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RESEARCH

Mental disorders and vulnerability to homicidal death: Swedish nationwide cohort study


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Abstract

Objective To determine the risk of people with mental disorders being victims of homicide.

Design National cohort study.

Setting Sweden.

Participants Entire adult population (n=7 253 516).

Main outcome measures Homicidal death during eight years of follow-up (2001-08); hazard ratios for the association between mental disorders and homicidal death, with adjustment for sociodemographic confounders; potential modifying effect of comorbid substance use.

Results 615 homicidal deaths occurred in 54.4 million person years of follow-up. Mortality rates due to homicide (per 100 000 person years) were 2.8 among people with mental disorders compared with 1.1 in the general population. After adjustment for sociodemographic confounders, any mental disorder was associated with a 4.9-fold (95% confidence interval 4.0 to 6.0) risk of homicidal death, relative to people without mental disorders. Strong associations were found irrespective of age, sex, or other sociodemographic characteristics. Although the risk of homicidal death was highest among people with substance use disorders (approximately ninefold), the risk was also increased among those with personality disorders (3.2-fold), depression (2.6-fold), anxiety disorders (2.2-fold), or schizophrenia (1.8-fold) and did not seem to be explained by comorbid substance use. Sociodemographic risk factors included male sex, being unmarried, and low socioeconomic status.

Conclusions In this large cohort study, people with mental disorders, including those with substance use disorders, personality disorders, depression, anxiety disorders, or schizophrenia, had greatly increased risks of homicidal death. Interventions to reduce violent death among people with mental disorders should tackle victimisation and homicidal death in addition to suicide and accidents, which share common risk factors.

Introduction

Mental disorders are well established risk factors for suicide and accidental death,[1-5] but little is known about their association with homicidal death. The perpetration of homicide and other violence by people with mental disorders has been extensively studied for decades.[6-13] However, the risk of such people being victims of homicide has seldom been examined. People with mental disorders may be at increased risk of homicidal death for several reasons, including a high prevalence of comorbid substance use, which is associated with violence. Irrespective of substance use, they also are more likely to live in high deprivation areas,[14] which have higher homicide rates, be in closer contact with other mentally ill people, be less aware of their safety needs,[15] or potentially be victimised because of perceptions that they are dangerous or vulnerable.[16-18] More effective prevention of violent death among people with mental illness requires a better understanding of the risks of homicidal death in addition to suicide and accidents, which are more widely studied.

The few previous studies on this topic have reported that people with any mental disorder have a twofold to sixfold risk of homicidal death relative to the general population.[19-22] These studies have had important limitations, including inadequate control for confounding,[19-22] insufficient sample sizes for the examination of specific mental disorders,[20-22] or the inclusion of only psychiatric patients admitted to hospital,[19] who have more severe illness and do not adequately represent mental disorders in the general population. We overcame these limitations by using outpatient and inpatient data for the entire adult population of Sweden (approximately 7.2 million). We ascertained potential sociodemographic confounders by using national census data and mental disorders by using outpatient and inpatient diagnoses from all healthcare settings nationwide.

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We used these data to examine the association between mental disorders or sociodemographic characteristics and homicidal death, while adjusting for confounders and exploring the potential modifying effect of comorbid substance use.

Methods

Study population and homicidal death ascertainment

We did a nationwide cohort study of all people aged 17 years or older who were living in Sweden on 1 January 2001 (n=7 253 516). The outcome of interest was death from homicide (codes X85-Y09 in ICD-10 (international classification of diseases, 10th revision); 615 total deaths) during eight years of follow-up (1 January 2001 to 31 December 2008). We identified these by using the Swedish death registry, which includes about 99.5% of all deaths nationwide.[23] We excluded deaths of undetermined intent (ICD-10 codes Y10-Y34; 1497 total deaths) from this outcome.

Mental disorder ascertainment

We identified mental disorders by any primary or secondary diagnosis in the Swedish outpatient registry or the Swedish hospital registry from 1 January 2001 (when the outpatient registry was started) to 31 December 2008 (the maximum follow-up at the time of analysis). The Swedish outpatient registry contains all primary and secondary outpatient diagnoses nationwide since 2001, and the Swedish hospital registry contains all primary and secondary hospital discharge diagnoses with nationwide coverage since 1987. These registries are estimated to be more than 99% complete.[24] We classified mental disorders according to ICD-10 codes and examined them in the following categories: any mental disorder (F00-F69); substance use disorders (F10-F19); schizophrenia and schizotypal and delusional disorders (F20-F29), including schizophrenia (F20), which was examined separately; mood (affective) disorders (F30-F39), including bipolar disorder (F31) and depression (F32-F33), which were examined separately; neurotic, stress related, and somatoform disorders (F40-F48), including anxiety disorders (F40-F41), which were examined separately; and personality disorders (F60-F61).

Sociodemographic variables

We identified sociodemographic characteristics that may be associated with mental disorders and risk of homicidal death by using national census data from 2000-01 and linked them to the registry data by using an anonymous personal identification number.[14 25 26] We examined the following as predictor and adjustment variables: sex (men or women); age (17-24, 25-34, 35-44, 45-54, 55-64, 65-74, ≥75 years at study entry); marital status (married/cohabiting, never married, divorced, widowed, or unknown); country of birth (Sweden, other Nordic countries (Denmark, Finland, Iceland, Norway), non-Nordic countries, or unknown); educational level (compulsory school or less (≤9 years), vocational high school or some college preparatory high school (10-11 years), college preparatory high school and/or college (≥12 years), or unknown); employment status (employed or non-employed; "non-employed" includes students and homemakers); income (categorical variable in quarters, or unknown); and urban/rural status (large cities, medium sized towns, small towns/rural, or unknown).

Statistical analysis

We used Cox proportional hazards regression to estimate hazard ratios and 95% confidence intervals for the association between mental disorders or sociodemographic characteristics and homicidal death during the follow-up period. We modelled each mental disorder for each person as a time dependent variable, so that a person contributed to "non-exposed" person time before and "exposed" person time after the earliest diagnosis of the respective disorder. We censored individuals (that is, treated them as no longer under observation or at risk of the study outcome) at the time of death from any cause other than homicide (n=834 395; 11.5%) or at the time of emigration as determined by the absence of a Swedish residential address in census data (n=219 571; 3.0%). We built sequential models to identify potential confounders that had the strongest effect on estimates of risk and identified the following variables: sex, age, marital status, country of birth, education, and employment status. After adjustment for these variables, income and urban/rural status had no effect on risk estimates and were subsequently excluded as adjustment variables. We used three different adjusted models: the first was adjusted for sex and age only; the second was adjusted for sex, age, and other sociodemographic characteristics (marital status, country of birth, education, and employment status); and the third was adjusted for the same variables after exclusion of people with any substance use disorder diagnosed during the study period (n=160 762; 2.2%). We evaluated the proportional hazards assumption by graphical assessment of log-log plots,[27] and it was met in each of the models.

In addition, we assessed for effect modification by sociodemographic factors by calculating hazard ratios and 95% confidence intervals for the association between any mental disorder and homicidal death after stratifying by these factors, and using a likelihood ratio test to formally test for interaction. We did a sensitivity analysis in which we calculated hazard ratios and 95% confidence intervals for the associations between mental disorders and either homicidal death or "death of undetermined intent" (ICD-10 codes Y10-Y34; 1497 total deaths) as a combined outcome. All statistical tests were two sided and used an α level of 0.05. We used Stata statistical software, version 11.2 for all analyses.

Results

In this population of 7 253 516 Swedish adults, 615 homicidal deaths (410 men and 205 women) occurred in 54.4 million person years of follow-up, including 141 homicidal deaths (104 men and 37 women) among people with mental disorders. Crude mortality rates due to homicide (per 100 000 person-years) were 1.1 in the entire population, 2.8 among people with mental disorders, and 0.9 among those without mental disorders.

Sociodemographic factors and homicidal death

Men had twice the risk of homicidal death relative to women, after adjustment for all other sociodemographic characteristics (table 1⇓). We found no linear trend in the risk of homicidal death by age (P for trend=0.78). The risk of homicidal death was more than twofold higher among people who were divorced or never married relative to those who were married or cohabiting. Other independent risk factors included low education (P for trend<0.001), low income (P for trend<0.001), non-employment, and living in large cities relative to medium sized or small towns (table 1⇓). Nordic and non-Nordic immigrants had an increased risk of homicidal death relative to

people born in Sweden before but not after adjustment for other sociodemographic characteristics.

Mental disorders and homicidal death

A total of 22.9% (n=141) of people who died from homicide were ever diagnosed as having a mental disorder during the study period, compared with 9.4% (n=680 596) of the general population. After adjustment for sex and age, any mental disorder was associated with more than a sevenfold risk of homicidal death (95% confidence interval 5.98 to 8.83), relative to people without mental disorders (table 2⇓). The risk of homicidal death was strongest among those with substance use disorders (approximately 16-fold risk). Only two homicidal deaths occurred among people with bipolar disorder, which was insufficient for obtaining meaningful risk estimates. However, the risk of homicidal death was significantly elevated among people with all other mental disorders, including about sevenfold among those with personality disorders, about fivefold among those with schizophrenia, and more than threefold among those with depression or anxiety disorders (table 2⇓). Further adjustment for other sociodemographic factors resulted in attenuation of all risk estimates, but they remained significantly elevated for most mental disorders, including a nearly fivefold risk among people with any mental disorder, an approximately ninefold risk among those with substance use disorders, an approximately threefold risk among those with personality disorders, and more than a twofold risk among those with depression or anxiety disorders (table 2⇓). Schizophrenia was associated with a 1.8-fold risk of homicidal death, although this no longer reached statistical significance (95% confidence interval 0.85 to 3.86).

We explored the influence of substance use by repeating the fully adjusted model after excluding people with any outpatient or inpatient diagnosis of substance use disorders (n=160 762; 2.2%). A diagnosis of any mental disorder was associated with an approximately twofold risk of homicidal death among people who were never diagnosed as having substance use disorders (table 2⇓). Risk estimates for the association between personality disorders or anxiety disorders and homicidal death were somewhat higher after this exclusion, and other risk estimates were only slightly affected. These findings suggest that the observed associations between mental disorders and homicidal death were not fully explained by comorbid substance use.

We also assessed whether the association between any mental disorder and homicidal death was modified by sociodemographic factors, by examining risk estimates stratified by these factors (table 3⇓). After adjustment for sex, age, and other sociodemographic factors, all hazard ratios were in the range of 2.7 to about six. Precision was low in some strata owing to small numbers of homicidal deaths and person years. However, these findings suggest that people with mental disorders have increased vulnerability to homicidal death irrespective of sociodemographic characteristics. The association between any mental disorder and homicidal death was somewhat stronger among men (P for interaction=0.03), people with higher income (P for interaction=0.02), and people who lived in medium sized or small towns (P for interaction=0.01), but it did not vary significantly by other sociodemographic factors (P for interaction>0.05 for each; table 3⇓).

A sensitivity analysis in which we examined the associations between mental disorders and either homicidal death or "death of undetermined intent" as a combined outcome yielded substantially higher risk estimates for each mental disorder (supplementary table), possibly owing to a high prevalence of suicide among deaths of undetermined intent.[28 29]

Discussion

In this large cohort study, people with mental disorders had highly increased risks of homicidal death, irrespective of sex, age, or other sociodemographic characteristics. Although the risk of homicidal death was highest among those with substance use disorders, it was also increased among those with personality disorders, depression, anxiety disorders, or schizophrenia and did not seem to be explained by comorbid substance use. Sociodemographic risk factors included male sex, being unmarried, and low socioeconomic status. These findings overlap with previously reported risk factors for suicide and accidental death,[1 30-32] which we also confirmed in this population (submitted). They suggest that preventive interventions targeting common underlying risk factors may have greater potential to reduce violent death than do narrower outcome specific interventions.[32 33]

Comparison with other studies

To our knowledge, this is the first study to examine the link between mental disorders and homicidal death by using comprehensive sociodemographic and outpatient and inpatient data for a national population. The use of outpatient as well as inpatient diagnoses is important because it allows more complete ascertainment of all mental disorders, including milder cases (not admitted to hospital), enabling more reliable and generalisable risk estimates than hospital based studies. Adjustment for sociodemographic confounders is also critical because many such factors are highly associated with mental disorders and, independently, with risk of homicidal death. The largest previous studies of this topic include a Danish study of 72 208 psychiatric patients admitted to hospital during 1973-93 that reported increased risks of homicidal death (based on 181 deaths) among those with substance use disorders, personality disorders, affective or non-affective psychoses (men or women), and schizophrenia (men only), but not neurosis.[19] The overall increase in risk among people with mental disorders was about sixfold (adjusted for sex, age, and year of death), compared with an increase of approximately fourfold to fivefold in risk that we found after further adjusting for sociodemographic confounders unaccounted for in the Danish study. Another study of 135 992 psychiatric patients in Australia with one year of follow-up reported a nearly fivefold higher risk among people with any psychiatric treatment, based on 11 homicidal deaths compared with 53 in the general population.[20] Smaller US studies of 5284 psychiatric emergency room patients and 500 psychiatric outpatients reported increases of approximately twofold and fourfold in risk among people with mental disorders, on the basis of less than 10 homicidal deaths.[21 22] These studies did not account for socioeconomic confounders, and sample sizes were insufficient to examine risks by specific mental disorders.

Possible explanations and implications

Comorbid substance use did not seem to fully explain the associations we found between mental disorders and homicidal death. Several other explanations are probably involved. People with mental disorders are more likely to live in high deprivation neighbourhoods,[14] which have higher homicide rates. They may be in closer contact with other mentally ill people and may be less aware of their safety risks owing to symptoms of the underlying illness.[15 34] A systematic review reported that people with virtually any mental disorder (especially schizophrenia but

also anxiety disorders and depression) are commonly perceived by the general public as unpredictable or dangerous.[16] Although some reactions towards mentally ill people are pro-social, feelings of uneasiness, fear, and a desire for social distance are common and may increase the risk of victimisation.[16-18] Interventions to reduce these risks should include collaborations between mental health clinics and the criminal justice system to develop personal safety and conflict management skills among people with mental illness.[35 36] Improved housing, financial stability, and substance abuse treatment may also reduce vulnerability to violent crime.[15 34]

The homicide rate in Sweden (1.1 per 100 000 person years) is similar to that of other western European countries[37]; it is much lower than that of the United States (7.0 per 100 000 person years),[38] where our findings are likely to have a larger public health impact. US studies of homicidal death among mentally ill people are scarce and much smaller.[21 22] However, recent studies of non-fatal violence have reported that victimisation of people with severe mental illness is more than four times the incidence in the general US population and is a larger public health problem than perpetration of violence by mentally ill people.[17 34]

Strengths and limitations

A major strength of this study was the ability to examine the link between mental disorders and homicidal death in the largest cohort to date by using comprehensive registry data for a national population. Mental disorders were ascertained by using outpatient as well as inpatient diagnoses from all healthcare settings nationwide, enabling more reliable estimates of risk than in studies limited to cases admitted to hospital or selected samples. The results were adjusted for broadly measured sociodemographic confounders, and we examined the potential modifying effect of comorbid substance use.

Limitations included the inability to examine mental disorders that were undiagnosed; the reported prevalence of mental disorders thus still probably underestimated the true prevalence. However, because Sweden has universal access to healthcare and we used all outpatient and inpatient diagnoses nationwide, ascertainment was probably much more complete than in previous studies. Substance use disorders also were ascertained by using nationwide outpatient and inpatient diagnoses, which may have underestimated their true prevalence and influence. Sociodemographic factors were measured only at the beginning of the study period, and residual confounding by such factors is possible. Despite the large size of this cohort, the precision of some risk estimates was limited owing to the relatively low homicide rate in Sweden. Associations between multiple psychiatric disorders and homicidal death were not examined owing to insufficient numbers of homicides among people with multiple diagnoses to allow meaningful risk estimates. Information on non-fatal assault was unavailable, so we examined only the most severe outcome of violent victimisation, which also occurs in many other forms. Psychiatric patients also have increased risks of violent death from suicide and accidents, which have been reported previously,[1-5 19-22] and which were not covered in this study. Finally, the extent to which our findings for homicidal death are generalisable to countries with different social contexts and healthcare systems is unclear, although they are broadly compatible to findings from much smaller studies in the US and Australia.[20-22]

Conclusions

This large national cohort study found that people with mental disorders, including those with substance use disorders, personality disorders, depression, anxiety disorders, or schizophrenia, had greatly increased vulnerability to homicidal death. We found strong associations irrespective of sex, age, or other sociodemographic characteristics. Homicidal death shared risk factors in common with those previously found for suicide and accidental death. Interventions to reduce violent death among people with mental disorders should tackle risks of victimisation and homicidal death in addition to suicide and accidents.

Contributors: CC, KS, MAW, and JS were responsible for the study concept and design. JS obtained funding. KS and JS acquired the data. CC, KS, MAW, and JS analysed and interpreted the data. CC and JS did the statistical analysis. CC drafted the manuscript, and all authors revised it for important intellectual content. JS is the guarantor.

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Competing interests: All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: support for the study by grants from the National Institute of Drug Abuse (R01DA030005), the Swedish Research Council, and ALF project grant, Lund, Sweden; no financial relationships with any organisations that might have an interest in the submitted work in the previous three years; and no other relationships or activities that could appear to have influenced the submitted work.

Ethical approval: This study was approved by the Regional Ethical Review Board of Lund University in Sweden.

Data sharing: No additional data available.

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What is already known on this topic

The perpetration of homicide by people with mental disorders has received much attention, but their risk of being victims of homicide has rarely been examined

No studies of this topic have examined mental disorders ascertained from all outpatient and inpatient settings in a national population

Such information may facilitate more effective strategies for improving the safety and health of people with mental illness

What this study adds

This study used nationwide outpatient and inpatient data from Sweden and adjusted for sociodemographic confounders

People with mental disorders, including those with substance use disorders, personality disorders, depression, anxiety disorders, or schizophrenia, had greatly increased risks of homicidal death

Interventions to reduce violent death among people with mental disorders should tackle modifiable risk factors for victimisation and homicidal death

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Tables

Table 1| Adjusted hazard ratios for associations between sociodemographic characteristics (2000-01) and homicidal death in Sweden (2001-08)

Characteristics	No of homicidal deaths	Person years (×100 000)	Rate*	Adjusted hazard ratio (95% CI)†
Total	615	543.5	1.13	—
Sex				
Women	205	276.7	0.74	Reference
Men	410	266.9	1.54	2.07 (1.74 to 2.45)
Age (years)				
17-24	89	54.4	1.64	0.96 (0.72 to 1.28)
25-34	107	97.7	1.09	Reference
35-44	133	99.2	1.34	1.53 (1.18 to 1.99)
45-54	137	93.1	1.47	2.05 (1.56 to 2.69)
55-64	70	86.5	0.81	1.13 (0.80 to 1.59)
65-74	37	56.6	0.65	0.53 (0.35 to 0.82)
≥75	42	56.0	0.75	1.74 (1.02 to 2.98)
Marital status				
Married/cohabiting	127	233.7	0.54	Reference
Never married	271	191.3	1.42	2.56 (2.01 to 3.26)
Divorced	110	58.5	1.88	3.04 (2.34 to 3.94)
Widowed	15	34.3	0.44	1.07 (0.60 to 1.90)
Unknown	92	25.8	3.57	Not estimable
Country of birth				
Sweden	433	453.3	0.96	Reference
Other Nordic countries	36	20.8	1.73	1.13 (0.79 to 1.62)
Non-Nordic countries	146	66.3	2.20	1.05 (0.81 to 1.35)
Unknown	0	3.2	0.00	Not estimable
Educational level (years)				
Compulsory high school or less (≤9)	154	101.5	1.52	1.66 (1.31 to 2.10)
Vocational or some college preparatory high school (10-11)	167	138.9	1.20	1.42 (1.14 to 1.78)
College preparatory high school and/or college (≥12)	174	224.2	0.78	Reference
Unknown	120	78.9	1.52	0.37 (0.21 to 0.65)
Employment status				
Employed	195	315.4	0.62	Reference
Non-employed	420	228.2	1.84	3.13 (2.53 to 3.86)
Income				
Highest quarter	66	132.8	0.50	Reference
Second quarter	96	131.8	0.73	1.34 (0.97 to 1.84)
Third quarter	136	127.6	1.07	1.70 (1.24 to 2.32)
Lowest quarter	225	125.6	1.79	2.43 (1.79 to 3.30)
Unknown	92	25.8	3.57	Not estimable
Urban/rural status				
Large cities	206	181.8	1.13	Reference
Medium sized towns	176	185.9	0.95	0.80 (0.65 to 0.98)
Small towns/rural	143	150.0	0.95	0.78 (0.63 to 0.98)
Unknown	90	25.8	3.48	0.28 (0.07 to 1.19)

*Homicidal death rate per 100 000 person years.

†Risk estimates were adjusted for all other variables included in this table.

Table 2| Adjusted hazard ratios for associations between mental disorders and homicidal death in Sweden (2001-08)

Mental disorders (ICD-10 codes)	No of homicidal deaths	Person years (×100 000)	Rate*	Hazard ratio (95% CI) adjusted for sex and age: total population	Hazard ratio (95% CI) adjusted for sex, age, and other sociodemographics†	
					Total population	No substance use‡
Any mental disorder (F00-F69)	141	49.8	2.83	7.27 (5.98 to 8.83)	4.91 (3.99 to 6.03)	2.13 (1.52 to 2.99)
Substance use disorders (F10-F19)	102	12.0	8.48	15.99 (12.85 to 19.91)	9.37 (7.39 to 11.88)	Not estimable
Schizophrenia and schizotypal and delusional disorders (F20-F29)	9	4.2	2.13	3.31 (1.71 to 6.41)	1.33 (0.68 to 2.58)	1.26 (0.52 to 3.06)
Schizophrenia (F20)	7	1.9	3.60	5.23 (2.48 to 11.04)	1.82 (0.85 to 3.86)	1.75 (0.65 to 4.73)
Affective disorders (F30-F39)	28	18.6	1.51	3.35 (2.28 to 4.91)	2.38 (1.62 to 3.50)	2.45 (1.52 to 3.95)
Depression (F32-F33)	25	16.3	1.54	3.47 (2.32 to 5.20)	2.55 (1.70 to 3.83)	2.61 (1.58 to 4.33)
Neurotic, stress related, and somatoform disorders (F40-F48)	36	19.3	1.87	4.08 (2.90 to 5.75)	2.83 (2.00 to 4.00)	2.67 (1.71 to 4.17)
Anxiety disorders (F40-F41)	17	11.5	1.48	3.30 (2.03 to 5.36)	2.16 (1.32 to 3.52)	2.51 (1.37 to 4.59)
Personality disorders (F60-F61)	10	2.5	3.98	7.07 (3.77 to 13.24)	3.21 (1.70 to 6.06)	4.58 (1.46 to 14.38)

ICD-10=international classification of diseases, 10th revision.

*Homicidal death rate per 100 000 person years.

†Other sociodemographic variables included marital status, country of birth, education, and employment status.

‡Excluding people with any outpatient or inpatient diagnosis of substance use disorders (n=160 762; 2.2%).

Table 3| Adjusted hazard ratios for association between any mental disorder and homicidal death in Sweden (2001-08), stratified by sociodemographic characteristics

	Any mental disorder			Adjusted for sex, age, and other sociodemographics*	
Characteristics	No of homicidal deaths	Person years (×100 000)	Rate†	Adjusted hazard ratio (95% CI)	P for interaction‡
Sex:					
Women	37	27.4	1.35	4.26 (2.92 to 6.22)	0.03
Men	104	22.4	4.65	5.08 (3.96 to 6.50)	
Age (years):					
17-24	20	4.8	4.16	5.59 (3.30 to 9.48)	0.24
25-34	24	7.7	3.13	4.86 (2.93 to 8.05)	
35-44	31	8.8	3.53	3.22 (2.07 to 5.01)	
45-54	40	8.3	4.81	4.79 (3.17 to 7.23)	
55-64	15	6.7	2.23	4.64 (2.51 to 8.56)	
65-74	6	5.1	1.18	4.63 (1.88 to 11.39)	
≥75	5	8.4	0.60	2.71 (1.04 to 7.02)	
Marital status:					
Married/ cohabiting	19	17.0	1.12	3.79 (2.29 to 6.25)	0.06
Never married	73	19.0	3.85	3.85 (2.89 to 5.14)	
Divorced	36	8.2	4.39	4.34 (2.84 to 6.65)	
Widowed	1	4.7	0.21	1.18 (0.15 to 9.09)	
Country of birth:					
Sweden	108	41.6	2.60	4.88 (3.86 to 6.18)	0.88
Other Nordic countries	10	2.2	4.62	6.12 (2.67 to 14.01)	
Non-Nordic countries	23	6.1	3.80	3.19 (2.00 to 5.11)	
Educational level (years):					
Compulsory high school or less (≤9)	55	11.1	4.93	4.22 (2.96 to 6.02)	0.11
Vocational or some college preparatory high school (10-11)	42	13.4	3.14	3.41 (2.45 to 4.97)	
College preparatory high school and/or college (≥12)	27	16.1	1.68	3.84 (2.51 to 5.89)	
Unknown	17	9.2	1.85	6.01 (3.51 to 10.28)	
Employment status:					
Employed	28	19.7	1.42	4.36 (2.90 to 6.57)	0.57
Non-employed	113	30.1	3.75	4.72 (3.72 to 5.99)	
Income:					
Highest quarter	14	8.2	1.71	6.23 (3.36 to 11.56)	0.02
Second quarter	19	11.3	1.68	3.56 (2.09 to 6.06)	
Third quarter	40	14.4	2.77	4.27 (2.86 to 6.38)	
Lowest quarter	56	14.9	3.75	3.62 (2.63 to 4.98)	
Urban/rural status:					
Large cities	47	19.2	2.45	3.40 (2.41 to 4.80)	0.01
Medium sized towns	46	16.8	2.74	4.31 (3.00 to 6.18)	
Small towns/rural	36	12.9	2.79	4.74 (3.17 to 7.11)	

*Other sociodemographic variables included marital status, country of birth, education, and employment status.

†Homicidal death rate per 100 000 person years.

‡Likelihood ratio test for interaction between any mental disorder and respective variable with respect to homicidal death.