

# The use of antidepressants and introduction of new types in different socio-economic groups: A Danish registry-based cross-sectional study

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**Background:** Danish registry-based studies have found socio-economic differences in drug use. The extent to which the use of antidepressants differs between socio-economic groups is unknown. **Aim:** 1) to examine the association between socio-economic status (SES) and use of antidepressants 2) to evaluate the introduction of new types of antidepressants. **Methods:** A registry-based cross-sectional study linking information from administrative registries in North Jutland County, Denmark, 1995–99. Main outcome measures: 1) the prevalence proportion for use of antidepressants in different SES groups and by sex, and the estimated prevalence proportion ratio; 2) the proportion using the new drugs in different socio-economic groups through the study period. **Results:** Women used antidepressants more than twice as often as men with an increasing tendency for both men and women. The use of antidepressants was highest in persons outside the labour market. Among employees, the proportion using new types of antidepressants increased from 1% to 18%. High SES seemed to correlate to higher use of new antidepressants. The new antidepressants were introduced faster among men compared with women. **Conclusion:** The study showed differences in purchase of antidepressants in different SES groups. Furthermore, it showed faster introduction of new antidepressants among men and employees with high SES.

• *Antidepressants, Denmark, Depression, Mirtazapin, SES, Venlafaxin.*

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In Denmark, use of newer antidepressants has increased in the last decade, especially in the younger age groups. In 2003, 45 per 1000 used SSRI antidepressants compared with 30 per 1000 in 1997 (1). The use of antidepressants is widespread. More than 15% of the population in Denmark is treated with antidepressants at least once in a lifetime (1). Increased use is related to an increasing number of persons treated, longer treatment and higher doses. Studies have shown that about 25% of antidepressants were used for other diagnoses than depression. Indications were in 2003 depression, preventing a relapse into depression or a new depression emerging, bulimia, panic disorder, obsessive-compulsive disorder, generalized anxiety and post-traumatic stress disorder (1). The broader indications and increasing use for other conditions than already mentioned (such as relief of pain) may also be important.

A recent review reports an association between depressive disorder and low socio-economic status (SES)

measured by income and educational level (2). Furthermore, a clear and graded association through different study populations was shown (2, 3). However, employment status and financial strain may be more important factors than income alone (4).

Danish registry-based studies have found socio-economic differences in use of statins (5) and medication of six main drug therapeutic groups (6). A recent study suggests that the Danish healthcare system is in general equitable (7). However, introduction of new drugs may be dependent on physician and drug characteristics (8). Furthermore, patient SES may affect the clinical decision of the general practitioner (9, 10). To what extent this could play a role in treatment of depression is unknown.

The aim of this study is to examine the association between SES and use of antidepressants by linking two administrative registries. Furthermore, we aim to evaluate if introduction of new types of antidepressants vary by SES.

Methods

This registry-based study was conducted in North Jutland County, Denmark, linking information from two registries, the North Jutland Pharmaco-Epidemiological Prescription Database and the Prevention Registry. Data in these registries and the study design have been described in an earlier study (5). The study period was from 1 January 1995 to 31 December 1999. Included were all persons aged 18 years or more with a permanent address in North Jutland County, Denmark, a mixed rural and urban area with approximately 500,000 inhabitants.

Data sources

THE PREVENTION REGISTRY

From the Prevention Registry at Statistics Denmark we obtained information on SES (11). SES is classified based upon receipt of social benefits, employment status, income and education collected from tax returns and other public registries. This classification was introduced in 1995 based on International Classification of Occupations (11) and divides the population into three main groups: the employed, the unemployed and persons outside the labour force. The group of employed is subdivided into self-employed with employees; self-employed without employees; assisting spouses and salaried employees. The groups of salaried employees are divided into (I) top managers, (II) upper level, (III) intermediate level, (IV) basic level and (V) other salaried employees. Persons outside the labour force are divided into students, persons receiving disability pension or early retirement benefit, old age pensioners, and others outside the labour force.

THE NORTH JUTLAND PHARMACO-EPIDEMIOLOGICAL PRESCRIPTION DATABASE

The Pharmaco-Epidemiological Prescription database was used to identify prescriptions for antidepressants for all subjects in the study period. The antidepressants are all on prescription and entitled to general re-imbursement from the Danish National Health Service. Medications are coded according to the anatomical therapeutic chemical classification system. We identified all redeemed prescriptions for antidepressants in the study period. The

following medication codes were used: tricyclic (N06AA), SSRI (N06AB), MAO inhibitors (N06AF, N06AG), dual action (N06AX) and tetracyclic (N06AX, N06AC02). In the study period, two new antidepressants with a different mechanism of action were introduced: venlafaxin N06AX16 in 1995 and mirtazapin N06AX11 in 1996.

RECORD LINKAGE BETWEEN REGISTRIES

Use of a unique social security number, given to all Danish residents shortly after birth or arrival in Denmark, made it possible to link the two data sources since the databases in question have included the social security number.

Statistical analysis

Annual use of antidepressants was defined as redemption of at least one prescription of antidepressant during one calendar year. The annual prevalence proportion for each sex was calculated as the number of persons with a redeemed prescription divided by the total population that particular year in every SES group. In a logistic regression model, we estimated prevalence proportion ratios in different SES groups in a model including the potential confounders age and degree of urbanization. Since basic-level employees were the largest group, we used this as the reference group. Age was included in the model in five groups (18–39, 40–49, 50–59, 60–66 and 67 years or more); 60–66 are ages of eligibility to early retirement pension and these are the most common ages for labour market exit. From 67, old age pension is received and most workers are retired. Urbanization was categorized in three groups (residence in a city >100,000 inhabitants, provincial town or rural).

In order to evaluate if the introduction of new antidepressants varies by SES, we calculated the proportion using the new drugs in different groups of salaried employees through the study period. A logistic regression model was estimated including sex, calendar year and employment status as independent variables and use of new antidepressants as dependent variables.

For the statistical analysis, Stata 9.0 was used.

Table 1. Use of antidepressants among adults living in North Jutland County, Denmark from 1995 to 1999, based on information from a Pharmaco-Epidemiological Prescription database; prevalence proportions for men and women.

| Year | Population size<br><i>n</i> | Sex distribution<br>Men, % of <i>n</i> | Use of antidepressants (PP) |                    |
|------|-----------------------------|----------------------------------------|-----------------------------|--------------------|
|      |                             |                                        | Men, % (95% CI)*            | Women, % (95% CI)* |
| 1995 | 381,869                     | 49                                     | 2.77 (2.70–2.85)            | 6.01 (5.91–6.12)   |
| 1996 | 383,511                     | 49                                     | 2.89 (2.82–2.97)            | 6.24 (6.13–6.35)   |
| 1997 | 384,593                     | 49                                     | 3.10 (3.02–3.18)            | 6.66 (6.55–6.77)   |
| 1998 | 385,418                     | 49                                     | 3.37 (3.29–3.45)            | 7.08 (6.97–7.19)   |
| 1999 | 385,879                     | 49                                     | 3.67 (3.59–3.76)            | 7.36 (7.25–7.48)   |

\*Adjusted for age and urbanization.

**Table 2.** Prevalence proportion and adjusted prevalence proportion ratio (PPR) of antidepressants *among women* according to socio-economic status (SES) in 1995 and 1999.

| SES                                    | 1995                       |                  | 1999                       |                  |
|----------------------------------------|----------------------------|------------------|----------------------------|------------------|
|                                        | Use of antidepressants (%) | PPR (95% CI)*    | Use of antidepressants (%) | PPR (95% CI)*    |
| Self-employed with employees           | 2.61                       | 0.92 (0.59–1.42) | 3.13                       | 0.85 (0.64–1.14) |
| Self-employed without employees        | 3.23                       | 1.12 (0.93–1.34) | 4.45                       | 1.17 (0.98–1.14) |
| Top managers                           | 2.12                       | 0.76 (0.46–1.26) | 3.96                       | 1.00 (0.75–1.33) |
| Salaried employees, upper level        | 2.83                       | 1.01 (0.89–1.16) | 3.32                       | 0.89 (0.80–1.00) |
| Salaried employees, intermediate level | 2.67                       | 1.08 (0.97–1.20) | 3.24                       | 0.92 (0.85–1.01) |
| Salaried employees, basic level        | 2.44                       | 1.00             | 3.40                       | 1.00             |
| Salaried employees, other              | 3.40                       | 1.24 (1.10–1.40) | 4.37                       | 1.17 (1.04–1.30) |
| Employees, not further specified       | 2.34                       | 1.06 (0.89–1.26) | 3.00                       | 0.99 (0.85–1.15) |
| Assisting spouses                      | 4.07                       | 1.23 (1.01–1.49) | 4.64                       | 1.14 (0.92–1.41) |
| Unemployed                             | 4.66                       | 1.78 (1.62–1.95) | 5.73                       | 1.61 (1.43–1.81) |
| Students                               | 1.23                       | 0.77 (0.61–0.96) | 2.46                       | 0.97 (0.83–1.12) |
| Disability pension                     | 15.23                      | 4.75 (4.39–5.12) | 18.74                      | 4.70 (4.41–5.01) |
| Old age pensioners                     | 11.99                      | 3.93 (3.38–4.56) | 14.32                      | 3.29 (2.83–3.82) |
| Early retirement benefit               | 6.54                       | 2.04 (1.82–2.29) | 7.32                       | 1.91 (1.74–2.09) |
| Other economically inactive persons    | 5.24                       | 2.22 (2.03–2.44) | 8.51                       | 2.62 (2.44–2.82) |
| Over all                               | 6.01                       |                  | 7.36                       |                  |

\*Adjusted for age and urbanization.

## Results

A total of 381,869 persons in 1995 and 385,879 persons in 1999 aged 18 years or more were registered with a permanent address in North Jutland County.

Table 1 shows the prevalence proportion for use of antidepressants for men and women during the study period. Women used antidepressants more than twice as often as men with an increasing tendency for both men and women.

Tables 2 and 3 show the prevalence proportion for use of antidepressants in different SES groups and sex, and the estimated prevalence proportion ratio adjusted for age

and urbanization. In every SES group, an increasing tendency was found comparing 1995 and 1999.

Among women (Table 2), especially top managers (2.12–3.96%) and students (1.23–2.46%), the use of antidepressants increased greatly as a percentage of 1995 usage. However, for both groups the prevalence proportions were low compared with other socio-economic groups. This is also the case in a model taking age and degree of urbanization into account. Among male students (0.61–1.36%), the relative increase in prevalence proportion was highest (Table 3). For this group, the

**Table 3.** Prevalence proportion and prevalence proportion ratio (PPR) of antidepressants *among men* according to socio-economic status (SES) in 1995 and 1999.

| SES                                    | 1995                       |                  | 1999                       |                  |
|----------------------------------------|----------------------------|------------------|----------------------------|------------------|
|                                        | Use of antidepressants (%) | PPR (95% CI)*    | Use of antidepressants (%) | PPR (95% CI)*    |
| Self-employed with employees           | 1.79                       | 1.24 (0.99–1.56) | 2.22                       | 1.11 (0.93–1.32) |
| Self-employed without employees        | 1.82                       | 1.33 (1.14–1.55) | 2.51                       | 1.27 (1.10–1.46) |
| Top managers                           | 1.31                       | 0.88 (0.67–1.16) | 1.91                       | 0.91 (0.73–1.13) |
| Salaried employees, upper level        | 1.79                       | 1.34 (1.15–1.57) | 2.06                       | 1.07 (0.94–1.22) |
| Salaried employees, intermediate level | 1.50                       | 1.19 (1.00–1.40) | 2.03                       | 1.11 (0.97–1.27) |
| Salaried employees, basic level        | 1.12                       | 1.00             | 1.70                       | 1.00             |
| Salaried employees, other              | 1.39                       | 1.18 (1.00–1.39) | 2.09                       | 1.18 (1.04–1.34) |
| Employees, not further specified       | 0.74                       | 0.82 (0.58–1.15) | 1.39                       | 0.96 (0.76–1.21) |
| Assisting spouses                      | 3.03                       | 1.99 (0.65–6.09) | 3.66                       | 1.67 (0.55–5.09) |
| Unemployed                             | 2.47                       | 1.95 (1.68–2.25) | 3.45                       | 1.84 (1.56–2.17) |
| Students                               | 0.61                       | 0.78 (0.55–1.10) | 1.35                       | 1.05 (0.84–1.33) |
| Disability supplement                  | 9.35                       | 6.26 (5.62–6.96) | 12.33                      | 5.91 (5.41–6.44) |
| Old age pensioners                     | 6.81                       | 3.55 (2.81–4.50) | 8.24                       | 2.94 (2.36–3.66) |
| Early retirement benefit               | 3.13                       | 2.04 (1.72–2.43) | 3.93                       | 1.89 (1.64–2.18) |
| Other economically inactive persons    | 3.71                       | 3.33 (2.87–3.87) | 6.40                       | 3.82 (3.44–4.24) |
| Over all                               | 2.77                       |                  | 3.67                       |                  |

\*Adjusted for age and urbanization.

Table 4. Prevalence proportion (PP) and prevalence proportion ratio (PPR) of new antidepressants among users of antidepressants according to socio-economic groups, calendar year (1995–99) and sex.

|                    | <i>n</i> | PP   | PPR*  | (95% CI)      |
|--------------------|----------|------|-------|---------------|
| Employment level   |          |      |       |               |
| Top managers       | 507      | 0.13 | 1.24  | (0.99–1.57)   |
| Upper level        | 2710     | 0.12 | 1.25  | (1.11–1.40)   |
| Intermediate level | 3659     | 0.11 | 1.17  | (1.05–1.30)   |
| Others             | 2868     | 0.11 | 1.13  | (1.00–1.27)   |
| Basic level        | 10987    | 0.10 | 1.00  |               |
| Calendar year      |          |      |       |               |
| 1999               | 4414     | 0.18 | 19.75 | (13.84–28.18) |
| 1998               | 3936     | 0.14 | 15.72 | (10.99–22.47) |
| 1997               | 3439     | 0.10 | 11.22 | (7.81–16.11)  |
| 1996               | 3132     | 0.04 | 4.70  | (3.20–6.89)   |
| 1995               | 2942     | 0.01 | 1.00  |               |
| Gender             |          |      |       |               |
| Men                | 6550     | 0.11 | 1.17  | (1.08–1.27)   |
| Women              | 1313     | 0.10 | 1.00  |               |

\*Adjusted for the other variables in the table.

prevalence proportion was relatively low in models adjusting for age and degree of urbanization.

Not surprisingly, the use of antidepressants was highest among persons receiving disability pension or early retirement benefit, old age pensioners and others outside the labour market.

Table 4 shows use of new antidepressants in comparison with total use of antidepressants by occupational level. High occupational level was positively correlated to higher use of new antidepressants, although the result was not statistically significant for top managers. Furthermore, the proportion of employees using new antidepressants increased from 1% in 1995 to 18% in 1999. Finally, the new antidepressants were introduced faster among men compared with women, also when adjusting for occupational level.

## Discussion

The present study showed variation in use of antidepressants by SES in North Jutland from 1995 to 1999. In this period, a new generation of antidepressants with different mechanism of action was introduced. Not surprisingly, the use was highest among persons receiving disability pension or early retirement benefit, old age pensioners, and others not in the labour market. For men and those with high SES, measured by occupational level, the introduction of new types of antidepressants was faster compared with women and those with low SES.

This study design cannot establish a causal relation between SES and the use of antidepressants. It was based on filled prescriptions but there is no information on compliance. For the present study, however, the important issue was if they had redeemed a prescription and not whether the medication had been used or not. This paper is about purchase of prescribed antidepressants. We

do not observe prescriptions and are therefore silent on the relationship between prescription non-redemption and SES. Any inference about physician prescribing behaviour would be biased to the extent that non-redemption might vary between socio-economic groups.

The strength of this population-based study is its large size and uniform data collection reducing the risk of selection bias. The antidepressants were all on prescription and entitled to general reimbursement from the Danish National Health Service and this reduce the risk of bias because of recall, since self-reported drug use may lead to under-ascertainment (12). However, the use of antidepressants was based on at least one filled prescription in a calendar year. We cannot rule out that the association between socio-economic group and use of antidepressants might have differed for certain subgroups. We were not able to detect whether antidepressants were used for different diseases in different SES groups, which might be a problem, especially if the new antidepressants have different indications compared with the older ones. The new antidepressants in this period were often used as a second choice of medication to more severe cases. If employees with higher SES had more severe symptoms, this may be a part of the explanation of the results. However, we have not found data to support this hypothesis.

Elderly people receiving disability pension and people with low income are in some cases entitled to further economic help when receiving medication and this could influence the results in the sub-analyses studying the influence of SES on introduction of new antidepressants. However, by considering only members of the labour force, this problem is avoided.

The present study demonstrates an association between SES and purchase of antidepressants. This is in agreement with other studies that have found SES such as low educational attainment and income were related to

depressive symptoms (2–4). We do not have information about diagnoses and are therefore not able to investigate if the association between SES and purchase of antidepressants reflects differences in disease burden. However, an earlier study has shown uneven distribution of self-reported disease in the general population and the use of medicine following this pattern (6). A Danish registry-based study has found higher use of statins in the highest SES (5). This is in agreement with the faster introduction of new antidepressants among high occupational levels compared with basic level workers found in our study. For both studies, the differences tended to decrease over time. One important difference between the two studies is the general re-imbursement for antidepressants in our study. The cost of antidepressants might still be different for patients, since new types of medicine often are more expensive than medicines that have been on the market longer. A recent study suggests that the Danish healthcare system is in general equitable but in areas with high degree of co-payment, some inequity might be present (7). The least advantaged with respect to income have been shown to consume a larger share of the prescribed drugs than the most advantaged (13). Finally, patient SES may affect the clinical decision of the general practitioners (9, 10).

We do not know whether the faster introduction of new antidepressants in men and high SES workers in the present study can be explained by patient-related resources (financial or personal) or is related to confounding factors such as age, diagnosis or general practitioners behaviour. Some general practitioners may become familiar with new types of medication faster than others, which might influence the result if distribution of patients SES groups differs systematically between general practitioners. Introduction of new drugs have been shown to depend on both physician and drug characteristics (8). However, the faster introduction of antidepressants in high SES groups as shown in this study has to our knowledge not been described earlier.

The increasing tendency to use antidepressants in the present study is based on data from 1995 to 1999, and may not reflect the actual level of antidepressants in the population. However, the relation between SES and introduction of new antidepressants with a different mechanism of action could only be studied in this particular time window. This relation may be important to be aware of when introducing new types of medicine.

In conclusion, the results showed differences in purchase of antidepressants in different SES groups. Furthermore, it showed faster introduction of new antidepressants among men and employees with high SES.

**Declaration of interest:** The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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