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**Mortality in persons with mental disorders is substantially overestimated using inpatient psychiatric diagnoses**

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**MORTALITY IN PERSONS WITH MENTAL DISORDERS IS SUBSTANTIALLY**

**OVERESTIMATED USING INPATIENT PSYCHIATRIC DIAGNOSES**

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**ABSTRACT**

Mental disorders are associated with premature mortality, and the magnitudes of risk have commonly been estimated using hospital data. However, psychiatric patients who are hospitalized have more severe illness and do not adequately represent mental disorders in the general population. We conducted a national cohort study using outpatient and inpatient diagnoses for the entire Swedish adult population (N=7,253,516) to examine the extent to which mortality risks are overestimated using inpatient diagnoses only. Outcomes were all-cause and suicide mortality during 8 years of follow-up (2001-2008). There were 377,339 (5.2%) persons with any inpatient psychiatric diagnosis, vs. 680,596 (9.4%) with any inpatient or outpatient diagnosis, hence 44.6% of diagnoses were missed using inpatient data only. When including and accounting for prevalent psychiatric cases, all-cause mortality risk among persons with any mental disorder was overestimated by 15.3% using only inpatient diagnoses (adjusted hazard ratio [aHR], 5.89; 95% CI, 5.85-5.92) vs. both inpatient and outpatient diagnoses (aHR, 5.11; 95% CI, 5.08-5.14). Suicide risk was overestimated by 18.5% (aHRs, 23.91 vs. 20.18), but this varied widely by specific disorders, from 4.4% for substance use to 49.1% for anxiety disorders. The sole use of inpatient diagnoses resulted in even greater overestimation of all-cause or suicide mortality risks when prevalent cases were unidentified (~20-30%) or excluded (~25-40%). However, different methods for handling prevalent cases resulted in only modest variation in risk estimates when using both inpatient and outpatient diagnoses. These findings have important implications for the interpretation of hospital-based studies and the design of future studies.

Keywords: mental disorders, mortality, suicide.

**INTRODUCTION**

Research from the past 20 years has shown that mental disorders are associated with increased all-cause(Harris & Barraclough, 1998) and suicide(Harris & Barraclough, 1997) mortality.  The largest and most highly cited studies have ascertained mental disorders using hospital discharge data, which are more commonly available than outpatient data.(Hamer, Stamatakis, & Steptoe, 2008; Hiroeh, Appleby, Mortensen, & Dunn, 2001; Hiroeh et al., 2008; Hoang, Stewart, & Goldacre, 2011; Laursen, Munk-Olsen, Nordentoft, & Mortensen, 2007; Politi et al., 2002; Qin, Agerbo, & Mortensen, 2003; Wahlbeck, Westman, Nordentoft, Gissler, & Laursen, 2011)  However, persons with mental disorders who are hospitalized typically have more severe illness and do not adequately represent mental disorders in the general population. This is increasingly the case as more mental disorders are now treated in outpatient settings.(Narrow et al., 2000; Wahlbeck et al., 2011)  Studies that ascertain mental disorders solely using inpatient diagnoses will miss many milder cases, likely resulting in overestimation of mortality risks, although to what extent is unclear.  Furthermore, studies have used different methods for handling prevalent psychiatric cases, which may either be identified and included, identified and excluded, or unidentified (counted as a case only if a new diagnosis).  Although inclusion of prevalent cases may result in underestimation of mortality risks due to survivor bias, such bias may potentially be avoided if properly accounting for variable time at risk after diagnosis (left truncation),(Azzato et al., 2009; Brookmeyer, 2005) with the additional advantage of improved statistical power due to a larger sample size.  The extent to which mortality risks are overestimated using only inpatient diagnoses, and the relative effects of different methods for handling prevalent cases, are unknown.  Such information would have important implications for

the interpretation of the large number of hospital-based studies, health policy planning based on such studies, and the design of future studies.

We used nationwide outpatient and inpatient data in Sweden to examine 1) the extent to which all-cause and suicide mortality risks are overestimated when mental disorders are ascertained using only inpatient compared with both inpatient and outpatient diagnoses, and 2) the extent to which risk estimates are influenced by different methods for handling prevalent psychiatric cases.

## MATERIALS AND METHODS

### Study Population and Outcomes

The study population consisted of all persons aged 17 years or older who were living in Sweden on January 1, 2001 (N=7,253,516). The outcomes were all-cause mortality and suicide mortality (*International Classification of Diseases*, version 10 [*ICD*-10] codes X60-X84) during 8 years of follow-up (January 1, 2001 through December 31, 2008). These outcomes were identified using the Swedish Death Registry, which includes ~99.5% of all deaths nationwide.(National, 2011) Suicide was examined because it is the most widely studied cause of death among psychiatric patients.(Harris et al., 1997) This study was approved by the Regional Ethical Review Board of Lund University in Sweden.

### Mental Disorder Ascertainment

Mental disorders were identified by any primary or secondary diagnosis in the Swedish Outpatient Registry or the Swedish Hospital Registry during the same follow-up period (January 1, 2001 through December 31, 2008). The Swedish Outpatient Registry contains all primary and

secondary outpatient diagnoses nationwide starting in 2001; and the Swedish Hospital Registry contains all primary and secondary inpatient psychiatric diagnoses starting in 1973 (non-psychiatric diagnoses in 1964) for six counties in southern Sweden, and with nationwide coverage since 1987.  These registries were recently estimated to be >99% complete.(Ludvigsson et al., 2011)  "Prevalent" mental disorders were identified by any primary or secondary diagnosis in the Swedish Hospital Registry from 1973 through 2000 (before nationwide outpatient data were available).  Mental disorders were classified according to *ICD*-10 codes and examined in the following categories:  any mental disorder (F00-F69), substance use disorders (F10-F19), schizophrenia (F20), bipolar disorder (F31), depression (F32-F33), anxiety disorders (F40-F41), and personality disorders (F60-F61).  Other less common mental disorders (and specifically those with <100 suicides) were not examined separately.  To evaluate excess mortality risks associated with having more than one psychiatric condition, we also examined "any second mental disorder" among those specified above, while adjusting for any first mental disorder.

**Statistical Analysis**

Cox proportional hazards regression was used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs) for the association between mental disorders and either all-cause or suicide mortality.  Each model was performed alternatively using only inpatient or both inpatient and outpatient diagnoses during the follow-up period (2001-2008).  Prevalent psychiatric cases (diagnosed in 1973-2000) were alternatively:  1) identified and included, accounting for left truncation (variable time at risk after diagnosis) in the Cox model(Brookmeyer, 2005); 2) unidentified, i.e., diagnoses prior to 2001 were disregarded, so that persons were counted as cases only if they received a diagnosis during 2001-2008; or 3) identified and excluded from the

model. Mental disorders were modeled as time-dependent variables in each model, so that persons contributed to "non-exposed" person-time before and "exposed" person-time after the earliest diagnosis of the respective mental disorder. Analyses of "any second mental disorder" were adjusted for any first mental disorder by modeling these simultaneously as separate time-dependent variables. All hazard ratios were also adjusted for age (modeled as a time-dependent continuous variable) and sex. Individuals were censored at the time of emigration, as determined by the absence of a Swedish residential address in census data (n=202,769; 2.8%); and, in analyses of suicide, at the time of death from any other cause (n=724,350, 10.0%). The proportional hazards assumption was evaluated by graphical assessment of log-log plots(Garrett, 1997) and was met in each of the models. All statistical tests were two-sided and used an α-level of 0.05. All analyses were conducted using Stata statistical software, version 11.2.(StataCorp, 2010)

**RESULTS**

In the entire population of 7,253,516 Swedish adults, 377,339 (5.2%) persons had an inpatient diagnosis of any mental disorder in 2001-2008, compared with 680,596 (9.4%) who had an inpatient or outpatient diagnosis of any mental disorder, hence 44.6% of diagnoses were missed using inpatient data only (Table 1). The proportion of diagnoses missed was highest for anxiety disorders (71.3%), and lowest for substance use disorders (27.3%) and schizophrenia (36.0%). Among cases identified using only inpatient diagnoses, 71,570 (19.0%) were prevalent (i.e., diagnosed in 1973-2000) with an average follow-up of 9.6 years (maximum 21.4 years); whereas using both inpatient and outpatient diagnoses, there were 90,289 (13.3%) prevalent cases with an average follow-up of 9.8 years (maximum 22.0 years).

**All-Cause Mortality**

When prevalent cases were included and left truncation accounted for, the adjusted

hazard ratio (aHR) for association between any inpatient-diagnosed mental disorder and all-

cause mortality was 5.89 (95% CI, 5.85-5.92), which was 15.3% higher than the corresponding

estimate using both inpatient and outpatient diagnoses (aHR, 5.11; 95% CI, 5.08-5.14) (Table 2,

first row).  The sole use of inpatient diagnoses resulted in undercounting deaths among persons

with mental disorders by >20,000 (12.8%).  It also resulted in overestimation of all-cause

mortality risk for each mental disorder examined separately, ranging from 6.7% for substance

use disorders to 25.9% for anxiety disorders.  Any second mental disorder was associated with

more than a ~2.5-fold mortality risk beyond that associated with a first mental disorder, and this

risk also was substantially overestimated (20.1%) when using only inpatient diagnoses.  Risk

estimates for any first mental disorder were negligibly affected by adjustment for any second

disorder (i.e., were similar to those reported for "any mental disorder" in Table 2) and therefore

are not shown separately.

We further examined the extent to which all-cause mortality risk was overestimated by

using only inpatient diagnoses, while comparing different methods for handling prevalent cases.

For each category of mental disorders, overestimation resulting from the sole use of inpatient

data was consistently lowest when prevalent cases were included and left truncation accounted

for (~5-30% range), intermediate when prevalent cases were unidentified (~10-45%), and

greatest when prevalent cases were excluded (~10-55%) (see Table 2, last column).

In addition, we examined the extent to which risk estimates varied among these different

methods for handling prevalent cases, while alternatively using only inpatient or both inpatient

and outpatient diagnoses.  For each category of mental disorders, these different methods resulted in substantial variation of risk estimates when using only inpatient diagnoses (maximum differences ~15-30%), but only modest variation when using both inpatient and outpatient diagnoses (consistently <15%, and <7% for most mental disorders) (see Table 2, "Maximum difference" columns).

**Suicide Mortality**

Among 8,821 persons who died from suicide, 3,179 (36.0%) had any inpatient psychiatric diagnosis during 2001-2008, compared with 3,875 (43.9%) who had any inpatient or outpatient psychiatric diagnosis (Table 3).  Suicides among persons with mental disorders were therefore undercounted by nearly 700 (18.0%) when using inpatient data only.

The sole use of inpatient diagnoses resulted in slightly greater overestimation of suicide risks than all-cause mortality, but this varied more widely by specific mental disorders.  When prevalent cases were included and left truncation accounted for, the adjusted hazard ratio for association between any inpatient-diagnosed mental disorder and suicide mortality was 23.91 (95% CI, 22.84-25.03), which was 18.5% higher than using both inpatient and outpatient diagnoses (aHR, 20.18; 95% CI, 19.28-21.11) (Table 3, first row).  Among specific disorders, overestimation of suicide risk ranged from 4.4% for substance use to 49.1% for anxiety disorders.  Any second mental disorder was associated with more than a ~30-fold suicide risk beyond that associated with a first mental disorder, and this risk also was markedly overestimated (39.7%) when using only inpatient diagnoses.

As with all-cause mortality, overestimation of suicide risk by using only inpatient diagnoses was consistently lowest when prevalent cases were included and left truncation

accounted for (<5% to 50% range), intermediate when prevalent cases were unidentified (~5-75%), and greatest when prevalent cases were excluded (~10-80%) (Table 3, last column). In addition, different methods for handling prevalent cases resulted in substantial variation of risk estimates when using only inpatient diagnoses (maximum differences ~15-40%), but only modest variation when using both inpatient and outpatient diagnoses (consistently <12% for all mental disorders) (Table 3, "Maximum difference" columns).

**DISCUSSION**

In this large cohort study, we found that risk estimates for all-cause and suicide mortality were substantially overestimated when mental disorders were ascertained using only inpatient compared with both inpatient and outpatient diagnoses. The sole use of inpatient data missed 45% of all psychiatric diagnoses, as well as 13% of all deaths and 18% of suicides among persons with mental disorders. As a result, all-cause and suicide mortality risks among psychiatric patients were overestimated by ~15-20% when prevalent cases were included and left truncation accounted for, and ~20-40% when prevalent cases were unidentified or excluded. The overestimation of suicide risk varied widely by specific disorders, and was modest (<15%) for substance use disorders but much greater (~30-80%) for anxiety disorders, personality disorders, depression, and bipolar disorder. In addition, we found that different methods for handling prevalent cases resulted in substantial variation in risk estimates when using only inpatient diagnoses, but only modest variation when using both inpatient and outpatient diagnoses.

Premature mortality among persons with mental disorders is a major clinical and public health problem(Demyttenaere et al., 2004; Murray & Lopez, 1996; Thornicroft, 2011) and has received highly deserved research attention.(Hamer et al., 2008; Harris et al., 1997; 1998; Hiroeh

et al., 2001; Hiroeh et al., 2008; Hoang et al., 2011; Laursen et al., 2007; Politi et al., 2002; Qin et al., 2003; Wahlbeck et al., 2011)  Studies have consistently reported that virtually all mental disorders are associated with premature mortality from both unnatural(Harris et al., 1997; Hiroeh et al., 2001) and natural(Harris et al., 1998; Hiroeh et al., 2008) causes, with a shorter life expectancy by up to ~15-20 years compared with the general population.(Wahlbeck et al., 2011) The magnitudes of risk, however, have been estimated primarily through large hospital-based studies.(Hamer et al., 2008; Hiroeh et al., 2001; Hiroeh et al., 2008; Hoang et al., 2011; Laursen et al., 2007; Politi et al., 2002; Qin et al., 2003; Wahlbeck et al., 2011)  To our knowledge, the current study is the first to examine the extent to which such risk estimates may be systematically biased.  The findings have implications for the interpretation of the large number of hospital-based studies, which may substantially overestimate mortality risks.  We found that the extent of overestimation was greatest when prevalent psychiatric cases were excluded, intermediate when they were unidentified, and lowest (but remained substantial) when they were included while accounting for left truncation.  Population-based studies that include outpatient as well as inpatient diagnoses would yield more valid and generalizable risk estimates.  Such estimates would enable a more accurate understanding of risk magnitudes and a more reliable basis for health policy planning.  We recently conducted other studies using nationwide outpatient and inpatient data in Sweden to examine more comprehensively the risks of somatic comorbidities and mortality among persons with schizophrenia,(Crump, Sundquist, Winkleby, & Sundquist, 2012) and suicide or accidental death among persons with various mental disorders (submitted).

The current study has several limitations, including the inability to examine mental disorders that were undiagnosed, hence the reported prevalence of mental disorders still likely underestimated the true prevalence in the general population.  However, because Sweden has

universal health care access and diagnoses were obtained from all health care settings nationwide, ascertainment was markedly improved compared with previous studies. Prevalent cases were likely underreported because they were based on inpatient data from an earlier period (1973-2000) when nationwide outpatient data were unavailable. Although classification of a death as suicide has been reported to be highly accurate in Sweden,(Allebeck, Allgulander, Henningsohn, & Jakobsson, 1991) suicide is likely underreported as in other countries.(Chishti, Stone, Corcoran, Williamson, & Petridou, 2003; DeLeo & Evans, 2004) The extent of underreporting and whether this may occur differentially among psychiatric patients is not well-established and is a common problem in suicide research.(Chishti et al., 2003; DeLeo et al., 2004) Generalizability of our findings to countries with different health care systems and utilization rates is also uncertain. However, low and decreasing psychiatric hospitalization rates have been reported in other Western countries, as in Sweden.(Narrow et al., 2000; Priebe et al., 2005) A U.S. study reported that only ~17% of persons with severe mental illness and <1% of those with non-severe mental illness were hospitalized in one year of follow-up,(Narrow et al., 2000) suggesting that inpatient diagnoses would be similarly inadequate for obtaining valid risk estimates for the association between mental disorders and mortality in the general population.

Future large cohort studies of the health outcomes of mental illness should use outpatient as well as inpatient ascertainment of mental disorders whenever feasible. When outpatient data are unavailable, findings from the current study should be considered in the interpretation of risk estimates. Inclusion of prevalent cases using appropriate left truncation methods may reduce (but not eliminate) overestimation of risks, while increasing statistical power to detect smaller effect sizes. Additional ascertainment of mental disorders through psychiatric interview or outpatient record review in a representative sample of the study population would also allow an

assessment of the proportion of diagnoses missed by inpatient data and the effect on risk estimates.

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    health systems: life expectancy of patients with mental disorders. Br J Psychiatry 2011;

    199: 453-458.

**Table 1.** Number and prevalence of Swedish adults (N=7,253,516) with mental disorders ascertained alternatively using only inpatient or both inpatient and outpatient diagnoses (2001-2008).[a]

| Mental disorders (*ICD*-10 codes) | Inpatient diagnoses only n (%) | Inpatient and outpatient diagnoses n (%) | Cases missed using inpatient diagnoses only |
|---|---|---|---|
| Any mental disorder (F00-F69) | 377,339 (5.2) | 680,596 (9.4) | 44.6% |
| Substance use disorders (F10-F19) | 116,924 (1.6) | 160,762 (2.2) | 27.3% |
| Schizophrenia (F20) | 16,620 (0.2) | 25,970 (0.4) | 36.0% |
| Bipolar disorder (F31) | 14,855 (0.2) | 30,895 (0.4) | 51.9% |
| Depression (F32-F33) | 95,492 (1.3) | 214,830 (3.0) | 55.5% |
| Anxiety disorders (F40-F41) | 42,633 (0.6) | 148,498 (2.0) | 71.3% |
| Personality disorders (F60-F61) | 12,952 (0.2) | 32,330 (0.4) | 59.9% |
| At least 2 mental disorders | 44,824 (0.6) | 115,206 (1.6) | 61.1% |

[a]These comparisons are based on psychiatric diagnoses from all inpatient and outpatient settings during 2001-2008, disregarding diagnoses prior to 2001 when nationwide outpatient data were unavailable.

**Table 2.** Age- and sex-adjusted hazard ratios for associations between mental disorders and all-cause mortality (2001-2008).

| Mental disorders (*ICD*-10 codes) | Inpatient diagnoses only | | | Inpatient and outpatient diagnoses | | | Overestimation of aHR using inpatient data only |
|---|---|---|---|---|---|---|---|
| | Deaths | aHR (95% CI) | Maximum difference[a] | Deaths | aHR (95% CI) | Maximum difference[a] | |
| **Any mental disorder (F00-F69)** | | | | | | | |
| Prevalent cases identified and included[b] | 139,236 | 5.89 (5.85, 5.92) | | 159,705 | 5.11 (5.08, 5.14) | | 15.3% |
| Prevalent cases unidentified[c] | 139,236 | 6.64 (6.60, 6.68) | 16.0% | 159,705 | 5.34 (5.31, 5.37) | 4.5% | 24.3% |
| Prevalent cases identified and excluded[d] | 114,751 | 6.83 (6.78, 6.88) | | 132,884 | 5.34 (5.30, 5.37) | | 27.9% |
| **Substance use disorders (F10-F19)** | | | | | | | |
| Prevalent cases identified and included[b] | 24,895 | 4.81 (4.74, 4.87) | | 28,464 | 4.51 (4.45, 4.57) | | 6.7% |
| Prevalent cases unidentified[c] | 24,895 | 5.76 (5.68, 5.84) | 19.8% | 28,464 | 5.14 (5.07, 5.20) | 14.0% | 12.1% |
| Prevalent cases identified and excluded[d] | 17,297 | 5.44 (5.35, 5.53) | | 20,302 | 4.76 (4.69, 4.84) | | 14.3% |
| **Schizophrenia (F20)** | | | | | | | |
| Prevalent cases identified and included[b] | 3,742 | 4.31 (4.17, 4.46) | | 4,498 | 3.78 (3.66, 3.90) | | 14.0% |
| Prevalent cases unidentified[c] | 3,742 | 5.34 (5.16, 5.53) | 23.9% | 4,498 | 4.22 (4.08, 4.35) | 11.6% | 26.5% |
| Prevalent cases identified and excluded[d] | 2,369 | 5.34 (5.11, 5.59) | | 2,987 | 4.01 (3.85, 4.17) | | 33.2% |
| **Bipolar disorder (F31)** | | | | | | | |
| Prevalent cases identified and included[b] | 2,650 | 3.11 (2.99, 3.24) | | 3,485 | 2.53 (2.44, 2.63) | | 22.9% |
| Prevalent cases unidentified[c] | 2,650 | 3.65 (3.50, 3.81) | 17.4% | 3,485 | 2.68 (2.58, 2.78) | 6.8% | 36.2% |
| Prevalent cases identified and excluded[d] | 1,828 | 3.63 (3.45, 3.82) | | 2,545 | 2.51 (2.40, 2.62) | | 44.6% |
| **Depression (F32-F33)** | | | | | | | |
| Prevalent cases identified and included[b] | 25,981 | 3.65 (3.61, 3.69) | | 33,207 | 3.20 (3.16, 3.23) | | 14.1% |
| Prevalent cases unidentified[c] | 25,981 | 4.12 (4.06, 4.17) | 15.9% | 33,207 | 3.31 (3.27, 3.35) | 4.4% | 24.5% |
| Prevalent cases identified and excluded[d] | 23,072 | 4.23 (4.17, 4.29) | | 29,772 | 3.34 (3.30, 3.39) | | 26.6% |
| **Anxiety disorders (F40-F41)** | | | | | | | |
| Prevalent cases identified and included[b] | 9,339 | 3.70 (3.63, 3.78) | | 14,811 | 2.94 (2.89, 2.99) | | 25.9% |
| Prevalent cases unidentified[c] | 9,339 | 4.28 (4.18, 4.38) | 15.7% | 14,811 | 3.03 (2.98, 3.09) | 3.1% | 41.3% |
| Prevalent cases identified and excluded[d] | 8,492 | 4.28 (4.18, 4.38) | | 13,729 | 2.98 (2.93, 3.04) | | 43.6% |
| **Personality disorders (F60-F61)** | | | | | | | |
| Prevalent cases identified and included[b] | 1,514 | 4.10 (3.91, 4.31) | | 2,238 | 3.33 (3.19, 3.48) | | 23.1% |
| Prevalent cases unidentified[c] | 1,514 | 5.12 (4.84, 5.42) | 26.8% | 2,238 | 3.56 (3.40, 3.73) | 6.9% | 43.8% |
| Prevalent cases identified and excluded[d] | 1,100 | 5.20 (4.86, 5.55) | | 1,755 | 3.36 (3.19, 3.54) | | 54.8% |
| **Any second mental disorder[e]** | | | | | | | |
| Prevalent cases identified and included[b] | 7,697 | 3.17 (3.09, 3.25) | | 11,982 | 2.64 (2.58, 2.70) | | 20.1% |
| Prevalent cases unidentified[c] | 7,697 | 3.71 (3.62, 3.80) | 17.2% | 11,982 | 2.81 (2.75, 2.87) | 6.5% | 32.0% |
| Prevalent cases identified and excluded[d] | 6,483 | 3.58 (3.47, 3.70) | | 10,500 | 2.58 (2.52, 2.65) | | 38.8% |

[a]Maximum difference in aHRs among three different methods for handling prevalent psychiatric cases.

[b]Psychiatric cases diagnosed before 2001 were included and left truncation (variable time at risk after diagnosis) accounted for in the Cox model.

**Table 3.** Age- and sex-adjusted hazard ratios for associations between mental disorders and suicide mortality (2001-2008).

| Mental disorders (*ICD*-10 codes) | Inpatient diagnoses only | | | Inpatient and outpatient diagnoses | | | Overestimation of aHR using inpatient data only |
|---|---|---|---|---|---|---|---|
| | Suicides | aHR (95% CI) | Maximum difference[a] | Suicides | aHR (95% CI) | Maximum difference[a] | |
| **Any mental disorder (F00-F69)** | | | | | | | |
| Prevalent cases identified and included[b] | 3,179 | 23.91 (22.84, 25.03) | | 3,875 | 20.18 (19.28, 21.11) | | 18.5% |
| Prevalent cases unidentified[c] | 3,179 | 27.48 (26.26, 28.76) | 14.9% | 3,875 | 21.46 (20.53, 22.44) | 11.8% | 28.1% |
| Prevalent cases identified and excluded[d] | 2,114 | 26.85 (25.45, 28.32) | | 2,664 | 19.19 (18.24, 20.19) | | 39.9% |
| **Substance use disorders (F10-F19)** | | | | | | | |
| Prevalent cases identified and included[b] | 1,325 | 17.99 (17.00, 19.05) | | 1,564 | 17.23 (16.31, 18.20) | | 4.4% |
| Prevalent cases unidentified[c] | 1,325 | 20.26 (19.08, 21.51) | 18.0% | 1,564 | 18.67 (17.65, 19.76) | 8.4% | 8.5% |
| Prevalent cases identified and excluded[d] | 914 | 21.23 (19.78, 22.78) | | 1,103 | 18.61 (17.43, 19.87) | | 14.1% |
| **Schizophrenia (F20)** | | | | | | | |
| Prevalent cases identified and included[b] | 190 | 15.07 (13.13, 17.30) | | 236 | 13.25 (11.66, 15.05) | | 13.7% |
| Prevalent cases unidentified[c] | 190 | 16.99 (14.71, 19.62) | 21.0% | 236 | 12.63 (11.20, 14.25) | 8.7% | 34.5% |
| Prevalent cases identified and excluded[d] | 114 | 18.23 (15.15, 21.94) | | 150 | 13.73 (11.68, 16.14) | | 32.8% |
| **Bipolar disorder (F31)** | | | | | | | |
| Prevalent cases identified and included[b] | 256 | 29.56 (26.24, 33.30) | | 331 | 22.69 (20.38, 25.26) | | 30.3% |
| Prevalent cases unidentified[c] | 256 | 33.78 (29.82, 38.28) | 23.2% | 331 | 23.02 (20.61, 25.71) | 1.9% | 46.7% |
| Prevalent cases identified and excluded[d] | 190 | 36.43 (31.53, 42.09) | | 260 | 23.12 (20.42, 26.18) | | 57.6% |
| **Depression (F32-F33)** | | | | | | | |
| Prevalent cases identified and included[b] | 1,531 | 35.25 (33.39, 37.22) | | 1,992 | 26.55 (25.24, 27.93) | | 32.8% |
| Prevalent cases unidentified[c] | 1,531 | 42.33 (39.98, 44.83) | 20.1% | 1,992 | 27.81 (26.40, 29.30) | 4.7% | 52.2% |
| Prevalent cases identified and excluded[d] | 1,271 | 41.79 (39.28, 44.46) | | 1,684 | 26.57 (25.12, 28.10) | | 57.3% |
| **Anxiety disorders (F40-F41)** | | | | | | | |
| Prevalent cases identified and included[b] | 492 | 23.38 (21.48, 25.44) | | 882 | 15.68 (14.64, 16.80) | | 49.1% |
| Prevalent cases unidentified[c] | 492 | 27.98 (25.52, 30.68) | 19.7% | 882 | 16.06 (14.95, 17.25) | 5.8% | 74.2% |
| Prevalent cases identified and excluded[d] | 419 | 27.09 (24.53, 29.92) | | 783 | 15.18 (14.08, 16.37) | | 78.5% |
| **Personality disorders (F60-F61)** | | | | | | | |
| Prevalent cases identified and included[b] | 360 | 39.77 (35.98, 43.95) | | 474 | 30.22 (27.61, 33.08) | | 31.6% |
| Prevalent cases unidentified[c] | 360 | 51.51 (46.29, 57.32) | 39.6% | 474 | 32.75 (29.80, 35.99) | 8.4% | 57.3% |
| Prevalent cases identified and excluded[d] | 262 | 55.52 (49.02, 62.88) | | 367 | 31.61 (28.42, 35.17) | | 75.6% |
| **Any second mental disorder[e]** | | | | | | | |
| Prevalent cases identified and included[b] | 971 | 43.66 (42.10, 50.15) | | 1,370 | 31.25 (29.39, 33.21) | | 39.7% |
| Prevalent cases unidentified[c] | 971 | 48.57 (45.34, 52.02) | 22.4% | 1,370 | 33.97 (31.95, 36.10) | 8.7% | 43.0% |
| Prevalent cases identified and excluded[d] | 767 | 53.44 (48.97, 58.33) | | 1,130 | 32.29 (29.97, 34.79) | | 65.5% |

[a]Maximum difference in aHRs among three different methods for handling prevalent psychiatric cases.
[b]Psychiatric cases diagnosed before 2001 were included and left truncation (variable time at risk after diagnosis) accounted for in the Cox model.
[c]Psychiatric diagnoses prior to 2001 were disregarded, so that persons were counted as cases only if they received a diagnosis during 2001-2008.
[d]Persons with the respective psychiatric diagnoses prior to 2001 were excluded from the model.
[e]Risk estimates for any second mental disorder were adjusted for any first mental disorder (modeled simultaneously as separate time-dependent variables).
Abbreviations:  aHR = adjusted hazard ratio; CI = confidence interval.