10 year follow up study of mortality among users of hostels for homeless people in Copenhagen

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Abstract

Objectives To investigate mortality among users of hostels for homeless people in Copenhagen, and to identify predictors of death such as conditions during upbringing, mental illness, and misuse of alcohol and drugs.
Design Register based follow up study.
Setting Two hostels for homeless people in Copenhagen, Denmark
Participants 579 people who stayed in one hostel in Copenhagen in 1991, and a representative sample of 185 people who stayed in the original hostel and one other in Copenhagen.
Main outcome measure Cause specific mortality.
Results The age and sex standardised mortality ratio for both sexes was 3.8 (95% confidence interval 3.5 to 4.1); 2.8 (2.6 to 3.1) for men and 5.6 (4.3 to 6.9) for women. The age and sex standardised mortality ratio for suicide for both sexes was 6.0 (3.9 to 8.1), for death from natural causes 2.6 (2.3 to 2.9), for unintentional injuries 14.6 (11.4 to 17.8), and for unknown cause of death 62.9 (52.7 to 73.2). Mortality was comparatively higher in the younger age groups. It was also significantly higher among homeless people who had stayed in a hostel more than once and stayed fewer than 11 days, compared with the rest of the study group. Risk factors for early death were premature death of the father and misuse of alcohol and sedatives.
Conclusion Homeless people staying in hostels, particularly young women, are more likely to die early than the general population. Other predictors of early death include adverse experiences in childhood, such as death of the father, and misuse of alcohol and sedatives.

Introduction

Homelessness poses serious threats to health, and the burden falls mostly on people who are marginalised because of mental illness, alcohol and drug misuse, poor family support, and insufficient medical care.[1] Several longitudinal studies have shown high mortality among homeless people, but analyses of cause specific mortality and predictors of death were carried out in only a few.[1–5]

Since the early 1960s, psychiatric services have undergone major transitions in the Western world. During the same period there have been an increasing number of mentally ill people living on the streets or in shelters or hostels.[6] Statistics in Denmark show that an increasing number of young people are staying in shelters and that the proportion of women is increasing. Repeated comparable cross sectional studies in Denmark show that the percentage of mentally ill people living in shelters rose from around 4% in 1961 to 19% in 1986.[7]

Studies have identified poor physical health, substance misuse, time spent in prison, and extended homelessness as risk factors for death and suicide among homeless people.[1 3 5] We aimed to determine the relation between cause specific mortality, mental illness, and alcohol and drug misuse, and to identify risk factors for overall mortality and suicide among homeless people staying in hostels in Denmark.

Methods

Our study comprised two populations. We identified the first population from the annual report of a hostel in Copenhagen. From the report we were able to obtain the age, sex, length of stay, and number of stays of 595 people who had resided at the hostel some time during 1991. This population comprised the registration sample (fig 1). Our second population comprised 200 homeless residents of the original hostel and one other in Copenhagen. We planned a stratified prevalence interview study of these people using the information from the 1991 annual report of the first hostel and the statistical information about age and sex from the second hostel. Because of the transient nature of the residents, it was impossible to interview an incident population. The statistics showed

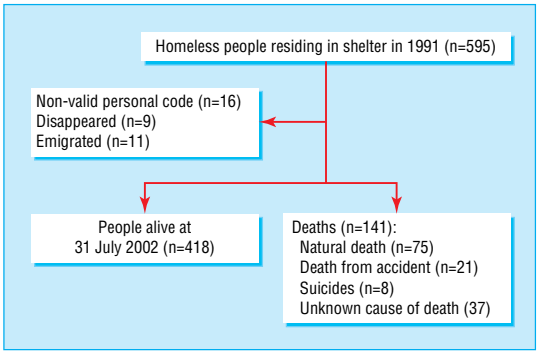

Fig 1 Flow of people in registration study

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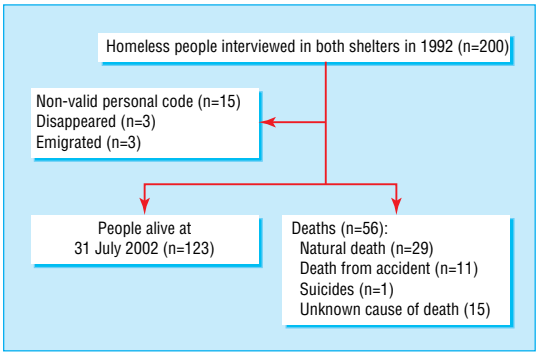

Fig 2 Flow of people in interview study

that the younger residents had the shortest stays. To avoid the length bias of an unstratified cross sectional study, we conducted a stratified prevalence study of a sample representative of the group for age and sex. Based on the age and sex composition of the registration sample, we were able to determine how many people of both sexes should be interviewed in each age group. This population comprised the interview sample (fig 2).

Everyone in Denmark has a personal code number. This enables them to be traced through the Danish civil registration system to ascertain whether they are alive or have emigrated or disappeared. Both our samples were traced through this system and through the Danish cause of death register to 31 July 2002. Excluded from the follow up study were people without a personal code and those with a non-valid code. People who had disappeared or emigrated were included for the number of days they could be traced and were omitted from the date of emigration or disappearance. The follow up study therefore includes 579 people in the registration sample and 185 people in the interview sample. Fifty six of the 579 people (9.7%) in the registration sample were also in the interview sample. We analysed the two samples separately.

People who had died were investigated through the Danish cause of death register. At the time of the follow up study the register contained electronic information on all deaths up to 1998. Causes of death from 1999 to 31 July 2002 were identified from death certificates.

Instruments

In 1992 we carried out both structured and semi-structured interviews with selected questions from the Copenhagen welfare surveys, highlighting upbringing, family background, school education, marital status, social network, number of children, daily living, and psychiatric treatment. Mental health was evaluated with the SCAN 1.0 interview.[8] Both authors were trained at the WHO collaboration centre in Aarhus to carry out the SCAN interviews. From the interview we were able to evaluate whether a person fulfilled diagnostic criteria according to the *Diagnostic and Statistical Manual of Mental Disorders*, third edition, revised.[9]

Statistical analysis

We calculated the standardised mortality ratio.[10 11] Age and sex specific relative risk of death was calculated in 10 year age groups, comparing the study population with the general population in Copenhagen. The comparison was based on population data from 1996. The homeless population from 1991 was therefore compared with a population that was five years older. The cause specific standardised mortality ratio was based on age groups: 18-24 years, 25-44, 45-64, and 65-85.

Cox regression was used to test differences in mortality between subgroups in the homeless populations. A multivariate analysis was applied because we could not exclude confounding between several of the variables in the model. Backward Cox regression with Wald test was used for the final model to predict death by any cause and suicide. The relative risk was adjusted for all other variables in the final multivariate model. We did not analyse predictors for suicide in the interview sample as only one suicide occurred.

Results

Figure 1 and table 1 present the causes of death in the registration sample. The standardised mortality ratio for both sexes was 3.8 (95% confidence interval 3.5 to 4.1); 2.8 (2.6 to 3.1) for men and 5.6 (4.3 to 6.9) for women. In this cohort the age and sex standardised mortality ratio for suicide was 6.0 (3.9 to 8.1), for unintentional injuries 14.6 (11.4 to 17.8), and for unknown cause of death 62.9 (52.7 to 73.2). The observed to expected mortality ratios were highest in the younger age groups and higher among women than among men (table 2).

Only 48 (34%) of the 141 deaths (registration sample) occurred in hospital. Of the rest, 49 (35%) occurred at home (some homeless people lived in apartments at the time of death), 8 (6%) occurred in institutions other than hospitals, and 36 (26%) occurred in public toilets or other places used by the public. During the 1990s, 4% of the general population died in public places.[12] An unexpectedly high proportion were found dead in their apartments after neighbours complained about a smell; however, no figures about this were available for the general population.

Predictors of death in registration sample

Increasing age, stays of fewer than 11 days, and more than one stay during the year were significant predictors of early death (table 3). In the general population increasing age is associated with higher mortality (relative risk 1.09 per year) whereas in homeless people (1.03 per year) the observed to expected mortality ratios were highest in the younger age groups (see table 2).[11] We found no statistically significant differences in mortality between homeless men and homeless women (table 3). In the general population the mortality among women is lower than among men whereas the observed to expected mortality ratios were higher among homeless women than among

Table 1 Vital status and cause specific mortality among 579 homeless people staying in one of two hostels in Copenhagen, 1991-2002

Vital status	No (%) of homeless people (n=579)	Observed to expected mortality (95% CI)
Death by natural causes	75 (13)	2.6 (2.3 to 2.9)
Unintentional injury	21 (4)	14.6 (11.4 to 17.8)
Suicide	8 (1)	6.0 (3.9 to 8.1)
Unknown	37 (6)	62.9 (52.6 to 73.2)
Alive	418 (72)	—
Emigrated or disappeared	20 (3)	—
Total	579 (100)	3.8 (3.5 to 4.1)

homeless men. No significant interaction was found between age and sex in the registration sample (Wald test 2.32, P=0.13). Significant predictors for suicide were stays of fewer than 11 days (relative risk 5.32, 1.07 to 26.32) and more than one stay during 1991 (4.70, 1.18 to 18.82).

Representativeness of interview study

The mean length of stay during 1991 for the 579 people in the registration sample was 11 weeks. The mean length of stay among the 185 homeless people in the interview sample, from adding the number of days spent in different hostels during the preceding year, was 22 weeks. These differences in data structure might explain some of the difference in mean length of stay between the two studies. However, length bias cannot be excluded.

Upbringing, mental illness, substance misuse, and criminality

Table 4 shows the distribution of diagnoses among the 185 homeless people who could be followed in the civil registration system, along with misuse of alcohol and drugs. Most patients with psychosis also misused alcohol or drugs. A psychiatrist was affiliated with one of the hostels; the other hostels collaborated with a community mental health centre. Only 13 of the 60 homeless people with psychosis received psychiatric treatment.

Overall, 135 of the 185 (73%) homeless people had been sentenced for crime, 47 (26%) involving violence; among these 10 had committed grievous bodily harm or murder. Being sentenced was significantly more common among those who misused alcohol or drugs (81% *v* 46%, χ^2=18.94, df 1, P$<$0.001), but was not significantly different for those sentenced for violence (χ^2=3.23, df 1, P=0.07).

Most of the homeless people had had severe problems and traumatic circumstances during upbringing; 19 (10%) had been institutionalised as children (table 5). In 25 (14%) cases the father had died before the interviewee was 17; in 20 (11%) cases it was the death of the mother. By the age of 17, 118 (64%) interviewees had not lived with both parents. These proportions are much higher than in the general population.[13 14]

Fifty six (30%) of the 185 people interviewed died. In univariate analyses, age, death of the father before the interviewee was 17, and misuse of alcohol and sedatives were predictors of death (table 6). After multivariate stepwise backward analysis based on Wald test, the variable of death of the father became insignificant and the diagnosis of psychosis was found to be associated with significantly lower mortality. Thus, the final model for predictors of death contained the variables age, alcohol misuse, sedative misuse, and psychosis.

Discussion

In Copenhagen, mortality is higher among homeless people who stay in hostels than it is among the general population. It was especially high in those aged 15-34 years. The standardised mortality ratio was increased for all causes of death except murder. Murder is rare in Denmark, and since our sample size was small we could detect no difference in rates.

The highest mortality was among homeless people staying only a short time at a hostel or staying more than once during 1991, showing that this transient population is the most vulnerable and has the highest risk of early death. In the registration sample, comprising 579 homeless people who had stayed in one hostel in Copenhagen at some time during 1991, we found no differences in mortality between men and women. Mortality was therefore much higher than expected among the young women.

The interview sample, comprising 185 homeless people who had stayed in two hostels in Copenhagen, was representative of the registration sample for age, sex, and mortality. Even though length bias could not be excluded, the interviewed group was representative for psychopathology, misuse of alcohol and drugs, and conditions during upbringing. We carried out a stratified prevalence study to ensure the best possible participation. Our interviews were structured and semistructured, and none of the homeless people had major difficulties understanding and responding to the questions. Among the homeless people in the two hos-

Table 2 Mortality in registration sample of 579 homeless people staying in a Copenhagen hostel in 1991

Age	No	No of years under risk	No of deaths	Expected mortality	Observed to expected mortality
Women:					
15-24	12	114.1	1	0.03	28.5
25-34	29	242.8	12	0.29	41.7
35-44	16	216.0	1	0.74	1.4
45-54	7	70.3	2	0.56	3.6
55-64	4	40.3	1	0.93	1.1
65-84	2	11.9	1	0.67	1.5
Total	70	—	18	3.21	5.6
Men:					
15-24	41	418.0	6	0.45	13.3
25-34	191	1786.3	42	4.43	9.5
35-44	168	1643.1	34	12.00	2.8
45-54	73	714.5	22	10.23	2.5
55-64	26	223.4	12	8.17	1.5
65-84	10	62.8	7	7.99	0.9
Total	509	—	123	43.40	2.8

Table 3 Univariate and multivariate stepwise Cox regression analysis of mortality among 579 homeless people staying in a Copenhagen hostel, 1991-2002

Variable	Unadjusted relative risk (95% CI)	P value	Adjusted relative risk (95% CI)*	P value
Age (years)	1.03 (1.02 to 1.05)	<0.001	1.03 (1.02 to 1.05)	<0.001
Male	0.92 (0.56 to 1.51)	—	—	—
More than one stay during 1991	1.83 (1.27 to 2.66)	<0.01	1.72 (1.17 to 2.52)	<0.01
Shortest stay fewer than 11 days	1.73 (1.25 to 2.41)	<0.01	1.62 (1.15 to 2.28)	<0.01

*Adjusted for all other variables in final model.

Table 4 Main diagnosis among 185 homeless people staying in two hostels in Copenhagen, 1992

Main diagnosis	No (%) of homeless people (n=185)	No (%) misusing alcohol or drugs in each category
Schizophrenia	31 (17)	20 (65)
Mood disorder	1 (1)	1 (100)
Organic psychosis	17 (9)	13 (77)
Other psychoses	11 (6)	5 (46)
Alcohol misuse and dependence	36 (19)	36 (100)
Drug misuse and dependence	62 (34)	62 (100)
Anxiety disorder, personality disorder, adjustment disorder, or mental retardation	10 (5)	7 (70)
No mental illness	17 (9)	0
Total	185 (100)	144 (78)

Table 5 Conditions during upbringing of 185 homeless people in Copenhagen compared with 488 people in general population, adjusted for age. Values are numbers (row percentages) unless stated otherwise

Condition during upbringing	Homeless people (n=185)	General population aged 20-49 years (n=216)	Odds ratio (95% CI)*
Had not lived with both parents by age 17	118 (64)	40 (19)	6.6 (4.4 to 11.1)
Father died before interviewee was 17	25 (14)	10 (5)	4.6 (2.4 to 9.4)
Mother died before interviewee was 17	20 (11)	2 (1)	18.9 (6.0 to 59.4)

*Based on comparison with 488 people in general population investigated in Copenhagen welfare survey, 1986.[13 14]

Table 6 Univariate and multivariate (after stepwise exclusion) Cox regression analysis of mortality, 1992-2002, among 185 homeless people interviewed in two Copenhagen hostels

Variable	No (%)	Unadjusted relative risk (95% CI)	Adjusted relative risk† (95% CI)
Mean (SD) age (years)	38.2 (10.9)	1.03* (1.00 to 1.05)	1.05*** (1.02 to 1.08)
Male	161 (87)	1.50 (0.60 to 3.26)	
School education‡		1.01 (0.84 to 1.22)	—
Mother died before interviewee was 17	20 (11)	1.19 (0.54 to 2.62)	—
Father died before interviewee was 17	25 (14)	1.91* (1.01 to 3.62)	—
Seldom or no contact with family	81 (44)	1.02 (0.60 to 1.73)	—
Institutionalised as child	19 (10)	0.83 (0.33 to 2.09)	—
Misuse of alcohol	86 (47)	2.04** (1.19 to 3.50)	2.19** (1.25 to 3.86)
Misuse of drugs:			
Opioids	81 (44)	0.91 (0.54 to 1.56)	—
Cannabis	48 (26)	0.89 (0.48 to 1.65)	—
Sedatives	25 (14)	2.02* (1.07 to 3.82)	3.14** (1.55 to 6.37)
Cocaine or stimulating drugs	25 (14)	1.60 (0.81 to 3.16))	—
Any misuse	144 (78)	1.37 (0.69 to 2.70)	—
Psychosis	60 (32)	0.64 (0.35 to 1.18)	0.47* (0.24 to 0.93)
Ever sentenced	135 (73)	1.01 (0.56 to 1.82)	—
Sentenced for violence	47 (25)	0.86 (0.46 to 1.60)	—

*P<0.05; **P<0.01; ***P<0.001.
†Adjusted for other variables in final model.
‡Estimate of increased risk for increased level of school education: 7 years, 8 years, 9 years, 10 years, and A level.

tels, there was a high proportion of mental illness, people with a criminal record, misuse of alcohol and drugs, and people who had had a traumatic childhood. This concurs with other studies.[15–19]

Contrary to our hypotheses, but in accordance with the findings of another study, psychosis was not predictive of death.[1] It is likely that stronger predictors of death were characteristic of people with no psychotic conditions in the interviewed population. Most misused several types of drugs and alcohol, making it difficult to interpret the effect of misuse. Misuse of opioids was not predictive of death; however, misuse of sedatives occurred almost exclusively among those who misused opioids. That opioids were not a risk factor for early death might be because a large proportion of the people who misused them used several compounds, and that a high mortality was associated with the misuse of both alcohol and sedatives.

It is possible to help mentally ill homeless people by providing psychiatric care, food, and shelter.[20–22] Outreach and case management techniques can improve the standards of daily living for homeless people. Young people who misuse drugs are difficult to help, and programmes should be especially developed to ensure that this group receives psychiatric treatment, detoxification treatment, medical treatment, social advice, and accommodation. The prevention of social exclusion should start early in life.

What is already known on this topic

Longitudinal studies show that homelessness is associated with increased mortality

They also show that increased mortality is associated with the misuse of intravenous drugs

What this study adds

Homeless people staying in hostels in Copenhagen are four times more likely to die early than people in the general population

Mortality was comparatively higher in the younger age groups and among homeless women

Other predictors of early death were adverse childhood experiences, such as death of the father, and misuse of alcohol and sedatives

Contributors: MN was responsible for the design of the study, analysed the data, and wrote and revised the manuscript. MN and NW-H conducted the research interviews and critically revised the manuscript and approved the final version. MN will act as guarantor for the paper.

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