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The bidirectional association between psychiatric disorders and sheltered homelessness

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Abstract

Background. Psychiatric disorders and homelessness are related, but temporal associations are unclear. We aimed to explore the overlap between hospital-based psychiatric disorders and sheltered homelessness.

Methods. This population-based cohort study was conducted using the Danish registers e.g., the Danish Homeless Register and the Danish National Patient Register. The study cohort included all individuals aged 15 years or older, living in Denmark at least one day during 2002–2021 (born 1984–2006). First psychiatric diagnosis was used to define psychiatric disorder and first homeless shelter contact to define homelessness. Adjusted incidence rate ratios (IRRs) and cumulative incidences were estimated.

Results. Among 1 530 325 individuals accounting for 16 787 562 person-years at risk aged 15–38 years, 11 433 (0.8%) had at least one homeless shelter contact. Among 1 406 410 individuals accounting for 14 131 060 person-years at risk, 210 730 had at least one psychiatric disorder. People with any psychiatric disorder had increased risk of sheltered homelessness relative to individuals with no psychiatric disorder [IRR 9.2, 95% confidence interval (CI) 8.8–9.6]. Ten years after first psychiatric disorder, 3.0% (95% CI 2.9–3.1) had at least one homeless shelter contact. Individuals experiencing homelessness had increased risk of any psychiatric disorder compared to individuals with no homeless shelter contact (IRR 7.0, 95% CI 6.7–7.4). Ten years after first homeless shelter contact, 47.1% (45.3–48.0) had received a hospital-based psychiatric diagnosis.

Conclusion. Strong bidirectional associations between psychiatric disorders and homelessness were identified. Health and social care professionals should be aware of and address these high risks of accumulated psychiatric and social problems.

Introduction

Homelessness, mental disorders, and substance use disorders are highly intertwined (Fazel, Geddes, & Kushel, 2014; Hodgson, Shelton, van den Bree, & Los, 2013) and associated with negative outcomes, including victimization (Nilsson, Nordentoft, Fazel, & Laursen, 2020), imprisonment and recidivism (Nilsson, Nordentoft, Fazel, & Laursen, 2023), severe morbidity, and mortality (Aldridge et al., 2018; Fine et al., 2022; Gutwinski, Schreiter, Deutscher, & Fazel, 2021; Momen et al., 2020; Nielsen, Hjorthøj, Erlangsen, & Nordentoft, 2011; Nilsson et al., 2022). Experiencing multiple of these and other exclusionary situations has been linked to even higher excess mortality (Tweed, Leyland, Morrison, & Katikireddi, 2022; Tweed et al., 2021). People experiencing homelessness have high rates of psychiatric disorders (Gutwinski et al., 2021), even when examined in younger populations (Burke, Firmin, & Wilens, 2022; Hodgson, Shelton, & van den Bree, 2014; Hodgson et al., 2013; Liu, Koh, Hwang, & Wadhera, 2022; Smith-Grant, Kilmer, Brener, Robin, & Underwood, 2022). The most prevalent psychiatric disorders in people experiencing homelessness have been estimated to be substance use disorders, but high prevalence has been found also for major depression and schizophrenia (Gutwinski et al., 2021).

Meta-analytic findings have identified psychiatric predictors of homelessness in high-income countries e.g., drug use disorders, psychotic disorders, and behavior problems (Nilsson, Nordentoft, & Hjorthoj, 2019b). In a systematic review of young people, studies pointed toward a bidirectional relationship between homelessness and psychiatric disorders

(Hodgson et al., 2013). High risk of homelessness has furthermore been found among psychiatric inpatients during the year after discharge from psychiatric departments (Nilsson, Laursen, Hjorthoj, & Nordentoft, 2019a). The prevalence of homelessness in young people leaving out-of-home placement has been found to be higher in people with psychiatric disorders than in those without (Chikwava, O'Donnell, Ferrante, Pakpahan, & Cordier, 2022), and substance use disorders have been linked to first-time homelessness in a large US sample (Thompson, Wall, Greenstein, Grant, & Hasin, 2013). However, studies often investigated associations in one direction or lifetime-ever associations and in selected study populations (Chikwava et al., 2022; Liu et al., 2022; Yoo et al., 2022). There has been a lack of population-based studies on the temporal relationship between homelessness and psychiatric disorders (Chikwava et al., 2022; Gutwinski et al., 2021; Hodgson et al., 2013). Clarification of this can assist in improving strategies to tackle health inequalities.

We hypothesized that psychiatric disorders and homelessness would be strongly associated in both directions (Gutwinski et al., 2021; Nilsson et al., 2019a, 2019b), especially substance abuse, schizophrenia spectrum disorders, and behavioral disorders (Fazel et al., 2014; Gutwinski et al., 2021; Hodgson et al., 2013; Nilsson et al., 2019a, 2019b). The objective was to explore the intertwined nature of psychiatric disorders and homelessness using nationwide registers.

Methods

Study design and participants

We conducted a nationwide cohort study including all individuals living in Denmark at least one day during the follow-up period from 1 January 2002, until 31 December 2021, and born between 1 January 1984, and 31 December 2006. A three-year wash-out period (1999–2001) was used to reduce problems of prevalent cases included as incident cases. Everyone was at the earliest included from their 15th birthday.

We retrieved the study population from the Danish Civil Registration System, which contains data on birth date, sex, vital status, and country of origin (Pedersen, 2011). A personal identification number is part of this register and makes optimal linkage between registers possible.

The study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines.

Data

We studied psychiatric disorders, i.e., any psychiatric disorder and individual mental disorders and substance use disorders, and homelessness as both exposures and outcomes.

Psychiatric disorders

We measured any psychiatric disorder as any diagnosis in the International Classification of Diseases version ten (ICD-10) F-chapter (Division of Mental Health World Health Organization, 1994) for the period from 1994–2021 with corresponding ICD-8 codes for the time prior to 1994. Psychiatric diagnostic information was based on inpatient, outpatient, and emergency room contacts including public and private health care. Definitions of the individual psychiatric disorders examined

can be found in online Supplemental Table S1. The diagnoses were defined according to (ICD-10). The information on psychiatric disorders was retrieved from the Danish Psychiatric Central Research Register (1967–1994) (Mors, Perto, & Mortensen, 2011) and the Danish National Patient Register (1995–2021) (Schmidt et al., 2015) having information on inpatient contacts since the establishment of the registers and outpatient and emergency room contacts since 1995. First psychiatric diagnosis was used to define the beginning of being exposed with a psychiatric disorder.

Homelessness

Homelessness was measured by first contact to a homeless shelter under the Consolidation Act on Social Services, Section 110 (Danish Ministry for Children and Social Affairs, 2018). Individuals with at least one night accommodated in these shelters were defined as experiencing homelessness. Danish municipalities are obliged to offer temporary stays in these shelters for people experiencing homelessness, if an individual does not have a place to live or is unable to live at home and has personal problems that require extra support. The Danish Homeless Register contains information on all homeless shelter stays from 1 January 1999, to 31 December 2021 (Benjaminsen, 2015; Nielsen et al., 2011; Statistics Denmark, 2020). According to FEANTSA's definition of homelessness, our definition covered primarily 'People living in accommodation for the homeless' (FEANTSA, 2005), and not individuals living rough or those living temporarily in conventional housing with family or friends who never used the homeless shelters. However, as previously described during a long follow-up period a considerable part of the rough sleepers are likely to use the shelters (Benjaminsen, 2015).

Statistical analyses

Absolute risks

First, we calculated cumulative incidences using the Aalen–Johansen estimator considering emigration and death as competing risks (Aalen & Johansen, 1978). The probability of incident sheltered homelessness following any psychiatric disorder and the probability of any psychiatric disorder following first homeless shelter contact was studied. These analyses were compared to the probability in a sex- and age-matched comparison group from the general population consisting of five individuals per case.

Relative risks

Second, we estimated incidence rate ratios (IRRs) which give an estimate of how much more a later condition/circumstance of interest occurred in individuals with a prior condition/circumstance of interest, compared to individuals without the prior condition/circumstance. Separate analyses were conducted for each psychiatric disorder studied. IRRs and 95% confidence interval (CI) were obtained from the Poisson Regression, which approximates a Cox regression model. Adjusting covariates were chosen a priori based on previous studies (Nielsen et al., 2011; Nilsson et al., 2019a). We adjusted for sex (male, female), age (one-year groups), calendar time (years), and country of origin (Denmark, other Western countries, and non-Western countries) in all regression analyses. We also conducted these analyses by sex. Piecewise constant intensity for the 1-year age-groups, which is assumed in the Poisson model, was met (Andersen & Keiding,

2002). Exposures were handled as time-dependent covariates. An individual counted as exposed from first date of exposure or from start of follow-up for those previously exposed and onward.

In the analysis of (1) the association between psychiatric disorders and the incidence of sheltered homelessness and (2) the association between first homeless shelter contact and the incident of psychiatric disorders, individuals were followed from 1 January 2002, or from their 15th birthday, whichever came last, and until outcome, emigration, death, or end of follow-up on 31 December 2021.

Time-patterns

Third, we studied the risk of sheltered homelessness and psychiatric disorders according to the time in years from exposure to outcome by defining a covariate according to a hierarchical pattern: less than one year, one to two years, two to five years, or five or more years.

Sensitivity analyses

Information on treatment for substance use disorders from the following registers: Registry of Drug Abusers Undergoing Treatment, the National Register on Treatment with Heroin and Methadone, and the National Registry of Alcohol Treatment were included in a sensitivity analysis to use as broad a data basis as possible (Nilsson et al., 2022). In another sensitivity analysis, the year prior to first exposure was included in the exposure definition i.e., people were at risk of outcome one year *prior* to their first diagnosis or homeless shelter contact.

The statistical analyses were performed using SAS (version 9.4.).

Results

Psychiatric disorders and subsequent homelessness

From 1 January 2002, to 31 December 2021, 1530325 individuals [747 484 females (48.8%) and 782 841 males (51.2%)] aged 15–38 years were included in the study population and accounted for 16 787 562 person-years at risk with 11 433 (0.8%) cases of sheltered homelessness with an IR of 0.7 per 1000 person-years. At the end of follow-up, the median age was 26.1 years (5th percentile: 16.2; 95th: 36.6). Higher IR of sheltered homelessness was found for people with any psychiatric disorder compared with those with no psychiatric disorder (2.7 *v.* 0.3 per 1000 person-years) (Table 1a).

Absolute risks of sheltered homelessness

After ten years, 3.0% (95% CI 2.9–3.1) of individuals with any psychiatric disorder compared to 0.8% (95% CI 0.7–0.8) in the age- and sex-matched comparison group from the general population had at least one homeless shelter contact (Fig. 1a and online Supplemental Table S2a).

Relative risks of sheltered homelessness

Any psychiatric disorder was associated with 9.2-times increased IR of sheltered homelessness compared with no psychiatric disorder (95% CI 8.8–9.6) after adjustment for sex, age, calendar time, and country of origin (Fig. 2). Each psychiatric disorder

was associated with elevated IRs of sheltered homelessness compared with not having that disorder; highest for drug use disorder (IRR 20.6, 95% CI 19.7–21.4). Schizophrenia spectrum disorder and personality disorder were associated with around 10-times increased IRs of homelessness compared with not having these disorders. Also, individual drug use disorders were associated with increased IRs of homelessness compared with not having these disorders (online Supplemental Table S3).

Sex-differences in the risk of sheltered homelessness

Females with any psychiatric disorder had higher IRR of sheltered homelessness (10.1, 95% CI 9.5–10.9) than their male counterparts (8.9, 95% CI 8.5–9.3) when compared with those without a psychiatric disorder. Higher IRR was also found in females than in males for most of the individual disorders including the drug use disorders (e.g. opioids, cannabis, and cocaine) (online Supplemental Tables S5, S6).

Time-patterns for the risk of sheltered homelessness

Figure 3 shows a highly increased IRR of sheltered homelessness during the first year after any psychiatric disorder compared with individuals with no psychiatric disorder (IRR 17.3, 95% CI 16.2–18.5), but high risk was also found during the following years. A 7.8-times (95% CI 7.4–8.1) increased IRR was found for sheltered homelessness even five or more years after first psychiatric disorder compared with no psychiatric disorder (see online Supplementary information). First year after first diagnosis was associated with the highest IRR of sheltered homelessness, also for most individual disorders (Fig. 4). Any drug use disorder compared with no drug use disorder was associated with an IRR of sheltered homelessness of 38.8 (95% CI 36.3–41.6) during first year after the first diagnosis (online Supplemental Table S11).

Homelessness and subsequent psychiatric disorders

During the study period, 1 406 410 individuals [697 341 females (49.6%); 709 069 males (50.4%)] aged 15–38 years were included in the study population and accounted for 14 131 060 person-years at risk of any psychiatric disorder. In total, 210 730 individuals had a psychiatric disorder during follow-up (IR 14.9 per 1000 person-years). At the end of follow-up, the median age was 24.5 years (5th percentile: 15.9; 95th percentile: 36.3). Higher IR for any psychiatric disorder was found for people experiencing sheltered homelessness compared with not having these experiences of homelessness (76.0 *v.* 14.8 per 1000 person-years) (Table 1b).

Absolute risks of any psychiatric disorder

After ten years of follow-up, 47.1% (95% CI 45.3–48.0) of the individuals with at least one homeless shelter contact compared to 11.1% (95% CI 10.7–11.5) in the age- and sex-matched comparison group from the general population had at least one psychiatric disorder (online Supplemental Table S2b).

Relative risks of psychiatric disorders

The adjusted IRR of any psychiatric disorder in people experiencing sheltered homelessness compared with those without shelter contact was 7.0 (95% CI 6.7–7.4) (Fig. 2). Especially high risk was

Table 1. Study characteristics according to the incidence rate of (a) sheltered homelessness and (b) any psychiatric disorder

(a) Sheltered homelessness[a]	No psychiatric disorder					Any psychiatric disorder				
	Homelessness	Person-years	%	IR/1000	(95% CI)	Homelessness	Person-years	%	IR/1000	(95% CI)
Total	4264	14 108 723	(100)	0.3	(0.3–0.3)	7169	2 678 839	(100)	2.7	(2.6–2.7)
Age (years)										
15–19	1187	5 810 586	(41.2)	0.2	(0.2–0.2)	1420	736 216	(27.5)	1.9	(1.8–2.0)
20–24	1978	4 247 804	(30.1)	0.5	(0.5–0.5)	3151	848 436	(31.7)	3.7	(3.6–3.9)
25–29	825	2 623 543	(18.6)	0.3	(0.3–0.3)	1720	675 211	(25.2)	2.5	(2.4–2.7)
30+	274	1 426 790	(10.1)	0.2	(0.2–0.2)	878	418 976	(15.6)	2.1	(2.0–2.2)
Sex										
Female	1266	6 843 053	(48.5)	0.2	(0.2–0.2)	2284	1 360 962	(50.8)	1.7	(1.6–1.8)
Male	2998	7 265 669	(51.5)	0.4	(0.4–0.4)	4885	1 317 877	(49.2)	3.7	(3.6–3.8)
Country of origin										
Denmark	2595	12 612 085	(89.4)	0.2	(0.2–0.2)	6055	2 486 326	(92.8)	2.4	(2.4–2.5)
Other Western countries	82	213 917	(1.5)	0.4	(0.3–0.5)	128	27 596	(1.0)	4.6	(3.9–5.5)
Non-Western countries	1587	1 282 720	(9.1)	1.2	(1.2–1.3)	986	164 917	(6.2)	6.0	(5.6–6.4)

(b) Any psychiatric disorder[b]	No sheltered homelessness					Sheltered homelessness				
	Psychiatric disorder	Person-years	(%)	IR/1000	(95% CI)	Psychiatric disorder	Person-years	(%)	IR/1000	(95% CI)
Total	209 075	14 109 283	(100)	14.8	(14.8–14.9)	1655	21 777	(100)	76.0	(72.4–79.8)
Age (years)										
15–19	101 320	5 810 860	(41.2)	17.4	(17.3–17.5)	174	1074	(4.9)	162.0	(139.7–188.0)
20–24	64 445	4 247 975	(30.1)	15.2	(15.1–15.3)	750	7524	(34.6)	99.7	(92.8–107.1)
25–29	30 763	2 623 625	(18.6)	11.7	(11.6–11.9)	520	7872	(36.1)	66.1	(60.6–72.0)
30+	12 547	1 426 823	(10.1)	8.8	(8.6–9.0)	211	5307	(24.4)	39.8	(34.7–45.5)
Sex										
Female	121 035	6 843 381	(48.5)	17.7	(17.6–17.8)	508	7682	(35.3)	66.1	(60.6–72.1)
Male	88 040	7 265 902	(51.5)	12.1	(12.0–12.2)	1147	14 094	(64.7)	81.4	(76.8–86.2)
Country of origin										
Denmark	191 435	12 612 602	(89.4)	15.2	(15.1–15.3)	1177	12 402	(56.9)	94.9	(89.6–100.5)
Other Western countries	2362	213 924	(1.5)	11.0	(10.6–11.5)	37	361	(1.7)	102.5	(74.3–141.5)
Non-Western countries	15 278	1 282 758	(9.1)	11.9	(11.7–12.1)	441	9014	(41.4)	48.9	(44.6–53.7)

[a]Total numbers for the entire study population: incident homeless shelter cases: 11 433; 16 787 562 person-years, and IR of 0.7 (95% CI 0.7–0.7) per 1000 person-years.
[b]Total numbers for the entire study population: incident psychiatric disorder cases based on inpatient, outpatient, and emergency room contacts: 210 730; 14 131 060 person-years, and IR of 14.9 (95% CI 14.9–15.0) per 1000 person-years.
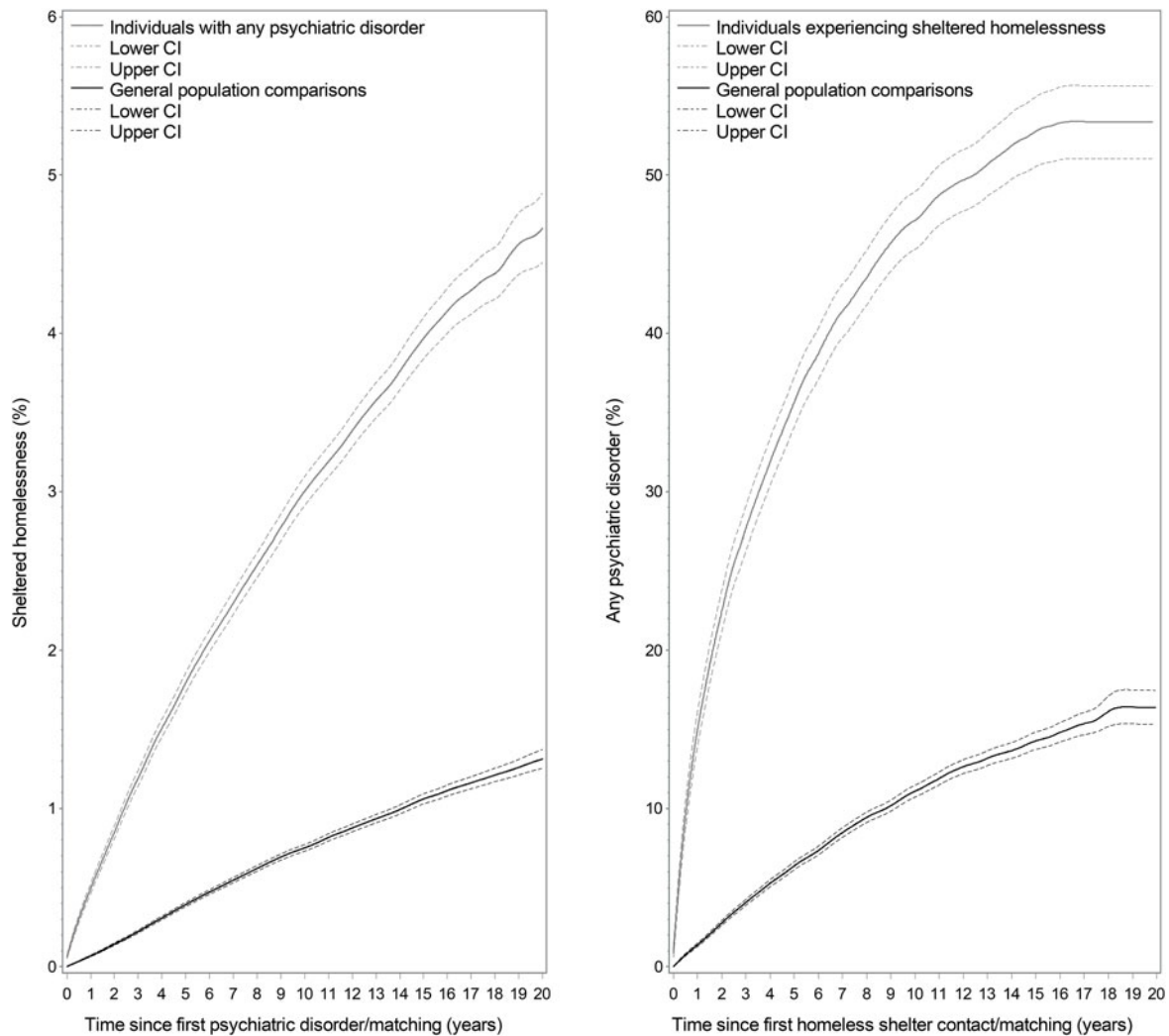
Figure 1. Probability of (a) sheltered homelessness and of (b) any psychiatric disorder. The figure shows the probability of (a) sheltered homelessness after first psychiatric disorder compared with sex- and age-matched individuals from the general population. The figure also shows the probability of (b) any psychiatric disorder after first homeless shelter contact compared with sex- and age-matched individuals from the general population.

found for drug use disorder (IRR 15.3, 95% CI 14.6–16.1) and schizophrenia (IRR 14.7, 95% CI 13.7–15.9) for individuals experiencing sheltered homelessness compared with not using homeless shelters. However, more than 9-times increased IRs of e.g., behavioral disorder, alcohol use disorder, personality disorder, and organic disorder were linked to sheltered homelessness. Sheltered homelessness was furthermore associated with increased IRR of individual drug use disorders compared with not using homeless shelters (online Supplemental Tables S7).

Sex-differences in the risk of psychiatric disorders

Males experiencing sheltered homelessness had a higher IRR of any psychiatric disorder (7.9, 95% CI 7.5–8.4) than females with sheltered homelessness (IRR 5.4, 95% CI 5.0–5.9) compared to males and females without homeless shelter use. Males experiencing homelessness had higher IRR of drug use disorder, schizophrenia spectrum disorder, personality disorder, and behavioral disorder than their female counterparts when compared with those without homeless shelter use. However, females

experiencing sheltered homelessness compared with those without these experiences had higher IRRs of several individual drug use disorders than males (online Supplemental Tables S9, S10).

Time-patterns in the risk of psychiatric disorders

During the year after first homeless shelter contact, the IRR of any psychiatric disorder associated with homelessness compared with no homeless shelter contact was 13.3 (95% CI 12.3–14.4) (Fig. 3) with increased risk also during the following years (see online Supplementary information). This pattern was also found for most individual psychiatric disorders (Fig. 4). Sheltered homelessness compared with no homeless shelter use was most strongly associated with increased rates of drug use disorder (IRR 29.8, 95% CI 27.6–32.3), schizophrenia spectrum disorder (IRR 22.0, 95% CI 19.8–24.4), and behavioral disorder (IRR 23.1, 95% CI 20.9–25.5) during first year after first homeless shelter contact. Even higher IRRs were found for the individual drug use disorders (online Supplemental Table S12).
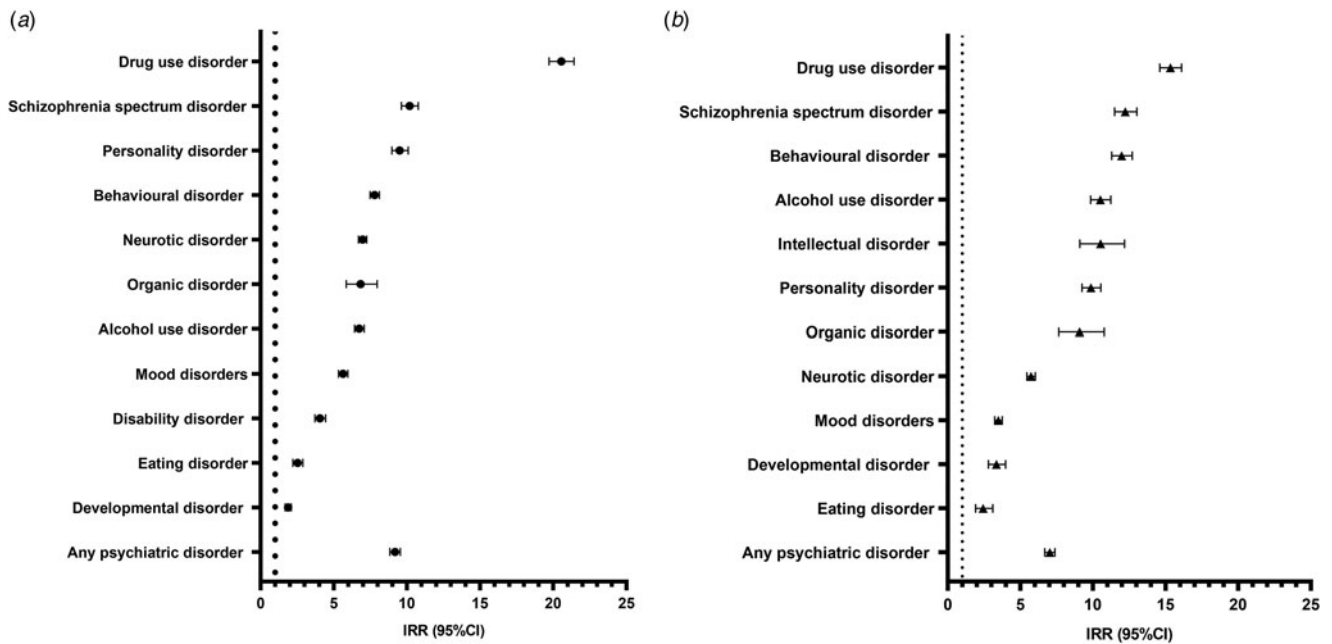
Figure 2. Associations of psychiatric disorders and sheltered homelessness. The figure shows the incidence rate ratios of (a) sheltered homelessness by any and individual psychiatric disorders compared with absence of the specific disorders after adjustment for sex, age, calendar time, and country of origin. The figure also shows the incidence rate ratios of (b) any and individual psychiatric disorders by experiences of sheltered homelessness compared with individuals without homeless shelter contact after adjustment for sex, age, calendar time, and country of origin.
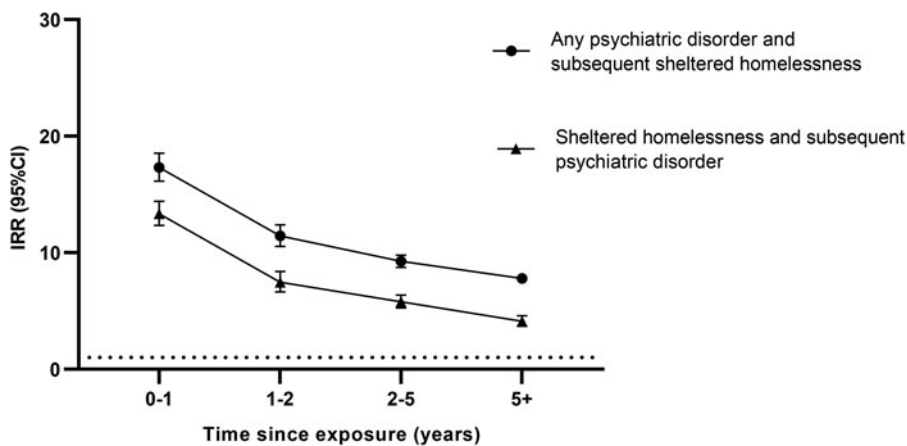

Figure 3. The association between any psychiatric disorder and sheltered homelessness by time of exposure. The figure shows the incidence rate ratio of sheltered homelessness from first psychiatric disorder and onwards compared with no psychiatric disorder. The figure also shows the incidence rate ratio of any psychiatric disorder from first homeless shelter contact and onwards compared with no homeless shelter contact. Estimates are adjusted for sex, age, calendar time, and country of origin.

Sensitivity analyses

Inclusion of information from the substance use treatment registers did not change the results (online Supplemental Table S3, S4 and S7, S8).

When including the year prior to exposure as a window of exposure, high IRRs of both outcomes were found. For most disorders, the rate of sheltered homelessness or psychiatric disorder was higher during the year prior to first psychiatric disorder or first homeless shelter contact (i.e. exposure) than during the period after first year from exposure. Risk patterns varied by disorder (online Supplemental Figs S13, S14 and Table S15, S16).

Discussion

Based on population-based data of 11 433 people who had at least one homeless shelter contact and 210 730 people who had a psychiatric disorder over 20 years, strong associations between psychiatric disorders and homelessness in individuals aged 15–38 years were found. Ten years after first psychiatric disorder, 3.0% experienced sheltered homelessness. Among people experiencing sheltered homelessness, 47.1% had a psychiatric disorder within ten years from their first homeless shelter contact. Increased adjusted relative risks were found in both directions of the association, in males and females, and for all individual psychiatric disorders studied, especially during the first year after first psychiatric disorder and first homeless shelter contact, respectively, but with strong associations several years after. Drug use disorder and schizophrenia spectrum disorder were most strongly associated with sheltered homelessness.

The strong associations between psychiatric disorders and homelessness support previous findings of an intertwined relationship (Gutwinski et al., 2021; Nilsson et al., 2019a, 2019b; Thompson et al., 2013), but also adds important information
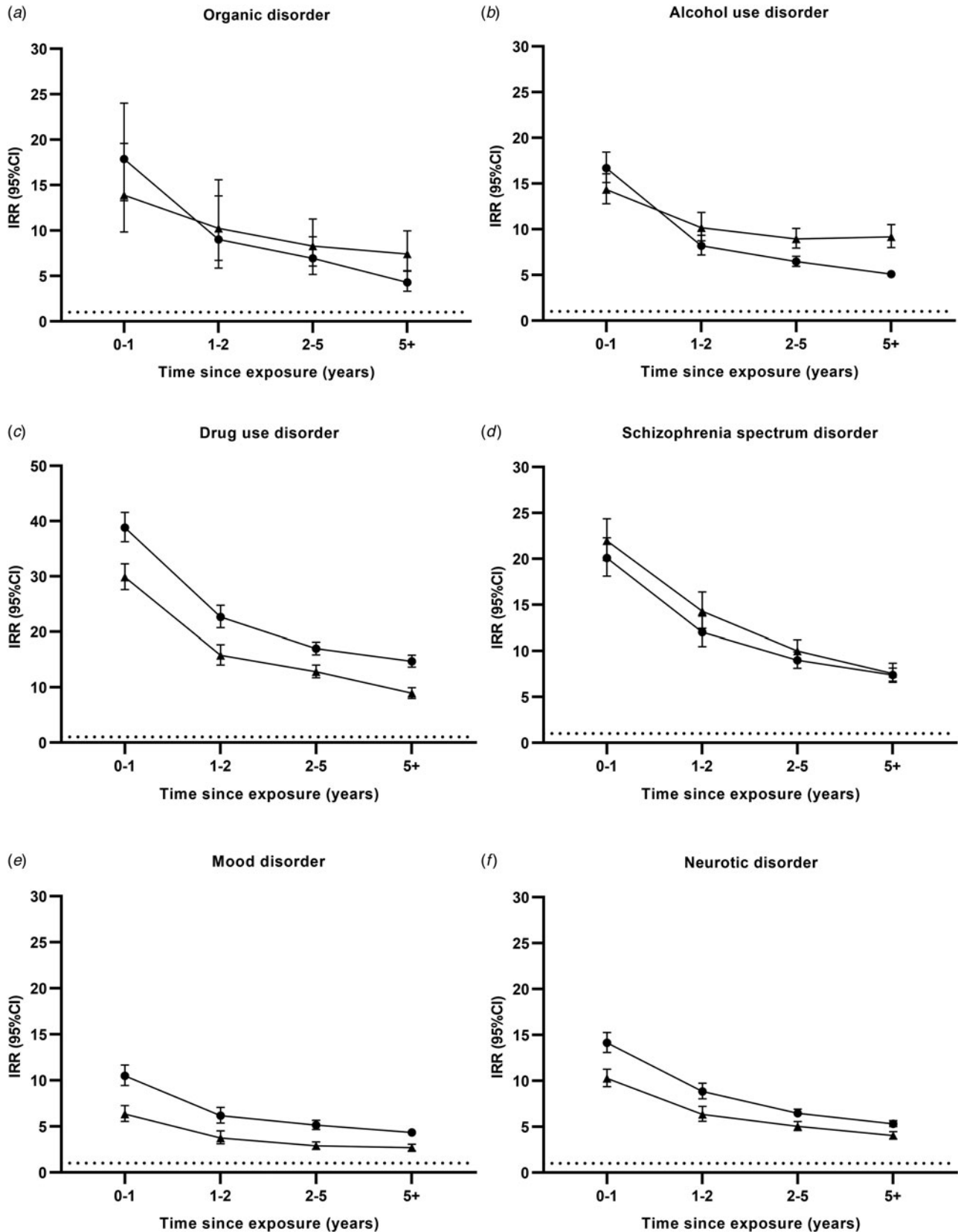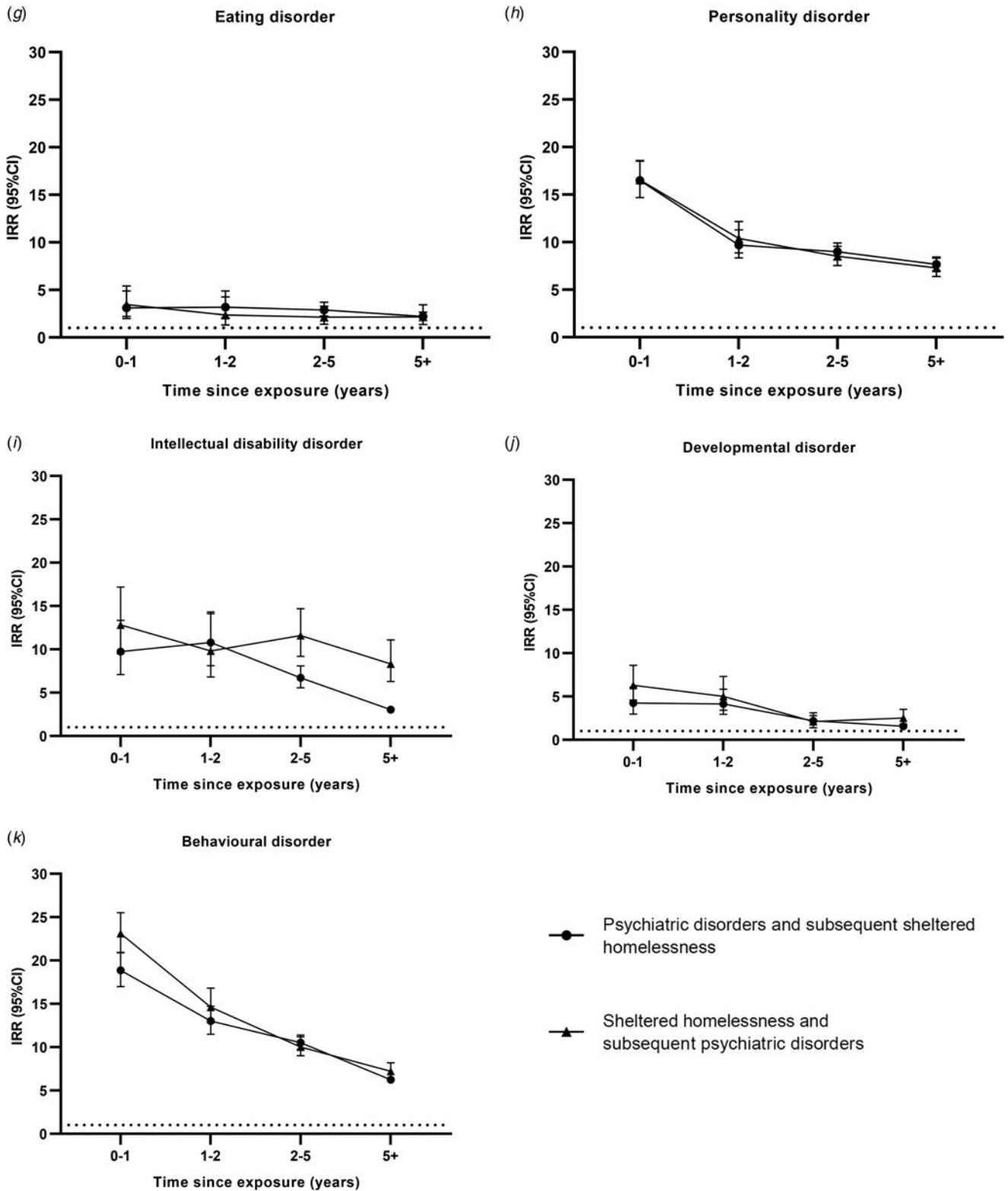
Figure 4. Incidence rate ratios of sheltered homelessness and individual psychiatric disorders by time of exposure. The figure shows the incidence rate ratio of sheltered homelessness from first individual psychiatric disorder and onward compared with absence of that disorder. The figure also shows the incidence rate ratio of the individual psychiatric disorders from first homeless shelter contact and onwards compared with no homeless shelter contact. Estimates are adjusted for sex, age, calendar time, and country of origin. The y-axis for drug use disorder is up to IRR of 50 instead of 30 as this one differed substantially from the others.

(g) Eating disorder

(h) Personality disorder

(i) Intellectual disability disorder

(j) Developmental disorder

(k) Behavioural disorder

Psychiatric disorders and subsequent sheltered homelessness

Sheltered homelessness and subsequent psychiatric disorders

e.g., about the timing from first psychiatric diagnosis and from first homeless shelter contact. Previous studies have shown that substance use disorders predict psychotic problems in people experiencing homelessness (Jones et al., 2020). Additionally, multiple v. fewer of psychiatric and social exposures have been linked

to higher risk of mortality (Tweed et al., 2022, 2021). The compiled evidence supports the importance of early intervention to avoid the accumulation of psychiatric and social problems.

Females were to a higher degree than males at risk of homelessness after first psychiatric disorder. This supports that females

experiencing homelessness constitute a group of highly vulnerable individuals with high rates of psychiatric morbidity and other service needs (Arnos & Acevedo, 2023; Milaney, Williams, Lockerbie, Dutton, & Hyshka, 2020; Winetrobe et al., 2017). Social factors might contribute more to the risk of homelessness in males or more undiagnosed psychiatric disorders predating their homelessness. However, females experiencing homelessness have been found to be at higher risks of violent victimization (Nilsson et al., 2020) and adverse childhood trauma than males (Milaney et al., 2020). Meta-analytic findings showed that around a quarter of young females in developed regions reported abuse-related reasons for street involvement, which was more than in males (Embleton, Lee, Gunn, Ayuku, & Braitstein, 2016).

Males experiencing homelessness had higher IRRs of psychiatric disorder than females. However, a noticeable finding was that females experiencing sheltered homelessness had higher IRRs of several individual drug use disorders than males, although it for any drug use disorder was lower.

This study confirms that psychiatric disorders are important predictors of becoming homeless (Chikwava et al., 2022; Nilsson et al., 2019a, 2019b; Thompson et al., 2013). More knowledge of effective interventions is needed focusing on the prevention of social marginalization in psychiatrically vulnerable individuals (e.g. prior to and during discharge from psychiatric admission, leaving out-of-home placement, and release from prison). First health-care contact could also be important for implementing prevention strategies.

Among persons with a first-time homeless shelter contact, but without prior hospital-based psychiatric disorder, approximately 15% will receive a psychiatric diagnosis within the next year. Furthermore, the increased risks of psychiatric disorders remained even after two years of follow-up. This leads to important research questions: are some of these previously undiagnosed psychiatric disorders predating the homelessness episode that emerge over time due to severity, or was the period before homelessness associated with emergent symptoms and it was later that the illness became clear? There is a need for studies clarifying this to show whether our findings indicate problems of undetected diagnoses, or we should be better to recognize specific symptoms and risk states earlier to reduce the risk of homelessness. Irrespective of the cause, the first homeless shelter contact becomes an effective time window to launch a preventive strategy to mitigate or prevent psychiatric disorders. Housing first interventions have been found to be effective e.g., in a Canadian setting to improve housing stability, mental functioning and hospital use after 4-year follow-up in people experiencing homelessness (Loubière et al., 2022). However, there are substantial gaps in the knowledge of effective intervention strategies.

The strong bidirectional relationship between sheltered homelessness and psychiatric disorders might also be explained by shared risk factors. Such factors could be adverse childhood experiences and parental factors (Fazel et al., 2014; Hodgson et al., 2013; Nilsson, Laursen, Hjorthoj, Thorup, & Nordentoft, 2017; Nilsson et al., 2019a, 2019b). Future studies of these associations are needed. A meta-analysis of reported reasons for street involvement found that psychosocial factors, any type of abuse, poverty, and family conflict were frequently reported reasons (Embleton et al., 2016).

Strengths and limitations

Our study has important strengths. Using the Danish nationwide register-data we were to our knowledge for the first time able to study the two-way association between psychiatric disorders and sheltered homelessness. Additionally, we were able to study individuals during a 20-year period with complete follow-up information, sex-specific associations, and include a high level of details.

The study also has limitations. First, due to the administrative data, we were not able to study real incidences of psychiatric disorders and homelessness. Our data on psychiatric disorders were based on inpatient, outpatient, and emergency room contacts and not from the general practitioners. We had no information on the specific treatment received. There will be some uncertainty associated with the date of onset of the disorder, and our data are expected to capture the time of first *severe* diagnosis requiring treatment in the hospital system. However, diagnoses of severe mental illnesses such as schizophrenia and bipolar disorder are most often received in the secondary sector and most of the register-based psychiatric diagnoses have been found to be valid (Munk-Jorgensen & Ostergaard, 2011). Furthermore, information on undiagnosed disorders and unsheltered homelessness is not available. We only had data on homeless shelter contacts since 1999, but we used a three-year washout period to limit problems of mixing prevalent and incident homeless cases. Furthermore, due to the lack of register-data prior to 1999, we were only able to study a young cohort with complete follow-up. Furthermore, the results may not be generalizable to homeless youth below 18 years, who may to a higher degree choose other options for accommodations. We did not study the contribution of migration status in the current study, but this is an area for future research.

Conclusions

This study confirms the strong associations between homelessness and psychiatric disorder and quantifies the high probabilities that having one of the conditions gives for subsequently having the other. Individuals with psychiatric disorders are at high risk of homelessness. Individuals experiencing sheltered homelessness are also at high risk of either developing psychiatric disorders or of receiving psychiatric diagnoses that had already emerged. The year after first psychiatric disorder or first homeless shelter contact constitutes a high-risk period for adverse outcomes and an opportunity for intervention. Health and social care professionals should be aware of the high risks of accumulated psychiatric and social problems from adolescence and early adulthood and onwards. Prevention efforts to reduce these accumulated risks are needed.

Health Data Authority. Approval by the Ethics Committee and written informed consent is not required for register-based projects. All data were de-identified and not recognizable at an individual level.

Data statement. The data that support the findings of this study are available from Statistics Denmark. The data access requires the completion of a detailed application form from the Danish Data Protection Agency, the Danish National Board of Health and Statistics Denmark. For more information on accessing the data, see https://www.dst.dk/en.

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