

**Sex differences in mortality among patients admitted with affective disorders in North Norway -  
a 33-year prospective register study**

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## **Abstract**

**Objective:** Previous studies from North Norway show significantly increased mortality in patients with schizophrenia and personality disorder. The aim of the present study was to investigate total and cause-specific mortality of in-patients with affective disorder in a 33-year follow-up cohort, with a specific focus on sex differences.

**Methods:** Based on a hospital case register covering all admissions to psychiatric hospital in the two northernmost counties in Norway from 1980 to 2012, 790 men and 866 women with major depressive disorder and 331 men and 514 women with bipolar disorder were included. The cohort was linked to the Norwegian Cause of Death Registry. The relative mortality in men compared to women was tested with Cox regression with attained age as the time variable. Standardized mortality ratio (SMR) of the patients when compared to the general population in Norway was calculated.

**Results:** Patients with affective disorders had twice the mortality of the general Norwegian population (SMR 2.1, 95% CI 1.9-2.3). For major depressive disorder, the SMR for total mortality was higher among men (2.6, 95% CI 2.2-3.0) than women (1.8, 95% CI 1.5-2.1). For bipolar disorder, no difference was seen between men and women. The SMR for suicide among women showed an increasing trend throughout the period (1980 – 1990: 20.0 (95% CI 10.4-38.4); 1991-2001: 27.0 (95% CI 15.7-46.2); 2002-2012: 40.4 (95% CI 23.0-71.2)).

**Conclusion:** The substantially increased mortality in patients with affective disorders in Norway has been persistent over a period of 33 years, despite extensive reforms in psychiatric health care.

Indications of increasing SMR for suicide in women call for further research.

## **Key words:**

Mortality, affective disorders, sex differences

## **Introduction**

Patients with severe mental disorders have significantly higher mortality than the general population, from both diseases and medical causes as well as external causes and injury (1-5), and have a 15-20 years reduced life span. The difference in life expectancy is greatest for men (4). Substance abuse, schizophrenia and personality disorders are associated with the highest risk of death due to medical conditions, while affective disorders and personality disorders are associated with the highest risk for suicide (5).

The ratio of the observed to the expected number of deaths, the standardized mortality ratio (SMR), expresses the relative mortality of the patient group compared to that of the general population. When compared to the mortality in the general population, patients with bipolar disorder have lower SMRs than patients with schizophrenia (5). Excess mortality due to cardiovascular diseases and other somatic diseases is higher than excess mortality due to suicides and other external causes for persons with bipolar disorders and schizophrenia, and diseases and medical causes contribute more than external causes of death and injury to the reduced life span for both groups (6-9). A registry based study from Sweden (1987-2006) published in 2012 demonstrated that suicides and other external causes accounted for 18% of deaths in individuals with bipolar disorders, whereas 38% were caused by cardiovascular diseases and 44 % by other medical diseases (6). Mortality from cardiovascular diseases was equally increased for men and women.

In Norway, mortality of individuals with severe mental illness has been reported infrequently since 1916 (10-16). Due to lack of relevant data there has been no nationwide mortality study with long-term follow-up from Norway since 1970, but regional studies from North Norway show increasing SMRs for patients with schizophrenia, especially women (17). Studies from Denmark and Finland between 1987 and 2006, have, however, showed slight decrease in the mortality gap between individuals with severe mental disorders and the general population, especially for women (4).

Individuals with bipolar disorders are shown to have up to 30 times higher risk of completing suicide than the general population, but the rates differ considerably across countries (18).

Furthermore, episodes of depression and mixed states are probably associated with increased suicide

risk among people with bipolar disorder (19). Deaths by suicide in individuals with bipolar depression may be attributed to major depression episodes, and the SMR for patients with bipolar disorder may therefore be higher than previously shown (20). Westman's study from Sweden demonstrated 9.7 times higher mortality for suicide and other external causes for patients with bipolar disorder compared to the general population, slightly higher for women than for men (10.0 and 9.4, respectively) (6).

Regardless of some differences between the Nordic countries there has, in general, been an overall decline in suicide mortality from 1980 to 2009; from 25-50 to 20-36 per 100 000 for men, and from 9-26 to 8-11 per 100 000 for women (21). The rates in Finland are consistently higher than in the other Nordic countries, and there has been a significant increase in suicides among young women in Finland and Norway and no change among young women in Sweden. Rural areas have the highest suicide rates, and in Finnmark, the northernmost county in Norway, the annual rate for men at all ages is > 35 per 100 000 inhabitants. For women, the rates in the northernmost counties are not markedly elevated compared to other regions of Norway. Nevertheless, studies from North Norway show an alarming increase in suicide mortality for patients with schizophrenia over a period of 27 years from 1980-2006 (17), especially for women.

The aims of the present study are: first, to estimate the excess mortality due to deaths from diseases and deaths from external causes in men and women admitted with an affective disorder in North Norway during a 33 years period (1980-2012), and second, to investigate whether the alarming increase in mortality observed in women admitted with schizophrenia also applies to women with affective disorders.

## **Material and methods**

### The study cohort

The University Hospital of North Norway is the only psychiatric hospital covering the two northernmost counties in Norway; Troms and Finnmark. These counties comprise a vast area of approximately 75 000 km<sup>2</sup>, with a total of 238 075 inhabitants in 2014. The development in relative

age distribution in North Norway has been more or less similar to Norway as a whole from 1986 – 2012 (22). Information about every admission to the psychiatric departments has been collected since 1980, and this computerized register has been regularly validated against patient files. The data used in this study was date of admission, date of discharge, and diagnoses according to the International Classification of Diseases (ICD) at discharge. From 1985, the diagnostic system used in Norway was ICD-9 (23), from 1997 ICD-10 (24). ICD-8 (25) codes (used before 1985) were converted to ICD-9 codes.

The study population includes all patients admitted from January 1<sup>st</sup> 1980 to December 31<sup>st</sup> 2012. The unique 11-digit personal identification number assigned to all Norwegian residents was used for linkage between the hospital register, the Norwegian Cause of Death Registry (26), and information regarding emigration held by Statistics Norway (27). The Cause of Death Registry covers data on all persons with residence in the country, independent of where they died. In Norway, all death certificates are completed by a physician and coded in accordance with the current ICD-system. The diagnoses recorded by the Cause of Death Registry as the underlying cause of death were grouped into cardiovascular causes (ICD-8 codes 390-459 and 782.4, ICD-9 codes 390-459 and ICD-10 codes I00-I99), cancer (ICD-8 codes 140-209, ICD-9 codes 140-208 and ICD-10 codes C00-C97), external causes and injury (ICD-8 codes and ICD-9 codes E800-999, ICD-10 codes V, W, X, Y) and suicide (ICD-8 and ICD-9 codes E950-959, ICD-10 codes X60-84). Diseases and medical causes were defined as all other causes than external causes and injury.

There was a total number of 32150 admissions among 8161 individuals in the study period. Of these, 283 were not included in the data file due to missing discharge date (N=79, 1.0%) or an invalid personal identification number, in most cases refugees (N=204, 2.5%). Thus, 4217 men (53.5%) and 3661 women (46.5%) were included. A total of 2501 (1121 men, 44.8%, 1380 women, 55.2%) of these patients were diagnosed with an affective disorder (ICD-9 codes 296, 298.0, 311, and ICD-10 codes F30-F39) at discharge for at least one of their admissions. Patients with affective disorders were categorized into two groups: 1) major depressive disorder (ICD-9 296.2, 296.3, 298.0, 311, ICD-10 F32-F34, F38, F39) as the only main diagnosis, 2) bipolar disorder (ICD-9 296.0, 296.1, 296.4-296.9, ICD-10 F30, F31) as the only main diagnosis or in combination with major depressive disorder at

different admissions. The 2501 patients were followed from the date of first admission after January 1<sup>st</sup> 1980 until death, moving abroad (N=30), or December 31<sup>st</sup> 2012, for a total of 24038 person years. Twelve subjects who were in-hospital patients at January 1<sup>st</sup> 1980 were included in the cohort with start of follow-up the same day. To investigate changes in mortality over time we split the cohort in three time periods; the first group included individuals admitted for the first time during 1980-1990, the second group included those with first admission during 1991-2001 and the third group included patients with first admission during 2002-2012.

### Statistical analyses

Differences in the clinical characteristics of male and female patients were tested with Student's t-test, Wilcoxon rank sum test (when the distributions were markedly positively skewed) or chi-square test. We studied the differences in age-adjusted mortality rates between men and women with affective disorders in the study cohort, and sex differences in standardized mortality ratios (SMR) compared to the general population

The relative mortality for men compared to women was tested with Cox regression with attained age as the time variable. For comparison with the mortality of the general population of Norway, indirect age adjustment was used. The number of deaths to be expected among the patients, if the mortality rates were the same as the general population in Norway according to age (5-year groups) and calendar year (5-year groups) during follow-up, was calculated. Confidence intervals for the SMRs were computed. P-values < 0.05 were considered statistically significant. Statistical analyses were performed with SAS Enterprise Guide 6.1.

### Results

The cohort included 1121 men and 1380 women with an affective disorder diagnosis during the study period 1980-2012 (Table 1). Among these, 790 men (70.5%) and 866 women (62.8%) had major depressive disorder as their only main diagnosis, whereas 331 men (29.5%) and 514 women (37.3%) had bipolar disorder as the main diagnosis or bipolar disorder and major depressive disorder diagnoses at separate admissions. The difference between major depressive disorder and bipolar disorder was

significantly higher among men than among women ( $p < 0.0001$ ). Mean age at first admission was 42.5 years for men and 43.7 years for women, the difference between the sexes was not statistically significant. Mean length of follow-up was significantly longer among women (10.4 years) than men (8.7 years).

#### Gender differences in all-cause mortality among patients with affective disorders

A total of 501 patients (235 men and 266 women) died during the follow-up period 1980-2012. Thus, the crude mortality rate was 20.8 per 1000 person years. A total of 392 deaths (78%) were due to diseases and 109 (22%) were due to external causes, of which 79 (16%) were suicides. The age adjusted hazard ratio (HR) in men compared to women was 1.7 (95% CI: 1.4-2.1) (Table 2). Men had higher mortality than women for both diseases (HR: 1.4, 95% CI 1.1-1.7) and external causes (HR: 1.8, 95% CI 1.2-2.8), including suicide (HR: 1.7, 95% CI 1.0-2.8). The relative mortality in men compared to women was highest in those with major depressive disorder as only main diagnosis. The mortality rate was higher in men than women in the period 1980-2001, while the mortality rate was similar in men and women admitted for the first time during 2002-2012. The diagnostic groups (major depressive disorder and bipolar disorder) did not differ in age- and sex-adjusted total and cause-specific mortality.

#### Mortality in patients with affective disorder compared to the general population (SMR)

Patients with affective disorders had twice the mortality of the general Norwegian population (SMR 2.1, 95% CI 1.9-2.3). The mortality was elevated for both diseases (SMR 1.7, 95% CI 1.6-1.9) and external causes of death (SMR 8.2, 95% CI 6.8-9.9). SMR was elevated for cardiovascular diseases (1.9, 95% CI 1.6-2.2), but not for cancer (1.0, 95% CI 0.8-1.3), and among the external causes SMR was particularly elevated for suicide (23.4, 95% CI 18.8-29.2). As displayed in Table 3, a similar pattern was found in both men and women. Among patients with major depressive disorder, the SMR for total mortality was higher among men (2.6, 95% CI 2.2-3.0) than women (1.8, 95% CI 1.5-2.1). For bipolar disorder, there was no significant difference between the sexes; SMR for men was 2.0 (95% CI 1.6-2.5), and for women 2.1 (95% CI 1.8-2.5) (Table 3).

All-cause mortality was elevated among patients with affective disorders compared to the population in all age groups, and highest in the younger age groups. For suicide, however, the SMRs for relatively young people did not differ much from SMR in older subjects (Table 4).

Time trends in mortality among patients with affective disorders

SMR was 1.9 (95% CI 1.6-2.2) for patients with affective disorders and admitted for the first time during 1980-1990, 2.3 (95% CI 2.0-2.6) for those admitted 1991-2001, and 2.1 (95% CI 1.8-2.6) for those admitted 2002-2012. For men the all-cause SMR was quite stable at 2.3 -2.4 throughout the study period (Table 5), while for women there was an increase in all-cause SMR from 1.7 (95% CI 1.4-2.1) for patients admitted during the first period, to 2.0 (95% CI 1.6-2.6) for those admitted during the last period (Table 6). The SMR for cardiovascular disease mortality in women tended to increase, from 1.6 (95% CI 1.2-2.2) to 2.2 (95% CI 1.4-3.4), whereas in men there was a decrease from 2.4 (95% CI 1.7-3.4) to 1.7 (95% CI 1.0-2.8) (Table 5). SMR for suicide increased with year of first admission in both sexes, and the increase in women from 20.0 (95% CI 10.4-38.4) during 1980-1990 to 40.4 (95% CI 23.0-71.2) during 2002-2012 is substantial. None of the observed time trend differences in SMRs were, however, statistically significant. Additional analyses restricted to subjects admitted during 1980-1990 showed that all-cause SMR for men was 1.9 (95% CI 1.1-3.3) with follow-up 1980-1990, 1.7 (95% CI 1.1-2.6) with follow-up 1991-2001 and 3.2 (95% CI 2.3-4.4) with follow-up 2002-2012. For women, the corresponding figures were 2.4 (95% CI 1.5-3.8), 1.3 (95% CI 0.9-1.9) and 1.8 (95% CI 1.4-2.4). Furthermore, all-cause SMR for men admitted and followed during 1991-2001 was 2.2 (95% CI 1.5-3.2), and 2.3 (95% CI 1.8-2.9) for men admitted and followed during 2002-2012. The corresponding figures for women were 2.2 (95% CI 1.5-3.2) and 2.0 (95% CI 1.6-2.6).

## **Discussion**

Key findings



In this study of all patients admitted to psychiatric hospital in North Norway during 1980-2012, we found 2-3 times higher all-cause mortality among patients with affective disorders compared to the general Norwegian population. Overall, there was no reduction in SMR due to diseases or external causes of death for patients with affective disorders over a period of 33 years. Among patients with major depression, men had significantly higher mortality for both diseases and external causes. Among women there was a trend for increasing SMR due to suicide throughout the 33-year period.

#### Comparison with other countries

A meta-analysis by Walker et al. (28) states a relative mortality risk of 2.1 (95% CI 1.9-2.3) for mood disorders. SMRs of 2.3 for all-cause mortality in men and 1.9 among women are thus in line with a series of similar studies from other Nordic countries (2-7). A comprehensive registry-based study from Finland, Sweden and Denmark demonstrated a surprisingly consistent all-cause SMR for men (2.5 in Finland and Sweden and 2.6 Denmark) and women (2.1 in Finland and 2.2 in Denmark and Sweden). SMR due to cardiovascular diseases was in our study 1.8 for men (95% CI 1.4-2.3). This is in line with the other Nordic countries (1.8 in Sweden, and 2.0 in Finland and Denmark) (5), and also with studies from non-Nordic countries stating that bipolar disorder is associated with a near doubling of cardiovascular mortality risk compared to general population estimates (29). Women in our study had similar or slightly higher SMR due to cardiovascular diseases (1.9, 95% CI 1.6-2.4) than women in Sweden (1.6), Denmark and Finland (both 1.7) (5). In contrast to the Nordic and other countries, SMR due to cancer was not higher in patients with affective disorders our study: 1.1 (95% CI 0.8-1.6) for men and 0.9 (95% CI 0.6-1.3) for women. In all the other Nordic countries the ratios were higher both for men (1.8 in Denmark, 1.4 in Finland and 1.5 in Sweden) and women (1.7 in Denmark, 1.5 in Finland and 1.6 in Sweden) (5), with similar findings from elsewhere such as Australia (30, 31). SMRs due to suicide in the present study, 21.0 for men (95% CI 15.7-28.2) and 27.6 for women (95% CI 19.8-38.7), are in line with data from Finland (18.3 for men and 26.3 for women), while the ratios were higher for both sexes in Denmark (36.6 for men, 50.5 for women) and Sweden (35.6 for men, 46.6 for women) (5).

For patients with a bipolar disorder we found slightly higher SMR for cardiovascular causes of death in women than in the other Nordic countries; 2.1 (95% CI 1.5-2.8) compared to 1.7 (95% CI 1.5-1.9) in Denmark, 2.1 (95% CI 1.7-2.4) in Finland and 1.8 (95% CI 1.7-1.9) in Sweden (7). SMR for external causes of death (including suicide) in bipolar women was also somewhat higher in our study than in a Swedish study, 11.3 (95% CI 7.9-16.2) compared to 10.2 (95% CI 9.0-11.1) (6). The differences are, however, not statistically significant.

As in the other Nordic countries, SMRs for persons with affective disorders in North Norway were lower compared to SMRs for schizophrenia (3.5 for men (95% CI 3.1-4.1) and 2.6 for women (95% CI 2.1-3.2) (17). The denominator for SMRs in the present study are based on the entire Norwegian population, and because North Norway has slightly higher mortality rates for men than the rest of Norway during most of the follow-up period (32), this might have resulted in higher SMRs for men in the study. However, a comparison with the population in North Norway would nevertheless have led to biased (low) SMRs because the suicide deaths of the patients in the cohort contribute to the total number of deaths in the population of North Norway.

#### Age at first admission

The median age at onset of all mood disorders combined ranges between the late 20s and the early 40s worldwide (33), and approximately half of those with bipolar I disorder or sub-threshold bipolar disorder report onset before age 25 years (34). The median age at first admission in our study cohort was 39.8 years (SD 17.2, range from 16 to 89 years) for men and 40.8 (SD 18.7, range from 15 to 93 years) for women, indicating that many patients may be admitted to specialist health care at a late stage during the disease course due to a crisis or exacerbation of symptoms. The high age at first admission could also be explained by a number of patients being admitted before 1980, but it is highly unlikely that there are many patients admitted before 1980 who do not have their next admission before e.g. 1990. Hence, the in-patient population with affective disorders is probably highly selected and biased towards more severe cases, and the increased mortality may thus indicate a strong association with symptom severity for both major depressive disorder and bipolar disorder. There are long travelling distances to specialist health care in North Norway, and many patients may have had

several contacts with primary health care before first admission to hospital. Unfortunately, we have no information on treatment outside hospital. Nevertheless, we found the highest SMR values in the younger age groups (<50 years) in both men and women for both diseases and external causes of death. Munk Laursen et al. state that life expectancy in Finland is lower in men with bipolar disorder than in men with schizophrenia due to the high mortality in younger age groups (7). Due to the high age at first admission in our cohort compared to age at onset reported in prevalence studies (33, 34), it might therefore be that there is an actual underestimation of mortality in individuals in younger age groups.

#### Changes in mortality over time

As for the other Nordic countries, Norway has undergone a reform within psychiatric health care the last two decades. There has been a strengthening of decentralized psychiatric services and development of community-based mental health services, and decrease in hospital beds and in-patient care. As demonstrated in Table 2, more patients were admitted for the first time during 1991-2000 than during 1981-1990. This reflects that in-patient care has changed towards treating a higher number of patients with admissions of shorter duration. Wahlbeck et al. conclude that there is a slight trend of reduced total mortality risk for patients with all mental disorders between 1987 and 2006 (4). In the present study, we found that SMRs for both diseases and external causes of death for men and women with affective disorders are essentially unchanged, or at least not reduced, during the period 1980-2012.

The mortality risk may be higher the first years after first admission, and thus the SMR differences between the three time cohorts could be affected by changes in length of follow-up and average age of the cohorts over time. Additional analyses of subjects admitted during 1980-1990 showed, however, no such effect. Furthermore, there was little evidence for a significant improvement in prognosis with regard to mortality in patients admitted in the 2000's than in the 1980's.

The difference in mortality between men and women admitted for the first time from 2002-2012 is not statistically significant (Table 2), indicating that the mortality for women is increasing relative to that in men. In our previous study of mortality in schizophrenia, based on the same in-patient population (admitted and followed-up during 1980-2006), albeit with a shorter follow-up period, we found higher SMRs for patients admitted for the first time during the period 1993-2006 than for patients admitted 1980-1992 (17). SMR for suicide was particularly high for women admitted in the 2000's. In the present study, we found a trend for increasing SMRs for suicide in women with affective disorders as well.

### Strengths and limitations

A strength of this study is the long follow-up and the completeness of data on admitted patients, with regular quality control against patient files. Also, there is virtually no loss to follow-up as the Norwegian Cause of Death Registry has a near-complete degree of coverage and completeness (35, 36). In two international quality assessments. The Norwegian Cause of Death Registry was assessed in the second-best groups (37, 38) due to a too high rate of unspecified diagnoses, in the third assessment it was ranked in the best group (39). The rate of unspecified diagnoses are higher for cardiovascular diagnoses than for cancer diagnoses (40), hence there might be an overestimation of cardiovascular mortality in our study (both for the patients and the national mortality rates we compare with). There are no private psychiatric hospitals in Norway. Being the only regional psychiatric hospital, all residents from these counties admitted to any psychiatric hospital in Norway will be transferred to the University Hospital of North Norway. The mental health services in the counties are almost exclusively public with established structures for cooperation on admission and follow-up. Hence, very few admissions of subjects who are residents in these two counties have taken place elsewhere without eventually being included in the database. We have, however, no information on whether the patients are treated or not in primary health care before admission.

Diagnoses are registered on the day of discharge by the treating clinician, usually derived by a team discussion, but diagnostic reliability is not known. This may have affected the validity of the diagnosis.

The study comprises only the two northernmost counties in Norway. These counties are sparsely populated, with long travelling distances and only one hospital covering both counties. Norway has, in line with the other Nordic countries, a long tradition of egalitarian health and welfare policies. There may still be regional inequity in health care or a lack of socioeconomic protective factors affecting risk factor prevention, follow-up after discharge for hospital or continuous support from decentralized psychiatric health care and community-based services. Our study may therefore not be fully representative for Norway at a national level, and further studies are needed to compare the northern regions with the rest of the country, as well as with similar regions in other countries. Furthermore, we have no information on potential confounders such as severity of psychiatric symptoms, smoking, alcohol or substance abuse. The study is underpowered for time-trend analysis of specific causes of mortality.

## **Conclusion**

This study demonstrates a persistent mortality gap between patients with affective disorders and the general population in Norway over a period of 33 years. Our findings support the assumption that the reforms in psychiatric health care that have been implemented in Norway during the last two decades have not reduced the mortality among patients with severe mental disorders relative to the mortality in the population. Mortality is affected by prevention of lifestyle risk factors, equal access to quality health care and strategies to reduce suicide risk. High mortality compared to the general population is thus a proxy indicator of the effectiveness of policy on health care, social services and access to meaningful work and activities. Our findings should therefore prompt a change in clinical prevention and treatment strategies, to reduce the mortality gap between patients with affective disorders and the general population. The importance of preventing deaths from somatic diseases in this group of patients is underscored, as 64% of the excess mortality in our study is due to diseases and medical causes. Furthermore, the indications of increasing mortality due to suicide in women with affective disorders compared to the general population call for further research.

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Table 1. Clinical characteristics of men and women with affective disorders

	Men	Women	p-value*
Number of patients	1121	1380	
Major depressive disorder	790	866	
Bipolar disorder	331	514	
Number of deaths	235	266	
Number of admissions	4318	6837	
Number of admissions (median, 1 and 3 quartile)	2 (1,4)	2 (1,5)	0.002
Total number of days admitted (median, 1 and 3 quartile)	30 (7, 88)	49 (12, 127.5)	0.002
Mean age at first admission in years (median, SD)	42.5 (39.8, 17.2)	43.7(40.8, 18.7)	NS
Total time follow-up (person-years)	9803	14235	
Follow-up time in years (mean, SD)	8.7 (6.9)	10.4 (7.8)	<0.0001

\*Differences between men and women

Table 2. Relative mortality (Hazard ratio) in men compared to women among patients with affective disorders

	Number of patients		Follow-up (person years)		Deaths		Hazard ratio (HR) (95 % CI)	p-value
	Men	Women	Men	Women	Men	Women		
All patients	1121	1380	9803	14235	235	266	1.7 (1.4-2.1)	<0.0001
<i>Major depressive disorder</i>	790	866	6244	7522	147	136	1.9 (1.5-2.4)	<0.0001
<i>Bipolar disorder</i>	331	514	3559	6713	88	130	1.6 (1.2-2.0)	0.002
Date of first admission								
<i>1980-1990</i>	120	218	2443	4790	68	100	2.1 (1.5-2.9)	<0.0001
<i>1991-2001</i>	337	440	3954	5714	107	109	1.7 (1.3-2.2)	<0.0002
<i>2002-2012</i>	664	722	3406	3730	60	57	1.4 (1.0-2.1)	0.1

HR, hazard ratio; CI, confidence interval

Table 3. Standardized mortality ratio (SMR) among patients with affective disorder admitted to the University Hospital of North Norway, 1980-2012, compared to the general Norwegian population

	All patients			Men			Women		
	Observed deaths (n)	Expected deaths (n)	SMR*	Observed deaths (n)	Expected deaths (n)	SMR*	Observed deaths (n)	Expected deaths (n)	SMR*
All patients									
Total mortality	501	238.0	2.1 (1.9-2.3)	235	101.0	2.3 (2.0-2.6)	266	137.0	1.9 (1.7-2.2)
<i>Deaths from diseases</i>	392	224.7	1.7 (1.6-1.9)	176	93.7	1.9 (1.6-2.2)	216	131.0	1.6 (1.4-1.9)
<i>CVD</i>	160	85.8	1.9 (1.6-2.2)	65	36.6	1.8 (1.4-2.3)	95	49.1	1.9 (1.6-2.4)
<i>Cancer</i>	68	68.4	1.0 (0.8-1.3)	33	29.5	1.1 (0.8-1.6)	35	38.9	0.9 (0.6-1.3)
<i>External causes of death</i>	109	13.3	8.2 (6.8-9.9)	59	7.3	8.1 (6.3-10.5)	50	6.0	8.3 (6.3-11.9)
<i>Suicide</i>	79	3.4	23.4 (18.8-29.2)	45	2.1	21.0 (15.7-28.2)	34	1.2	27.6 (19.8-38.7)
Major depressive disorder									
Total mortality	283	131.9	2.1 (1.9-2.4)	147	56.8	2.6 (2.2-3.0)	136	75.1	1.8 (1.5-2.1)
<i>Deaths from diseases</i>	224	124.0	1.8 (1.6-2.1)	108	52.3	2.1 (1.7-2.5)	116	71.7	1.6 (1.3-1.9)
<i>CVD</i>	88	47.0	1.9 (1.5-2.3)	38	19.7	1.9 (1.4-2.6)	50	27.3	1.8 (1.4-2.4)
<i>Cancer</i>	41	36.6	1.1 (0.8-1.5)	19	17.7	1.1 (0.7-1.8)	22	19.8	1.1 (0.7-1.7)
<i>External causes of death</i>	59	7.8	7.5 (5.8-9.7)	39	4.4	8.8 (6.4-12.0)	20	3.3	5.9 (3.8-9.2)
<i>Suicide</i>	47	2.0	23.9 (18.0-31.8)	32	1.3	24.0 (17-33.9)	15	0.6	23.7 (14.3-39.4)
Bipolar disorder									
Total mortality	218	106.1	2.1 (1.8-2.3)	88	44.2	2.0 (1.6-2.5)	130	61.9	2.1 (1.8-2.5)
<i>Deaths from diseases</i>	168	100.7	1.7 (1.4-1.9)	68	41.4	1.6 (1.3-2.1)	100	59.3	1.7 (1.4-2.1)
<i>CVD</i>	72	38.8	1.9 (1.5-2.3)	27	16.9	1.6 (1.1-2.3)	45	21.8	2.1 (1.5-2.8)
<i>Cancer</i>	27	31.9	0.8 (0.6-1.2)	14	12.8	1.1 (0.6-1.8)	13	19.1	0.7 (0.4-1.2)
<i>External causes of death</i>	50	5.5	9.2 (6.9-12.1)	20	2.8	7.1 (4.6-11.0)	30	2.6	11.3 (7.9-16.2)
<i>Suicide</i>	32	1.4	22.8 (16.1-32.2)	13	0.8	16.1 (9.4-27.8)	19	0.6	31.8 (20.3-49.8)

\*Figures are SMR (95% confidence intervals)

Table 4. Standardized mortality ratio (SMR) according to age groups in patients with affective disorders admitted to the University Hospital of North Norway during 1980-2012, compared to the general Norwegian population

	Number of deaths	SMR total (95% CI)
All causes		
Age 15-39	42	7.5 (5.5-10.1)
Age 40-49	47	5.7 (4.3-7.6)
Age 50-59	51	2.9 (2.2-3.8)
Age 60-69	78	2.2 (1.8-2.8)
Age 70+	283	1.7 (1.5-1.9)
Total	501	2.1 (1.9-2.3)
Deaths from diseases		
Age 15-39	8	2.9 (1.4-5.6)
Age 40-49	23	3.6 (2.4-5.5)
Age 50-59	31	1.9 (1.4-2.7)
Age 60-69	61	1.8 (1.4-2.3)
Age 70+	269	1.6 (1.4-1.8)
Total	392	1.7 (1.6-1.9)
External causes of death		
Age 15-39	34	12.3 (8.8-17.2)
Age 40-49	24	12.9 (8.6-19.2)
Age 50-59	20	11.7 (7.5-18.1)
Age 60-69	17	12.4 (7.7-20.0)
Age 70+	14	2.5 (1.5-4.2)
Total	109	8.2 (6.8-9.9)
Suicide		
Age 15-39	27	24.4 (16.7-35.7)
Age 40-49	20	26.2 (16.9-40.1)
Age 50-59	13	19.7 (11.4-33.9)
Age 60-69	13	29.7 (17.3-51.2)
Age 70+	6	15.0 (6.7-33.4)
Total	79	23.4 (18.8-29.2)

Figures are SMR (95% confidence intervals)

Table 5. Standardized mortality ratio (SMR) among men with affective disorders admitted to the University Hospital of North Norway during 1980-2012, compared to the general Norwegian population

	1980-1990		1991-2001		2002-2012	
	SMR*	Deaths**	SMR*	Deaths**	SMR*	Deaths**
All cause	2.3 (1.8-2.9)	68 (29.9)	2.4 (2.0-2.9)	107 (44.5)	2.3 (1.8-2.9)	60 (26.6)
<i>Deaths from diseases</i>	2.1 (1.6-2.7)	58 (28.0)	1.9 (1.5-2.4)	78 (41.5)	1.7 (1.2-2.3)	40 (24.2)
<i>CVD</i>	2.4 (1.7-3.4)	29 (12.2)	1.4 (0.9-2.1)	22 (16.2)	1.7 (1.0-2.8)	14 (8.3)
<i>Cancer</i>	1.2 (0.7-2.3)	11 (8.8)	1.3 (0.8-2.1)	17 (13.9)	0.6 (0.3-1.6)	5 (7.8)
<i>External causes of death</i>	5.3 (2.8-9.8)	10 (1.9)	9.7 (6.7-13.9)	29(3.0)	8.4 (5.4-13.1)	20 (2.4)
<i>Suicide</i>	11.8 (5.6-24.8)	7 (0.6)	29.6 (20.0-43.9)	25 (0.8)	18.4 (10.7-31.7)	13 (0.7)

\*SMR (95% confidence interval)

\*\*number of observed deaths (expected number of deaths)

Table 6. Standardized mortality ratio (SMR) among women with affective disorders admitted to the University Hospital of North Norway during 1980-2012, compared to the general Norwegian population

	1980-1990		1991-2000		2001-2012	
	SMR*	Deaths**	SMR*	Deaths**	SMR*	Deaths**
All cause	1.7 (1.4-2.1)	100 (58.7)	2.2 (1.8-2.6)	109 (50.4)	2.0 (1.6-2.6)	57 (27.9)
<i>Deaths from diseases</i>	1.4 (1.2-1.8)	81 (56.4)	1.9 (1.6-2.3)	92 (48.1)	1.6 (1.2-2.2)	43 (26.5)
<i>CVD</i>	1.6 (1.2-2.2)	36 (22.5)	2.2 (1.6-3.1)	39 (16.5)	2.2 (1.4-3.4)	20 (9.1)
<i>Cancer</i>	0.8 (0.5-1.3)	13 (16.6)	1.0 (0.6-1.7)	15 (14.7)	0.9 (0.4-1.9)	7 (7.6)
<i>External causes of death</i>	8.1 (5.2-12.8)	19 (2.3)	7.5 (4.7-12.1)	17(2.3)	9.9 (5.8-16.7)	(14, 1.4)
<i>Suicide</i>	20.0 (10.4-38.4)	9 (0.5)	27.0 (15.7-46.4)	13 (0.5)	40.4 (23.0-71.2)	12 (0.3)

\*SMR (95% confidence interval)

\*\*number of observed deaths (expected number of deaths)