Use of Antidepressants and Suicide Rate in Finland: An Ecological Study

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Objective: The suicide rate has decreased in many countries, while the use of antidepressants has increased greatly. The aim of this study was to investigate the associations between use of antidepressants and suicide rate.

Method: Population-based suicide rates and reimbursed prescriptions of antidepressants between 1994 and 2001 in Finland were analyzed in the whole population, and separately by gender, age, and geographical region.

Results: There were significant differences in suicide rates between men and women ($p < .0001$), but there were no differences between different regions of the country. The decline in the suicide rate was significantly associated with use of antidepressants among men aged 15 to 44 ($p < .0001$), 45 to 64 ($p = .0005$), and 75 years and over ($p = .001$) and men in 3 regions ($p < .001$). The decline in the suicide rate was significantly associated with the use of antidepressants among 15- to 44-year-old women ($p = .008$) and women in 1 region ($p = .013$). Use of antidepressants had a significant association with the decrease in the suicide rate (risk ratio = 0.08, 95% CI 0.02 to 0.30, $p < .001$), despite the effect of background variables, their interaction, and the course of time.

Conclusions: An increase in the use of antidepressants may decrease the suicide rate. Baseline suicide rate and access to health care may influence this association.

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Finland has had one of the highest rates of suicide mortality in Europe.[1] During the last decade, while the sale and use of antidepressants have increased greatly, the suicide rate has declined considerably.[2,3] Despite these trends, suicide remains a major public health concern. The use of antidepressants as a method of suicide prevention has recently been described as a medical breakthrough.[4] However, the trends uncovered in Denmark, Finland, Norway, and Sweden[4] have not been found in Iceland.[5] Additionally, a recent study in the United States found a significant inverse relationship between the regional change in the use of antidepressants and suicide among adolescents after adjusting for age group, sex, regional median income, and regional racial composition.[6]

However, some controversy has remained concerning the possibility of an increase in suicidality brought about by the use of selective serotonin reuptake inhibitors (SSRIs) in some patients.[7,8] Furthermore, the practice guideline for the assessment and treatment of patients with suicidal behaviors drafted by the American Psychiatric Association states that the evidence for a lowering of the suicide rate with antidepressant treatment is inconclusive.[9]

Almost two thirds of suicide victims in Finland suffer from depressive disorders.[10] There is evidence that depression has not previously been adequately treated among patients who commit suicide.[11–13] Many suicide completers use psychotropic medications and psychiatric care, but few use antidepressants.[14] The age-adjusted prevalence of depression in Finland has been found to be 4.1% for major depression and 1.7% for dysthymia.[15] In a representative population sample, only 13% of subjects with an episode of major depression during the previous 12 months were using antidepressants despite the multifold increase in sales of these medicines.[16]

There were significant changes for the worse regarding several central determinants of suicides in Finland during the 1990s. First, the rate of unemployment rose sharply from the level of 3.5% in 1990 to a high of 18.4% in 1994. The rate of unemployment remained at a very high level for several years.[17] Second, consumption of alcohol and rates of age-standardized alcohol-related deaths have increased steadily since the early 1990s.[1] Third, the proportion of divorces in relation to new marriages has remained at a high level of 40% to 50% since the late 1980s.[17] The

disability due to mental disorders, especially major depression, has increased significantly from the mid 1990s, as the number of work days missed due to illness and the number of new disability pensions have increased due to mental disorders.[18] Yet, during the same time period the rate of suicides has been steadily decreasing.

The aim of the present study was to compare trends in completed suicides and in use of antidepressants in Finland between 1994 and 2001. We hypothesized that there is a significant inverse association between the rate of completed suicides and population-based use of antidepressants; that this association is evident among all subgroups based on gender, age, or geographical regions; and that the association is stronger among men.

METHOD

Every calendar year, Statistics Finland compiles a 54-category short list of causes of death. The classification of causes of death follows the revision of the *International Classification of Diseases* valid in Finland at the given time of death (World Health Organization [WHO] ICD-10 since 1996). The causes of death are obtained from the death certificates issued by physicians, and in the case of suicide, the certificate is based on a forensic autopsy. The statistics cover the deaths in Finland or abroad of persons who were at the time of death residents of Finland, regardless of their citizenship. The statistics also include the deceased for whom no death certificates have been obtained or whose causes of death have remained unknown. The data filed in Statistics Finland also comprise information on sex, age, and region where the deceased lived, as well as various other demographic data.[2]

The Finnish Social Insurance Institution (SII) provides nationwide social insurance for the whole population of Finland and pays a refund for the purchase of prescription drugs to each person in Finland.[3] The SII keeps a prescription register that comprises approximately 96% of all refunded prescriptions and includes information derived from the prescription relating to the patient, the medicine, the prescribing physician, and the cost of and reimbursement paid for the medicine. According to an agreement between the SII and pharmacies, customers are routinely refunded directly at the pharmacy without having to make a separate claim. Presently, 91% of the refunds are paid through pharmacies, and all purchases of prescription drugs exceeding 8.41 euros are refunded by 50%.

The prescription register covers information on the gender and residence of the person purchasing the drug, but it does not include detailed information on the person's exact age, as the refunds of the purchases are filed in 5 different age categories: (1) under 15 years, (2) 15 to 44 years, (3) 45 to 64 years, (4) 65 to 74 years, and (5) 75 years or older. Data on use of drugs are filed according to the WHO anatomical therapeutic chemical classification (ATC) system.[19] Data have been available on electronic file only since 1994. In Finland, the National Agency for Medicines has, on file, annual data on consumption in the form of defined daily doses (DDD), but these data do not include information on region, sex, and age groups. The data included in this study comprise only the use of antidepressants in outpatient care and do not include use of these medicines in hospitals.

Statistics Finland provided the data on the annual number of completed suicides in the 22 health care districts of Finland and the corresponding number of inhabitants from 1994 to 2001. The data comprised separate information for men and women and for 5 age group categories with 5-year intervals. The SII provided data from 1994 to 2001 regarding the number of persons, their sex and age in the 5 groups, and prescriptions for an antidepressant drug (international ATC class N06, which includes all classes of compounds, SSRIs, serotonin-norepinephrine reuptake inhibitors, etc.) that had been refunded in each health care district. Statistics Finland provided the data as raw numbers and rates per 100,000 inhabitants, and the SII provided data as reimbursed prescriptions to persons per 1000 inhabitants by municipality, sex, and age group. We were compelled to collapse the age groups of the suicide data to match those of the SII statistics. The data for the 22 health care districts were grouped into 5 regional groups that constitute the social security areas in Finland: (1) South Finland, (2) Southwest Finland, (3) West Finland, (4) East Finland, and (5) North Finland. We used these geographical units because many of the approximately 450 municipalities in Finland that form the 22 hospital districts have less than 5000 inhabitants. Consequently, the populations in some of the health districts are too small for analysis. Social security area is a commonly used geographical division for examining regional differences in Finnish studies.[20]

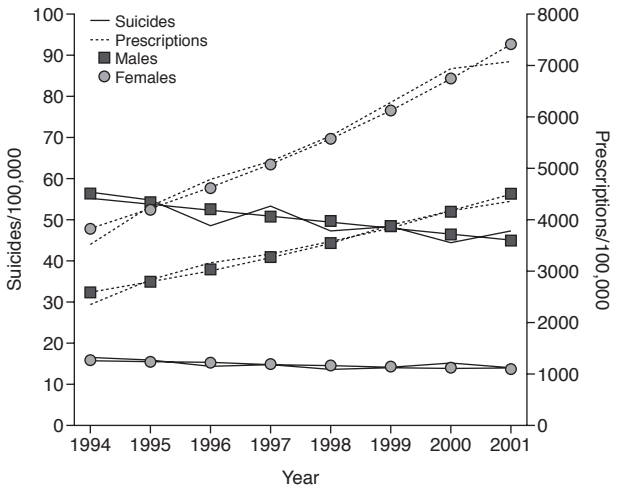
This regional grouping is also relevant for other reasons besides the convention of its usage. Previous epidemiologic data on population-based rates of mental disorders have shown that psychoses and depression are more prevalent in the social security areas of Northern and Eastern Finland.[20] Availability of health services measured as physicians per capita is poorer in these areas than in the rest of the country. In 3 northern health care districts, there is 1 physician per 500 to 577 inhabitants, whereas in 3 southern health care districts the respective figure is 243 to 260.[21] Northern Finland and parts of Eastern Finland have remained poorer and the rate of unemployment has remained at a higher level compared to the rest of the country. A net emigration trend affects these areas, which have already had a sparse population.

Statistical analyses were performed using Poisson regression.[22] This is an appropriate method when the relation between a count or event rate and explanatory variable(s) is analyzed. Autocorrelation was taken into

Table 1. Suicides Rates per 100,000 Inhabitants in Finland Among Men and Women and by Regions Between 1994 and 2001

Year	Men	Women	South	Southwest	East	West	North	All
1994	43.6	11.8	28.60	26.22	32.58	19.46	26.79	27.26
1995	43.4	11.8	28.52	24.71	32.67	19.59	29.20	27.19
1996	38.7	10.7	24.07	25.07	27.32	19.89	24.90	24.33
1997	41.4	10.8	25.02	22.28	31.54	23.85	28.70	25.72
1998	38.3	10.1	21.63	21.67	30.91	21.06	25.40	23.83
1999	37.9	9.6	22.09	21.60	27.72	20.96	29.58	23.37
2000	34.6	11.0	22.04	20.58	27.42	19.73	24.20	22.51
2001	36.8	10.2	22.04	22.50	27.96	19.62	26.37	23.21

Figure 1. Use of Antidepressants and Suicides by Gender From 1994 to 2001 in Finland[a]



[a]The lines that pass through the datapoint symbols represent the expected numbers, and the adjacent lines represent the actual numbers.

account by using generalized estimation equations.[23] Poisson regression is interpreted by using the concept of risk ratio (RR). The risk ratio describes how much a risk changes when an independent variable (if continuous) changes by 1 unit. Among categorical explanatory variables, the risk ratio shows how great a risk there is in one group compared to another group.

In our analyses, variation in suicide rate (as dependent variable) was first explained by the course of time (1 year is 1 unit), gender, age group, region, or use of antidepressants (independent variables). An increase in use by 100,000 persons was considered a unit. In addition, the variation in use of antidepressants (as dependent variable) was explained by the course of time, age group, or region (independent variables). After univariate analyses, multivariate analyses were performed using course of time and use of antidepressants as independent variables, while gender, age, and region were used as covariates. Both univariate and multivariate models were also carried out separately by gender, age group, and region when appropriate. We regarded a p value of less than .05 as significant. The statistical analyses were carried out using SAS/STAT software, Version 9.1.3 SP4 of the SAS System for Windows.[24]

RESULTS

A total of 1387 persons committed suicide in 1994, and 1204 committed suicide during 2001. The total number of suicides during the follow-up was 10,149. Antidepressant prescriptions were reimbursed to 140,438 persons in 1994, and at the end of our follow-up, in 2001, to 272,370. Thus, during the last study year (2001), 5.2% of the whole population (5.2 million) had bought antidepressants. Use of antidepressants increased highly significantly throughout the study period, as course of time had a statistically highly significant impact on use of antidepressants in Finland (RR = 1.09, 95% CI = 1.08 to 1.11, $p < .0001$). Additionally, this increase in use of antidepressants (9% each year in the whole country) was highly significant within all regions, among all age groups, and in both sexes (range among subgroups, 5%–27%).

The suicide rate was higher among men, but its decline among men was more conspicuous than among women (Table 1). Regarding use of antidepressants, the opposite was true, as use of antidepressants was at a higher level among women, and the increase was larger than among men (Figure 1). The suicide risk of men was 3.59-fold compared to that of women (95% CI = 2.98 to 4.32, $p < .0001$). There were no significant differences in the suicide risk between the age groups except compared to those under 15 years, as the other age groups had a 50- to 85-fold risk of suicide compared to the youngest group ($p < .0001$). There were no statistically significant differences in the suicide risk between the regions.

During the study period, course of time had a statistically significant impact on suicide rate in Finland in the whole sample (RR = 0.97, $p < .0001$; Table 2). This was true, likewise, for the age groups 15 to 44 and 45 to 64 years, as well as in South, Southwest, and East Finland. Among men, the association between course of time and suicide rate was statistically significant in individuals 15 to 64 years and 75 years or older, and in 3 regions (South, Southwest, and East), while among women, this was true only among 15- to 44-year-olds, and in 1 region (South) (Table 2). When the effects of gender, age, and region and their interactions were taken into account, course of time had a significant association with the suicide rate (RR = 0.97, 95% CI = 0.96 to 0.98, $p < .001$).

Use of antidepressants also had a significant association with suicide rate among males aged 15 to 64 years and 75 years and over and males in 3 regions, as well as females aged 15 to 44 years and females in 1 region (Table 3). In West Finland, where the association between suicide

Table 2. Annual Change in Risk Ratio of Suicide Among Women and Men by Regions and Age Groups

	Women			Men			All		
Variable	Risk Ratio	95% CI	p Value	Risk Ratio	95% CI	p Value	Risk Ratio	95% CI	p Value
Region									
South	0.9665	0.9402 to 0.9935	.0155	0.9546	0.9390 to 0.9704	.0001	0.9580	0.9446 to 0.9716	< .0001
Southwest	0.9936	0.9550 to 1.0337	.7498	0.9638	0.9437 to 0.9844	.0006	0.9707	0.9528 to 0.9889	.0017
West	0.9691	0.9165 to 1.0247	.2696	1.0094	0.9814 to 1.0382	.5129	1.0014	0.9765 to 1.0268	.9148
East	0.9987	0.9551 to 1.0443	.9544	0.9720	0.9515 to 0.9930	.0093	0.9770	0.9584 to 0.9961	.0182
North	0.9813	0.9275 to 1.0382	.5109	0.9948	0.9679 to 1.0224	.7078	0.9925	0.9684 to 1.0172	.5494
Age, y									
0–14	1.0387	0.8108 to 1.3307	.7637	0.9543	0.7791 to 1.1689	.6511	0.9872	0.8442 to 1.1545	.8722
15–44	0.9670	0.9407 to 0.9941	.0173	0.9646	0.9518 to 0.9775	.0001	0.9649	0.9534 to 0.9766	< .0001
45–64	0.9828	0.9553 to 1.0111	.2304	0.9765	0.9606 to 0.9928	.0047	0.9785	0.9647 to 0.9926	.0028
65–74	0.9833	0.9297 to 1.0399	.5547	0.9653	0.9325 to 0.9993	.0457	0.9757	0.9474 to 1.0049	.1017
75+	0.9794	0.9118 to 1.0520	.5674	0.9578	0.9179 to 0.9993	.0464	0.9671	0.9324 to 1.0032	.0734
All	0.9794	0.9619 to 0.9971	.0231	0.9709	0.9616 to 0.9803	.0001	0.9731	0.9648 to 0.9814	< .0001

Table 3. Risk Ratio Between Prescriptions of Antidepressants (100,000 as 1 unit) and Suicides

	Women			Men			All		
Variable	Risk Ratio	95% CI	p Value	Risk Ratio	95% CI	p Value	Risk Ratio	95% CI	p Value
Region									
South	0.54	0.33 to 0.88	.013	0.14	0.07 to 0.29	< .001	0.56	0.49 to 0.65	< .001
Southwest	0.72	0.15 to 3.54	.687	0.10	0.05 to 0.21	< .001	0.51	0.40 to 0.66	< .001
West	0.13	0.00 to 13.03	.386	3.40	0.26 to 44.60	.352	1.09	0.62 to 1.91	.766
East	0.80	0.18 to 3.51	.763	0.07	0.02 to 0.19	< .001	0.45	0.35 to 0.58	< .001
North	0.20	0.02 to 1.73	.143	0.51	0.02 to 11.48	.670	0.66	0.26 to 1.69	.389
Age, y									
0–14[a]	…	…	NS	…	…	NS	…	…	NS
15–44	0.48	0.28 to 0.82	.008	0.20	0.15 to 0.27	< .0001	0.58	0.51 to 0.66	< .001
45–64	0.71	0.47 to 1.07	.104	0.40	0.24 to 0.67	.0005	0.74	0.66 to 0.83	< .001
65–74	0.45	0.03 to 6.62	.562	0.02	0.00 to 9.16	.205	0.38	0.05 to 2.65	.328
75+	0.29	0.03 to 2.55	.267	0.01	0.00 to 0.14	.001	0.36	0.22 to 0.58	< .001
All	0.85	0.76 to 0.95	.005	0.63	0.56 to 0.72	< .001	0.87	0.84 to 0.89	< .001

[a]There were very few suicides in this age group, so the range in the 95% CI was extremely wide.
Abbreviation: NS = nonsignificant.

rate and use of antidepressants remained low, the suicide rate was the lowest and use of antidepressants the second lowest. In North Finland, where the association between suicide rate and use of antidepressants also remained nonsignificant, the suicide rate was high but the use of antidepressants very low.

When course of time was included in this model, the p values concerning the effects of use of antidepressants were above .05. However, when the effects of gender, age, region, and their interactions were taken into account, an increase in use of antidepressants was significantly associated with a decrease in suicide rate (RR = 0.08, CI = 0.02 to 0.30, $p < .001$), whereas the effect of mere course of time was no longer significant.

DISCUSSION

A significant inverse relationship was found between increased use of antidepressants measured by reimbursed prescriptions and decline in suicides in Finland, although this was not the case in all subgroups. The observed decline in suicide among women was not as marked as the decline among men. It seems that the decline in suicide is more closely associated with use of antidepressants among men, a finding that can be expected given the high level of suicide among men in Finland and treatment preferences among men.[25] In a Finnish psychological autopsy study, the sex distribution of suicide completers who had major depression was balanced within psychiatric care. Among those in medical care or without contact with health services, individuals who committed suicide were significantly more commonly men (77% vs. 23%).[26] By the end of the 1980s, antidepressants were prescribed for 60% of suicide victims in psychiatric care, but for only 16% in medical care.[26] It could thus be expected that a better recognition of depression would accrue benefits especially for men.

In our series, there were significant differences in the decline of suicide risk. The fact that there was no decline in suicide rate in West Finland may depend on the lower baseline level compared to the other regions, whereas the lack of decline in North Finland may indicate other reasons. For instance, the use of antidepressants was and remained at a lower level in the north than elsewhere,

plausibly due to the poorer availability of health services than in other social security areas of the country.

It is plausible that an association between use of antidepressants and decline in suicide rate can only be seen at population level if the rate of suicide is relatively high and the availability of health services is relatively good. In such regions, an increase in the recognition of depression would lead to a greater increase in the use of antidepressants, providing better statistical power to detect a significant impact of use of antidepressants on suicide rates. The number of subjects required for a study to ensure a detection of a 20% decrease in suicide rate (assuming 80% power and 5% level of significance), according to Gunnell and colleagues'[27] estimation, was 1.9 million based on an approximation of a suicide rate of 39/100,000. This may have been an overestimation. The decline in the suicide rate in Finland varied between 14% and 23% at the level of social security regions and was 16% among men and 14% among women in the whole country. Furthermore, among some of the subgroups, the suicide rate has been well above 60/100,000 at the health care district level and the decline has been above 20%. The suicide rate has continued to decrease after 2001. During the follow-up of the present study, annually between 140,000 and 270,000 persons received reimbursements. This would add up to 1.7 million "theoretical" persons, but we cannot say how many actual persons this figure includes, because treatments are not bound within a calendar year, whereas the statistics comprise annual data of individuals.

Moreover, one cannot expect a one-to-one relationship between suicide rate and increase in antidepressant use for various reasons. Antidepressants were increasingly prescribed for other indications such as anxiety disorders. Suicide rate is not as strongly associated with anxiety disorders as with depressive syndromes in Finland.[28] Less than half of suicide completers had come into contact with health services during the month preceding the suicide, while communication of suicide intent is uncommon in general practice and nonpsychiatric specialist settings.[29] Therefore, it is likely that individuals at risk are missed within these services. Antidepressants also seem to be prescribed to those who do not fulfill the diagnostic criteria of a disorder, decreasing the efficiency of antidepressant prescription. For instance, in the United Kingdom, the proportion of persons not satisfying the criteria of any psychiatric diagnosis, but who were prescribed antidepressants, has greatly increased.[30]

In the present study, when the effect of other variables and their interactions were taken into account, increase in use of antidepressants was still significantly associated with decreased suicide rate. This implies that use of antidepressants has had an obvious effect on suicide rate and is not likely to be satisfactorily explained by other course-of-time–related confounding factors. In our analyses, course of time includes both the effects of an increase in use of antidepressants and unknown confounding factors. In an ecological study, the overall trends identified do not necessarily signify that use of antidepressants reduces suicide rate. The study can support causal hypotheses only if other concurrent evidence supports the results.

Previously, a significant association has been found between alcohol consumption and suicide mortality in Finland.[31] The consumption of alcohol did in fact increase throughout the 1990s in Finland.[2] A previous Finnish study demonstrated that, despite the severe economic hardships during the early 1990s, suicide rate was not associated with the sharp rise in either unemployment or the divorce rate.[32] Moreover, violent crimes have been conventionally associated with the use of alcohol in Finland. During the study period, the absolute number and proportion of violent crimes out of all crimes increased from 2.8% to 4.0%, and the number of homicides increased by 9.5%.[16] Taking these figures into account, one would have expected an increase in the suicide rate.

Special attention has been paid to better recognition of depression during the early years of our study period, while the treatment situation has actually improved in Finland at all levels of health care.[33] However, as suicide is a rare phenomenon, there is little direct evidence that antidepressant treatment lowers suicide rate, as prescription of medication is additionally accompanied by various other interventions such as assessments and supports for the patients and their next of kin. The inverse association between use of antidepressants and suicide rate is likely to reflect all these elements.

In a study in Sweden, only 1 in 5 patients with major depression was treated with antidepressants. The calculated risk of suicide among the untreated patients was found to be 1.8-fold compared to the antidepressant-treated patients (259 vs. 140 per 100,000 person years).[34] One long-term prospective study (40 to 44 years' follow-up) of suicides among 406 patients with and without long-term medication has been carried out. Use of antidepressants, lithium, and antipsychotics was associated with a significantly reduced suicide rate.[35] In a large-scale study, the risk of suicide attempt was highest in the month before antidepressant treatment was started and declined progressively after medication was started.[36] An increase in risk after the start of treatment was seen only for the older drugs.

Our findings are for the most part in line with the previous findings in most of the Nordic countries. Several other studies[4,6,37,38] on population-level time trends have also concluded that recent rises in use of antidepressants have at least to some extent contributed to a decrease in suicide rate, although there are also some conflicting findings.[5,39,40] However, suicide rates have been at a lower baseline level in Iceland, Italy, and Slovenia

than especially among men in Finland,[1] which may have influenced the lack of association in these studies.

In an Australian study, the association between decline in suicide rate and rise in antidepressant prescribing was significant among the older age group most heavily exposed to antidepressants.[37] In our study, the increase in use of antidepressants was most pronounced among women, but suicide rate was at a low baseline level compared to among men. Suicide rate decreased most among men in the regions with a coinciding significant increase in use of antidepressants. High rates of use of antidepressants among women compared to those among men are likely to reflect, for example, differences in treatment-seeking behavior. Moreover, antidepressant treatment may be better targeted toward men than women. As the increase of use has been very large among women, the likelihood of unnecessary prescription to women is greater than among men. One would expect a lower level of efficiency among women, who had additionally a much lower suicide rate to begin with.

The prescription of newer antidepressants has been associated with lower suicide rate in both the United States and Sweden.[38,41] The increase in use of antidepressants during the 1990s in Finland took place almost solely due to the SSRIs. More than two thirds of the use of antidepressants expressed as DDD/1000 inhabitants in 2001 involves SSRIs.[3] Previously, the tricyclic antidepressants had been prescribed at too low doses, and the new compounds provided a better chance of adequate dosing.[42] A study on suicides and antidepressants in Finland[43] found that between 1990 and 1995, while there was a decline in suicides by hanging and carbon monoxide poisoning, the number of suicides by overdosing antidepressants increased slightly. For the most part, the suicides by antidepressants had been committed using tricyclics, while the lowest fatal toxicity indices were associated with fluoxetine, citalopram, mianserin, and moclobemide. There has been no significant change in the use of older antidepressants during the study period. During the study period, there were no changes in the accessibility to the lethal means commonly used in suicides. Barbiturates were removed from the market in the 1980s, and there were no changes in gun laws or composition of gases, which are in general very rarely used in Finnish households.

There has been growing concern that the SSRIs may precipitate suicidal behavior, especially in children and adolescents.[44] With respect to the current debate on the negative influence of SSRIs on the risk of suicide, a finding of a significant increase in suicides among adolescents might have been expected in our sample, but in our study there were very few suicides among those under 15 years of age. Nevertheless, the increase in the sale of SSRIs does not seem to have presented a major risk for the population, despite recent concerns. Our results are, however, in accordance with the findings from Denmark, where suicide rate declined in a more pronounced manner among those receiving SSRIs than among those not treated with antidepressants.[45]

Considering our findings, it must be remembered that reimbursed prescriptions do not necessarily equal actual use of antidepressants. According to Helgason et al.,[5] the self-reported use was only 54% of the official sales. No comparative data are available from Finland, but it is reasonable to presume that in many cases, antidepressants are not actually used as much as they are prescribed. There is evidence that half of the patients discontinue their antidepressant medication prematurely.[25] All the same, nothing suggests that the relationship between reimbursed prescriptions and concrete use would have changed, supporting the time-trend analysis as a valid method.

Limitations of Study

Due to the structure of the data regarding use of antidepressants, we were unable to study more closely the relationships between certain groups of antidepressant compounds and suicide rate. In addition, data on antidepressants based on DDD would have provided more detailed information regarding the dosing of the antidepressants. Reliable DDD-based data are not available on file for different regions of the country or for different age groups. The prescription register described in the Method provides an accurate and comprehensive picture of the sale of drugs in Finland. The reliability of suicide statistics in Finland is high, as the cause of death in such a case is determined by forensic autopsy. Suicides are accurately recorded as suicides in the statistics.[46] In the Nordic countries, the probability of erroneous registration of suicide is low.[47] Additionally, the number of undetermined deaths is approximately 10% of that of suicides. From 1994 to 2001, the rate of undetermined deaths expressed as a standardized death ratio decreased from 3.8 to 1.7 per 100,000 inhabitants. Of the undetermined deaths, about 44% have been suspected to be suicides.[48] As the numbers involved are small, undetermined deaths can hardly have a large-scale influence on suicide statistics and their trends.

CONCLUSION

This study demonstrates, at the level of the whole population of a nation, that an increase in use of antidepressants is associated with a decline in suicide rate when controlling for sex, age, national region, and their interactions. A low baseline suicide rate, a low level of availability of health care, and economic influences[49] may weaken this association. It has been argued that a compilation of environmental factors influencing a generation, i.e., a cohort effect, exerts an influence on suicide rate, although a clear description of such factors is not available.[50] This study provides further evidence in support of the notion that antidepressants may play a role in combating suicide.

Drug names: citalopram (Celexa and others), fluoxetine (Prozac and others).

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