless shelters in Toronto than for those in US cities. For men aged 25 to 44 years using homeless shelters, mortality rate ratios were 0.52 (95% CI, 0.41-0.65) for Toronto compared with Boston and 0.61 (95% CI, 0.44-0.85) for Toronto compared with New York City. For men aged 35 to 54 years using homeless shelters, the mortality rate ratio was 0.42 (95% CI, 0.27-0.66) for Toronto compared with Philadelphia.

Conclusions Mortality rates among men who use homeless shelters in Toronto, while higher than in the general population of Toronto, are much lower than mortality rates observed among men using homeless shelters in 3 major US cities. Further study is needed to identify the reasons for this disparity.

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New York City found age-adjusted death rates 2 to 3 times higher than the city's general population.³⁴ Mortality among older men and women of all ages was higher in New York City's homeless population than in the Boston or Philadelphia homeless populations.

How do homeless persons fare in the United States compared with those in other developed Western countries? A cross-national comparison of mortality rates would shed light on how societal factors affect the health of marginalized segments of the population. However, little information is avail-

able on death rates among homeless persons outside the United States. A search of the literature reveals a single study conducted in Stockholm, Sweden, during 1969 through 1971.³⁵ Among 6032 homeless men, 327 deaths

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occurred, corresponding to a standardized mortality ratio of 3.8; absolute mortality rates were not reported. High levels of excess mortality were observed due to accidents, poisonings, and violence. Comparisons of these findings with US data are difficult due to the lapse of more than 2 decades between the Swedish and US studies.

This study examines death rates among homeless men in Toronto, Ontario. We identified a cohort of 8933 men who used shelters in 1995 and ascertained the number and causes of deaths in this group for 1995 through 1997. Mortality rates for homeless men in Toronto are compared with rates previously reported in Boston, New York City, and Philadelphia.

METHODS

We compiled a database of men who used homeless shelters in Toronto in 1995 from various sources. The Toronto Hostel Services Division operates all public shelters in the city and contracts with all private nonprofit organizations that run full-time shelters. Both publicly and privately operated shelters provide the Toronto Hostel Services Division with a uniform dataset on every person admitted, and shelters receive per diem funding based on these reports. A few small church-run shelters that operate for only 1 night per week during the winter do not contribute to this dataset. Data on shelter admissions are compiled into a single master file that is audited by the Hostel Services Division. Each record includes a unique identifier permanently assigned to the shelter user (but not their full name), the person's sex, date of birth, whether or not the person was accompanied by a spouse or children, the shelter site, and the dates of shelter admission and discharge.

We selected all records from the master file for men aged 18 years or older who stayed at homeless shelters in 1995. We excluded the small number of men accompanied by a spouse and/or children who were admitted to shelters for homeless families. The selected homeless men stayed at any of

10 homeless shelters with a maximum winter capacity of 1300 beds per night. We matched the unique identifiers from the master file to full names obtained from the registration records at each homeless shelter. Women were not included because registration records were not available at women's shelters at the time this study was conducted. We compiled a database containing the names of 92% of the selected men in the 1995 master file, and this group forms the study population.

Persons who were homeless in 1995 but who lived on the street without ever using a shelter were not represented in the study population. Data are not available on the size of the street homeless population in Toronto relative to the shelter homeless population. However, a survey of homeless persons at daytime meal programs at drop-in centers in Toronto showed that 93% of these individuals had stayed at a homeless shelter within the last year (P. Goering, PhD, written communication, January 7, 2000).

The Ontario Office of the Registrar General ascertained deaths in the study population by comparing the shelter database with provincial death certificate records for 1995 through 1997. Matches were identified if the records agreed on (1) last name and exact date of birth or (2) first and last name and at least 2 of the following: day of birth, month of birth, and year of birth within 1 year. Names were compared using the Soundex algorithm to allow for minor differences in spelling. Matches were deemed correct if the first and last name and date of birth were exactly the same. Three reviewers examined all other potential matches and reached a consensus as to whether the match was correct.

Person-years of observation in the cohort were calculated as follows. We determined that a single individual could be represented by more than 1 identifier in the master file if he spelled his name differently or gave a different date of birth at separate shelter admissions. Duplicate identifiers related to a single individual were combined into a single identifier, using methods de-

veloped for this purpose in a previous study of mortality among homeless shelter users.³² We then calculated person-years of observation for each individual, with the period of observation defined as the time from first shelter admission in 1995 through December 31, 1997, or, in the case of decedents, their date of death. Total person-years of observation in the homeless cohort were calculated by age groups, with age determined at first shelter admission.

We calculated age- and cause-specific mortality rates (deaths per 100 000 person-years of observation). Causes of death were obtained from death certificates, as coded by the Office of the Registrar General according to the *International Classification of Diseases, Ninth Revision (ICD-9)*. We calculated rate ratios by dividing the mortality rate among shelter users by the corresponding mortality rate for men in the general population of Toronto in 1995. These values were not adjusted for race, because neither the race of homeless men in the master file nor race-specific mortality rates for the general population of Toronto were available. We determined the 95% confidence intervals (CIs) for rates and rate ratios using standard techniques.³⁶

We compared mortality rates among homeless men in Toronto with mortality rates reported in studies of homeless men in Boston,³³ New York City,³⁴ and Philadelphia.³² The Boston study examined mortality among 11 745 men, almost all of whom were shelter residents, who had contact with a Health Care for the Homeless Program during 1988 through 1993.³³ The New York City study reported mortality rates in a representative sample of 949 homeless male shelter residents in 1987 through 1994.³⁴ The Philadelphia study, conducted from 1985 through 1988, involved 6378 men who were homeless shelter users or street-dwelling homeless persons who had contact with a team of outreach workers.³²

Because blacks and Hispanics account for a larger proportion of the homeless population in US cities than in Toronto, mortality rates were adjusted for race

through the following standardization. We estimated the racial composition of Toronto's homeless population using data from the Mental Illness and Pathways into Homelessness Study, a random sample of 300 shelter users in Toronto in 1995 through 1997, stratified by age, sex, and intensity of shelter use. Male shelter users were 76% white and 24% nonwhite (specifically, 13% black, 6% Native Indian, and 5% other races) (P. Goering, PhD, written communication, January 5, 1999). Total mortality rates for homeless men in Boston, New York City, and Philadelphia were adjusted for race by direct standardization, using homeless men in Toronto as the standard population. Race-specific mortal-

ity rates for homeless men in Boston (S. W. H., unpublished data, 1997), New York City (S. Barrow, PhD, and D. Herman, DSW, written communication, July 29, 1999), and Philadelphia³² were used.

Because studies of deaths among homeless men in North America have been conducted over somewhat different periods, secular trends may have contributed to differences in observed mortality rates. Trends in deaths due to homicide and AIDS are particularly notable. Homicide rates among young men in the United States increased steadily during the mid-1980s and early 1990s, followed by a sustained decline beginning in 1994.^{37,38} Similarly, mortality due to AIDS in both the United States and Canada peaked in 1995, but has fallen dramatically over subsequent years due to highly active antiretroviral therapy.^{39,40} To assess the impact of these factors on differences in mortality between cities, we performed 2 additional comparisons of mortality rates in Toronto and Boston, the only other city for which cause-specific mortality rates were available. In these analyses, we compared total mortality rates excluding deaths from homicide and excluding deaths from AIDS.

The Research Ethics Board of St Michael's Hospital approved the study protocol. Because this study analyzed routinely collected administrative data and

posed no significant risk to subjects, informed consent was not obtained.

RESULTS

The study population consisted of 8933 men who stayed at homeless shelters in Toronto in 1995. Characteristics of the cohort are shown in TABLE 1. We identified 201 deaths in the cohort during 22958 person-years of observation, for a crude mortality rate of 876 per 100 000 person-years. The mean age at death was 46 years (range, 20-84 years). Death occurred outside a hospital in 41% of deaths, but the location was not otherwise specified. Deaths were relatively evenly distributed across months of the year; in particular, the number of deaths did not increase significantly during winter months. The coroner's office performed an autopsy on 57% of the decedents.

Age- and cause-specific mortality rates and rate ratios comparing mortality in the shelter population with that of the general population of Toronto are shown in TABLE 2. For almost all causes of death, rate ratios significantly exceeded 1. For total mortality, rate ratios were 8.3 among 18- to 24-year-olds (95% CI, 4.4-15.6), 3.7 among 25- to 44-year-olds (95% CI, 3.0-4.6), and 2.3 among 45- to 64-year-olds (95% CI, 1.8-3.0). Thus, younger homeless men

Table 1. Characteristics of Men Using Homeless Shelters in Toronto (N = 8933)

Characteristic	No. (%)
Age, y	
Mean	36.1
18-24	1046 (12)
25-44	6143 (69)
45-64	1580 (18)
≥65	164 (2)
Total homeless shelter use in 1995, d	
Mean	24
1-7	4437 (50)
8-14	1148 (13)
15-30	1366 (15)
31-60	1031 (12)
61-120	637 (7)
121-365	314 (4)
Mean duration of follow-up, y	2.6

Table 2. Mortality Rates of Men Using Homeless Shelters in Toronto and Rate Ratios Comparing Mortality Rates Among Homeless Men With Those of Men in the General Population of Toronto*

Cause of Death	Age 18-24 y		Age 25-44 y		Age 45-64 y	
	Mortality Rate	Rate Ratio (95% CI)	Mortality Rate	Rate Ratio (95% CI)	Mortality Rate	Rate Ratio (95% CI)
AIDS	...	...	114.8	1.7 (1.1-2.8)	75.2	1.5 (0.5-4.9)
Cancer	...	...	19.1	1.0 (0.3-3.1)	225.7	0.9 (0.4-1.7)
Heart disease	...	...	25.5	2.4 (0.9-6.6)	200.6	1.4 (0.7-2.9)
Cerebrovascular disease	...	...	6.4	2.9 (0.4-22.8)	125.4	4.9 (2.0-12.3)
Pneumonia and influenza	...	...	12.8	13.0 (2.4-71.1)	...	...
Chronic liver disease	...	...	19.1	6.5 (1.8-23.1)	25.1	0.8 (0.1-5.5)
Struck by motor vehicle	...	...	25.5	3.1 (1.1-8.6)	25.1	4.6 (0.6-35.4)
Unintentional poisonings	76.6	113.2 (10.3-1249.0)	102.0	14.4 (7.8-26.4)	50.2	10.0 (2.2-44.8)
Other accidents	114.9	24.3 (6.3-93.8)	57.4	9.0 (4.2-19.2)	125.4	16.7 (6.2-45.1)
Suicide	76.6	10.3 (2.3-46.4)	57.4	3.1 (1.6-6.2)	50.2	2.8 (0.7-11.6)
Homicide	38.3	9.4 (1.1-78.4)	19.1	7.1 (2.0-25.5)	...	...
Unknown or unspecified	76.6	9.4 (2.1-42.2)	133.9	10.7 (6.4-17.8)	376.1	11.2 (6.4-19.3)
Total	421.4	8.3 (4.4-15.6)	669.4	3.7 (3.0-4.6)	1680.1	2.3 (1.8-3.0)

*Mortality rates are expressed as deaths per 100 000 person-years. CI indicates confidence interval; AIDS, acquired immunodeficiency syndrome. Ellipses indicate that no deaths due to this cause were observed among homeless men.

are at greater relative disadvantage, despite the fact that older homeless men have higher absolute mortality rates.

The leading identified causes of death among men 18 to 24 years old using shelters in Toronto were accidents (other than poisonings), poisonings, and suicides. Among men 25 to 44 years old, AIDS, accidents (other than poisonings), poisonings, and suicide were the most common causes. The most frequently identified mechanisms of traumatic accidental death were falls from stairways or buildings and being struck by a motor vehicle, streetcar, or train. Poisoning deaths included unintentional overdoses of opiates, other drugs, or alcohol. Among men aged 45 to 64 years, the main identified causes of death shifted to cancer, heart disease, and cerebrovascular disease, although accidental deaths (other than poisonings) remained common.

These patterns of causes of death are similar to those reported among homeless men in Boston, with 2 exceptions.³³ Homicide was not among the 3 leading causes of death for men aged 18 to 24 years using shelters in Toronto, but was the most common cause of death in this age group in Boston. Mortality rates due to homicide in these cities were 38 and

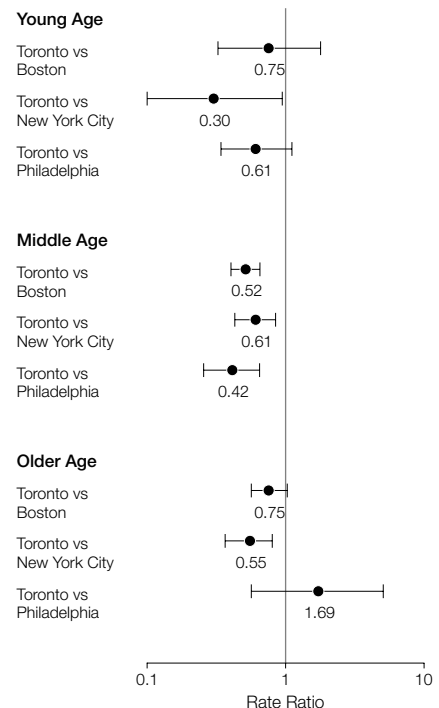
243 per 100 000 person-years, respectively (rate ratio, 0.2; 95% CI, 0.02-1.4). The proportion of homicides involving firearms was 0% in Toronto and 13% in Boston. While AIDS was a leading cause of death among men aged 25 to 44 years in both cities, mortality rates due to AIDS were significantly lower in Toronto than in Boston (115 vs 337 per 100 000 person-years, respectively; rate ratio, 0.3; 95% CI, 0.2-0.6).

Total mortality rates among men who use homeless shelters in Toronto are generally lower than race-adjusted mortality rates among homeless men in Boston, New York City, and Philadelphia (TABLE 3). The FIGURE shows the rate ratios and 95% CIs for these comparisons. A disparity is particularly prominent in the middle age group, with mortality rates 40% to 60% lower in Toronto compared with US cities. Crude mortality rates (not adjusted for race) for these comparisons yield similar results (data not shown).

We examined the extent to which deaths due to AIDS and homicide accounted for the disparity in mortality rates between Toronto and Boston. After excluding all deaths from AIDS, rate ratios comparing mortality in Toronto

with Boston increased only slightly. Rate ratios rose to 0.78 (95% CI, 0.33-1.83) for 18- to 24-year-olds, 0.58 (95% CI, 0.45-0.75) for 25- to 44-year-olds, and 0.76 (95% CI, 0.57-1.00) for 45- to 64-year-olds. Thus, lower rates of HIV infection and recent therapeutic advances for this condition can account for only a small proportion of the overall mortality advantage for shelter users in Toronto. When deaths from homicide were excluded, the mortality rate ratio for men aged 18 to 24 years in Toronto compared with Boston rose from 0.75 (95% CI, 0.32-1.75) to 1.51 (95% CI, 0.50-4.53). Both CIs include 1, and the rate ratios are not significantly different. For men aged 25 to 44

Figure. Rate Ratios Comparing Mortality Rates Among Men Using Homeless Shelters in Toronto With Corresponding Rates Among Homeless Men in Boston, New York City, and Philadelphia



Mortality rates in Boston (data from Hwang et al³³), New York City (data from Barrow et al³⁴), and Philadelphia (data from Hibbs et al³²) are adjusted for race (see "Methods" for details). Young, middle, and older age groups are defined as 18 to 24, 25 to 44, and 45 to 64 years, respectively, for the comparisons with Boston and New York City, and as 15 to 34, 35 to 54, and 55 to 74 years, respectively, for the comparison with Philadelphia. Bars indicate 95% confidence intervals; gray line indicates rate ratio equal to 1.

Table 3. Mortality Rates and Person-Years of Observation Among Men Using Homeless Shelters in Toronto and US Cities*

Age Range, y	Toronto	Boston†	New York‡	Philadelphia§
18-24				
Mortality rate	421	563	1392	...
Person-years of observation	2610	1851	292	...
25-44				
Mortality rate	669	1298	1089	...
Person-years of observation	15 687	21 839	5080	...
45-64				
Mortality rate	1680	2227	3048	...
Person-years of observation	3988	9582	1720	...
15-34				
Mortality rate	508	...	...	839
Person-years of observation	11 618	...	...	1881
35-54				
Mortality rate	963	...	...	2266
Person-years of observation	9661	...	...	1085
55-74				
Mortality rate	3238	...	...	1910
Person-years of observation	1452	...	...	185

*Mortality rates are expressed as deaths per 100 000 person-years. Mortality rates in US cities are adjusted for race by standardization using homeless men in Toronto as the standard population (see "Methods" for details). Ellipses indicate data not applicable.

†Data from Hwang et al.³³

‡Data from Barrow et al.³⁴

§Data from Hibbs et al.³²

years, the rate ratio remained unchanged at 0.52 (95% CI, 0.41-0.65), and for men aged 45 to 64 years it increased minimally to 0.78 (95% CI, 0.59-1.03). Therefore, the fact that homicide rates were higher in Boston than Toronto did not account for the overall mortality advantage for homeless men in Toronto, particularly for men older than 25 years.

COMMENT

Men who use homeless shelters in Toronto experience significant excess mortality compared with the city's general population. This finding is consistent with previous studies of homeless persons in major US cities.³²⁻³⁴ Indeed, rate ratios comparing mortality among homeless men with that of the general population are remarkably similar in Toronto (8.3, 3.7, and 2.3) and Boston (5.9, 3.0, and 1.6) for young, middle, and older age groups, respectively.³³

Because many deaths among men who used homeless shelters in Toronto were attributed to unknown or unspecified causes, detailed analyses of cause-specific death rates must be approached with caution. Despite this limitation, we note 2 causes for which mortality rates are far lower among homeless men in Toronto compared with Boston: homicide among men aged 18 to 24 years and AIDS among men aged 25 to 44 years. These differences persist even if all of the deaths due to unknown or unspecified causes in Toronto are attributed to homicide (in the case of 18- to 24-year-olds) or AIDS (in the case of 25- to 44-year-olds).

The most striking finding of this study is that men who use homeless shelters in Toronto had total mortality rates much lower than the corresponding rates reported among homeless men in Boston, New York City, and Philadelphia. This disparity is consistent across cities and age groups and is most significant in the middle age range, which includes about half of all homeless men in the United States.⁴¹ Differences in mortality rates could potentially be explained by variations in how each homeless cohort was defined. Specifically, the Toronto co-

hort was limited to shelter users; mortality in the US cohorts might appear higher if they included significant numbers of street-dwelling homeless people, who presumably have higher mortality rates than homeless people who use shelters. This may have been a factor in the Philadelphia study, which included a number of individuals living on the street. The New York City cohort, however, consisted of a sample of homeless shelter residents. The Boston cohort was made up of men who had contact with a Health Care for the Homeless Program, almost all of whom were residing at homeless shelters. While a group of health service users might have higher morbidity and mortality than the general shelter population,⁴² contact with the health care system could also result in lower mortality rates. In fact, death rates in the Boston cohort were comparable to or lower than death rates in the general shelter population in New York City. Of note, the only instance in which death rates were higher in Toronto was for the comparison against Philadelphia for men aged 55 to 74 years. This finding may be related to the fact that the mortality rate among older homeless men in Philadelphia was based on a very small number of observations and may represent an underestimate of the true rate.

Why are death rates among men who use homeless shelters lower in Toronto than in US cities? Men entering the shelter system in Toronto may have fewer baseline comorbidities. Previous studies have shown that risk factors for death among homeless people include medical conditions such as renal disease, liver disease, arrhythmias, and seizures.⁴³ Other risk factors include injection drug use and a history of incarceration.³⁴ Shelter users in Toronto may have a lower prevalence of these risk factors, particularly injection drug use.⁴⁴

The events that transpire after an individual becomes homeless can also have important effects on mortality. Preliminary analyses of patterns of shelter use in our cohort reveal that men who use shelters in Toronto are less likely to have prolonged episodes of homelessness than persons using shelters in New

York City and Philadelphia.⁴⁵ Because chronic homelessness itself may increase the risk of death,³⁴ this difference may contribute to lower mortality among shelter users in Toronto. Another factor is the dramatically lower incidence of homicide in Canada⁴⁶ compared with the United States,³⁷ an advantage that extends to homeless persons as well as the general population.

Canada's system of universal health insurance may have contributed to lower death rates among shelter users in Toronto. Whereas most homeless persons in the United States lack health insurance,²² homeless persons in Canada do not encounter any financial barriers to obtaining health care services. Studies have shown that low-income persons in Canada receive more physician services than their US counterparts.⁴⁷ Survival rates among low-income patients with cancer are higher in Canada than the United States, a disparity that has been attributed to better access to health care in Canada.⁴⁸ With respect to mental health services, residents of Ontario with a perceived need for help are more likely to receive care than comparable individuals in the United States.⁴⁹ In view of the consistency of these findings, a beneficial effect of the Canadian health care system on mortality among homeless men would not be surprising.

This study has certain limitations. Homeless women were not studied due to restrictions in data sources. We used death certificates to obtain causes of death. The accuracy of death certificate data has been questioned, as significant discrepancies have been found between death certificates and autopsy reports.⁵⁰ Other studies have shown that death certificates reliably document deaths due to coronary heart disease,⁵¹ AIDS,⁵² and injuries.⁵³ Because many deaths in this cohort were attributed to unknown or unspecified causes, cause-specific death rates should be interpreted with caution; however, this limitation does not affect analyses of total mortality rates. Death rates among homeless people in various cities were compared using data obtained over different time periods. However, the major

potential confounding factors in such an analysis have been discussed and are unlikely to be responsible for the consistent mortality advantage for the shelter population in Toronto.

In conclusion, this study demonstrates that mortality rates among men who use homeless shelters in Toronto, while higher than in the general population of Toronto, are dramatically lower than mortality rates previously observed among homeless men in Boston, New York City, or Philadelphia. Further investigations are needed to identify the reasons for this disparity. Possible contributory factors include the effects of universal health insurance and access to health care in Canada, lower homicide rates, particularly among young men, and the differential health effects of short-term vs chronic homelessness. Insights into the reasons behind lower mortality among homeless men in Toronto could help direct efforts to reduce deaths among homeless persons and other disadvantaged populations in the United States.

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