Thunander Sundbom L, Bingefors K. Women and men report different behaviours in, and reasons for medication non-adherence: a nationwide Swedish survey. Pharmacy Practice (Internet) 2012 Oct-Dec;10(4):207-221.

Original Research

Women and men report different behaviours in, and reasons for medication non-adherence: a nationwide Swedish survey

Lena THUNANDER SUNDBOM, Kerstin BINGEFORS.

Received (first version): 26-May-2012 Accepted: 14-Nov-2012

ABSTRACT[*]

Objectives: The aim of the present study was to analyse gender differences in self-reported non-adherence (NA) to prescribed medication in the Swedish general population. We aimed to study unintentional and intentional NA as well as the reasons given for NA.

Methods: A questionnaire was mailed to a cross-sectional, random, national sample of people aged 18-84 years in Sweden (n=7985). The response rate was 61.1% (n=4875). The questionnaire covered use of prescription drugs, NA behaviour and reasons for NA.

Results: Use of prescription drugs was reported by 59.5% (n=2802) of the participants, and 66.4% (n=1860) of these participants did not adhere to the prescribed regimen. No overall gender differences in reporting NA were found. However, when analysing the various types of NA behaviour and the reasons for NA, different gender patterns emerged. Men were more likely to report forgetting [OR=0.77 (95%CI 0.65:0.92)], changing the dosage [OR=0.64 (95%CI 0.52:0.79)] and that they had recovered [14.3%, (OR=0.71 (95%CI 0.56:0.90)] as a reason. In contrast, more women than men reported filling the prescription but not taking the drug [OR=1.25 (95%CI 1.02:1.54)] and reported the development of adverse drug reactions (ADRs) [OR=1.89 (95%CI 1.37:2.59)] as a reason more commonly. The gender differences remained, in most cases, after controlling for confounders such as age, socioeconomic factors, medical problems and attitudes toward drugs.

Conclusions: Women and men have different patterns of NA behaviour and different reasons for NA. Therefore, if adherence is to be improved, a wide knowledge of all the reasons for NA is required, along with an understanding of the impact of gender on the outcomes.

Keywords: Medication Adherence. Health Knowledge, Attitudes, Practice. Health Care Surveys. Sweden.

HOMBRES Y MUJERES COMUNICAN DIFERENTES COMPORTAMIENTOS Y RAZONES PARA EL INCUMPLIMIENTO DE LA MEDICACIÓN: ENCUESTA NACIONAL SUECA

RESUMEN

Objetivos: El objetivo del presente estudio fue analizar las diferencias de género en el incumplimiento auto-reportado a la medicación prescrita en la población general sueca. Intentamos estudiar el incumplimiento voluntario e involuntario, así como las razonas dadas para el incumplimiento.

Métodos: Se envió por correo un cuestionario a una muestra nacional, transversal, aleatoria de personas de 18-84 años en Suecia (n=7985). La tasa de respuesta fue de 61,1% (n=4875). El cuestionario trataba sobre el uso de los medicamentos prescritos, comportamiento sobre incumplimiento y razones.

Resultados: Se comunicó uso de medicamentos de prescripción en un 59,5% (n=2802) de los participantes, y el 66,4% (n=1860) de ellos no cumplía el régimen prescrito. No se encontraron diferencias generales en la comunicación de incumplimiento. Sin embargo, al analizar los diferentes tipos de comportamientos en incumplimiento y las razones del incumplimiento, aparecieron patrones diferentes por géneros. Los hombres comunicaban más frecuentemente olvidos [OR=0.77 (IC95% 0.65:0.92)], cambios de la dosis [OR=0.64 (IC95% 0.52:0.79)] y que ya estaban recuperados [14.3%, (OR=0.71 (IC95% 0.56:0.90)] como motivo. Por el contrario, más mujeres que hombres comunicaba comprar la medicación pero no tomarla [OR=1.25 (IC95% 1.02:1.54)] y la aparición de reacciones adversas [OR=1.89 (IC95% 1.37:2.59)] como motivo. Las diferencias de género se mantuvieron en la mayoría de los casos después de controlar los factores de confusión tales como edad, factores socio-económicos, problemas de salud y actitudes hacia los medicamentos.

Conclusión: Hombres y mujeres tienen patrones diferentes de comportamientos de incumplimiento y diferentes motivos para el incumplimiento. Por tanto, si se quiere mejorar el cumplimiento, se requiere un amplio conocimiento de las razones del incumplimiento, así como la comprensión del impacto del género en los resultados.

Palabras clave: Cumplimiento de la Medicación. Conocimientos, Actitudes y Práctica en Salud. Encuestas de Atención de la Salud. Suecia.

[*] **Lena THUNANDER SUNDBOM**. MSc (Pharmacy). Department of Health and Caring Sciences, Faculty of Health and Occupational Studies, University of Gävle. Gävle (Sweden) & and Department of Pharmacy, University of Uppsala. Uppsala (Sweden).
Kerstin BINGEFORS. PhD (Medicine). Associate Professor in Pharmacoepidemiology. Department of Pharmacy, University of Uppsala. Uppsala (Sweden).

INTRODUCTION

Poor adherence to prescribed medication regimens is a common, complex problem that can greatly affect the treatment outcome, even making the best therapy ineffective.[1] According to the literature, the prevalence of non-adherence (NA) is 30-50% on average, irrespective of the disease, the study setting, or the method of measurement.[1-5] However, despite the fact that NA is the most common cause of poor medication treatment outcomes,[1] knowledge about the reasons for NA is still lacking.

Although there are many studies on adherence published over the years, not many of these examine the reasons for NA. In order to design effective interventions in this area it is crucial to obtain a broad understanding of its complexity including all the different reasons for NA.[6] Further, to be able to improve adherence, both intentional and unintentional NA should be taken into consideration.[7] Intentional NA is defined as those cases where patients actively choose not to follow a medication regimen and has been explained based on the Health Belief Model where for example severity, susceptibility, benefits and barriers are considered to influence adherence.[8] Unintentional NA, on the other hand, is thought to be a more passive process, for example simply forgetting to take medication.[7]

Several factors appear to be associated with NA: socioeconomic factors such as education, income and social support[1,2], patient-related factors such as attitudes toward drugs and treatment beliefs[1,2,9-11], therapy-related factors such as complicated dosage regimens[5] and adverse drug reactions (ADRs)[1,2,5,12-16], health-care system factors such as the cost of the medication[1,2] and the patient-provider relationship[1,2,9], and factors related to the condition.[1] It has also been suggested that gender could influence adherence since women and men differ in their health beliefs and health behaviours[17,18] and also have different attitudes toward drugs.[14,19,20] According to the literature, poor adherence appears to be associated more with women than with men[21-24], although differing results have been described.[1,2,25] It is well-known that, on a population basis, women and men differ in for example educational level, income and disease patterns.[17] Thus, one hypothesis could be that these differences explain some, or all, of the gender differences found in NA behaviour, i.e. gender cannot be separated from, for example, social and economic factors.[26] Consequently, in some circumstances, when numerous factors are considered, the effects of gender may even be negligible.[26] However, publications with a gender-perspective on NA are scarce.

The aim of the present study was to analyse gender differences in self-reported NA to prescribed medication in the Swedish general population. We aimed to study unintentional and intentional NA as well as the reasons given for NA.

METHODS

The study was based on a postal questionnaire that was sent to a random sample of the Swedish population (n=7985, aged 18-84 years) drawn from the national population register. The survey was managed by Statistics Sweden (SCB, a Swedish government agency), which keeps the population register. The register is based on the personal identification numbers of the population: these are unique individual numbers for all persons legally living in Sweden. The questionnaire was mailed between October 2004 and January 2005 to all individuals in the sample; reminders were sent twice. The respondents returned the questionnaires to SCB and sociodemographic information (sex, age, educational level, marital status, country of birth) from the national population register was linked with the questionnaires. The personal identification numbers were then deleted to ensure complete anonymity.

Sample characteristics

The questionnaire response rate was 61.1% (n=4875). Data from 166 participants (81 women, 85 men) were deleted because of missing values (n=4709). The response rate was higher among women (65.2%, n=2549) than among men (56.8%, n=2160) and increased with the participants' age, up to about 80 years (18-40 y: 51.9%, 41-79 y: 66.6%, 80-84y: 60.7%). Age was categorised into six groups: 18-34, 35-44, 45-54, 55-64, 65-74 and 75-84 years. Response rates were higher in participants with higher incomes (high income 66.9% vs. low income 52.6%) and those born in Sweden (born in Sweden 63.6% vs. born in other countries 45.1%). As shown in Table 1, there were 2549 women and 2160 men in the initial study population. However, the analyses in this paper concern only those who reported prescription drug use (n=2802, 1718 women, 1084 men).

Questionnaire

The Swedish Survey of Living Conditions[27], also managed by SCB, was used to determine the questions. The questionnaire contained three parts concerning drug use: use of prescription drugs, NA to the drug regimens and reasons for NA. It also contained questions on economic ability, attitudes toward drugs and somatic and mental problems.

The question on use of prescription drugs was worded: “Have you, during the last two weeks, used any prescription drug?” The participants were able to make as many choices as appropriate from the list of alternatives provided. Participants who had not used any prescription drug in the two weeks prior to receiving the questionnaire were to mark the box: “I have not used any prescription drug”. Participants who reported use of any prescription drug during the last two weeks were classified as users.

The questions on NA and the reasons for NA were inspired by Morisky's self-report questionnaire.[28] The question on NA was worded: “Have you ever… a) forgotten to take your medication? b) filled the prescription but not taken the medication? c)

changed the dosage on your own accord? d) discontinued your medical treatment? e) not had a prescription filled?" Each question was followed by three choices: "Yes, several times", Yes, sometimes" and "No, never". The responses indicating that some kind of NA had occurred (sometimes or several times) were pooled into one group. Users who reported one or several types of NA were classified as either unintentionally or intentionally non-adherent, where forgetting were classified as unintentional NA and the rest as intentional NA.

The question on the reasons for NA was worded: "What was the reason for not following your prescription?" A number of alternatives followed where several choices could be made: "I did not need the medication", "I recovered", "I developed unpleasant adverse drug reactions", "I had a fear of potential adverse drug reactions", "the treatment was not effective", "I wanted to save money".

Potential confounding variables were assembled into five sets of variables: age, socioeconomic variables, attitudes towards drugs, somatic problems and mental problems. Information on education was added to the research data set by Statistics Sweden from the National Education Data Base. In the survey the respondents were asked if they, during the last 12 months, had experienced any economic problems in paying for food, rent, bills etc. Those who reported any economic difficulty were compared to those who did not. In the survey a question on attitudes towards drugs was included which had been used in an earlier survey.[19] The questionnaire contained several questions concerning medical complaints. Participants could indicate current problems in vision, problems in hearing, high blood pleasure, heart problems, obstructive lung problems and/or diabetes. Questions on chronic problems during the last three months were also included; the respondent could answer "Yes, severe", Yes, light" or "No". In the following conditions light and severe problems were combined resulting in dichotomous variables: gastrointestinal problems, musculoskeletal pain (i.e pain in neck and shoulders, back pain, joint pain), headache, anxiety, and depression.

Statistics

The Statistical Analysis System (SAS®9.2) was used to perform logistic regression analyses (The LOGISTIC Procedure) investigating the relationships between gender and self-reported NA behaviour and reasons for NA. The regression coefficients (standard errors) were used to obtain odds ratios [OR; women vs. men, with 95% confidence intervals (CI)]. The chi-square test was used for the categorical analyses comparing female and male users in different age groups. In order to compare statistical differences between mean values ANOVA-tests were applied (The NPAR1WAY Procedure).The significance level was set at p=0.05. In order to analyse the importance of the potential confounders for the differences between female and male users, the sets of variables in the multivariate analyses were added in consecutive order. For each of the NA behaviours and reasons we started with a model controlling for age. In the next model we added the socioeconomic variables. Then we added attitudes towards drugs. In the fourth step we added somatic problems and in the fifth step mental problems. In the final models we decided to keep only those variables which were statistically significant.

Ethical approval

The study complied with ethical research requirements, as approved by the SCB Ethics Committee, in concordance with Swedish legislation before 2008.[29] Participation in this study was voluntary and information about the objectives was sent with the questionnaire. Filling and returning the questionnaire was regarded as the participants giving their consent to participate in the study. The data used by the researchers were anonymous and unidentifiable.

Outcome measures

The main outcomes in the study were: self-reported unintentional and intentional NA among prescription drug users, the reasons given for NA, and differences in this respect between female and male users. We also analysed NA controlling for confounding variables such as age, socioeconomic factors, attitudes toward drugs and medical problems. The number of prescription drug users in the population was also measured.

RESULTS

Table 1 shows the study population (n=4709) and number of users (n=2802) in the study population in the six age categories. In the study sample, 59.5% of the participants (women 67.4%, n=1718 and men 50.2%, n=1084) reported use of at least one prescription drug during the previous two weeks. Analyses of NA in this paper concern only those who reported prescription drug use (n=2802, 1718 women, 1084 men). The numbers and percentages of self-reported non-adherent users, presented as the sum of intentional and unintentional NA, are also presented in Table 1. In total, 66.4% (n=1860) of the users were classified as non-adherent (women 67.0%, n=1151 and men 65.4%, n=709). Among those reporting any type of NA behaviour, different patterns emerged for men and women with respect to unintentional and intentional behaviours. Among men 36.0% reported only unintentional behaviour, 20.9% reported intentional behaviours only and 43.2% reported both behaviours; the corresponding figures among women were 28.4%, 26.9% and 44.7%, respectively (p<0.001). On the average women reported 1.34 intentional behaviours while men reported 1.19 (p<0.01).

In Table 2, descriptive statistics of marital status, education, economic problems, attitudes toward drugs and medical problems among the prescription drug users are presented.

Descriptive statistics for self-reported NA among female and male users in the different age groups are provided in Table 3 along with the results of logistic regression analyses controlling for confounders. The table shows to what extent the

OR for women changes for the different types of NA behaviours when the various sets of potential confounders are stepwise added to the regression models. For instance, if we look at "forgetting to take medication" the OR, when controlling for age only, was 0.79 (95%CI 0.67: 0.92), with women less likely to forget their medication. The OR changed only marginally when socioeconomic factors were added to the model [OR=0.75 (95%C I 0.63: 0.89)]. In the final model when all the various sets of confounders had been included the OR was basically the same [OR=0.81 (95%CI 0.67: 0.97)]. Overall controlling for confounders, such as age, socioeconomic factors, attitudes toward drugs and somatic and mental problems, did not affect the odds ratios comparing women vs. men for the NA behaviours included in the study.

As shown, forgetting to take medication, i.e. unintentional NA, was the most commonly reported NA for both men and women, with men reporting this more often than women [OR=0.81 (95%CI 0.67: 0.97)]. The descriptive statistics showed that a gender difference in unintentional NA (higher in men) was most marked among medication users aged 55- 64 years ($p<0.01$). Other gender differences were found, e.g. more female than male users reported filling a prescription but not taking the drug [OR=1.25 (95%CI 1.01:1.55)]. The greatest gender difference in this respect was found among those aged 45-54 years ($p<0.01$). Changing the dosage, on the other hand, was more frequently reported by male users [OR=0.62 (95%CI 0.50:0.78)], especially in the youngest age group ($p<0.01$). The overall picture with respect to discontinuation of medical treatment was somewhat mixed. In users aged 35- 44 years, men reported discontinuation to a greater extent than women ($p<0.01$); however, in users aged 45- 54 years, the reverse occurred ($p<0.001$). In the end no statistical difference between women and men was found with respect to discontinued medical treatment drug [OR=1.03 (95%CI 0.83:1.28)] in the multivariate analyses. The same was the case with "did not fill prescription" [OR=1.05 (95%CI 0.84:1.31)].

In Table 4 the final regression models for the different NA behaviours are presented. It should be noted that these models should be carefully interpreted. Obviously they are based on many statistical tests. Consequently, some statically significant differences found could be due to chance. However, some general patterns could be noted. Education was associated with several of the behaviours, and economic problems were associated with forgetting to take medication and with not filling a prescription. As can be seen in the table, there were strong associations between attitudes toward drugs and discontinuing a medical treatment and/or deciding not to fill a prescription.

Descriptive statistics and the multivariate analyses on the various reasons given for NA among female and male users are presented in Table 5. Due to a small number of observations with the reason "wanted to save money", the multivariate analyses on potential confounders were carried out not controlling for age. The ORs for women did not change to any greater extent when the various set of confounders were added to the models with one notable exception. Fear of potential ADRs was statistically significant for female users [OR=1.59 (95%CI 1.17:2.17)] when controlling for age only. However, after controlling for the other potential confounders the difference between women and men did not remain statistically significant [OR=1.36 (95%CI 0.99:1.87)].

Among the men, 14.3% reported that they had recovered as a reason for NA, compared to 13.7% among the women. This difference was statistically significant in the multivariate analysis controlling for potential confounders [OR=0.71 (95%CI 0.56:0.90)]. For the female users the most commonly reported reason, 16.4%, was that they did not need the medication. The corresponding figure for male users was 12.8%. However, this difference was not statistically significant in the multivariate analyses. While the OR for women for fear of potential ADRs did not remain statistically significant in the final regression model, there was a statistically significant difference between women and men with respect to the development of ADRs [OR=1.89 (95%CI 1.37:2.59)] .

In Table 6 the final regression models for the different NA reasons are presented. Similarly to the models in Table 4, these models should be carefully interpreted. However, education and economic problems were found to be associated with some of the reasons for NA. Also, as was the case in the multivariate analyses on NA behaviours, attitudes toward drugs were found to be of great importance. For instance, with respect to fear of ADRs, the OR for those with a negative attitude toward drugs was 1.78 (95%CI 1.32: 2.40) and for those considering drugs as dangerous the OR was 6.30 (95%CI 3.12: 12.72).

DISCUSSION

This study provides an overview of adherence to medication regimens among women and men. It confirms previous conclusions that NA is common, perhaps even more common than previously suggested.[1-5] Because previous studies on adherence have mostly been restricted to specific clinical populations, a specific condition and/or a single treatment, the relevance of the outcomes to prescription drug users in general has been unclear. However, this study takes into consideration all the medications used by a wide range of participants with many different disorders. We also sought to determine the reasons for NA and found gender differences in both NA behaviour and the reasons for NA. Also, after controlling for confounders such as age, socioeconomic factors, medical problems and attitudes toward drugs the differences, apart from "fear of ADRs", remained. To our knowledge, no previously published study has described both NA and the reasons for NA among prescription drug users in general, with a focus on gender.

Gender patterns

Gender has been found one of the most important factors influencing health related behaviours[18],

consequently gender should also affect adherence. However, a relationship between gender and adherence has not been consistently shown in the literature. Several studies have found women to be more non-adherent than men[21-24], others have reported that women tend to follow their prescriptions better[30] whilst some studies found no relationships between gender and adherence.[4,13,25] These somewhat conflicting results may be dependent on the condition or treatment under study, i.e. gender might predict NA differently for different conditions. Our study, which was not restricted to a specific condition or treatment, found no overall gender differences in reporting NA, i.e. the proportions of participants reporting NA were about the same for both sexes. However, when analysing the various types of NA behaviour and the reasons for NA, some gender patterns emerged. For example, women were more likely than men to report that they filled a prescription but did not use the medication. However, despite indications in the descriptive statistical analysis of gender differences regarding the rate of discontinuing medical treatment or not filling a prescription, no overall differences were found in the logistic regression analysis. In the literature, it appears to be a tendency for men to discontinue their medication more frequently[31] and for women to not fill prescriptions more frequently.[23] For example, men were found to be more likely to stop taking their antidepressants as soon as they felt better.[31] In our study, both sexes frequently reported that they were non-adherent because the medication was not needed or they had recovered. Although we could not confirm it, these options could be connected to premature discontinuation, since feeling no need or recovery would lead to a lack of motivation. Clearly, in many conditions, absence of symptoms is not equal to recovery, and premature discontinuation can be associated with a risk for relapse. We found men more likely than women to report recovery and changing the dosage. These could be connected; feeling better or recovering might have been the motive for reducing the dose. In several studies men have been more likely to engage in risky health behaviours[18] and changing dosage on one´s own accord could be seen as high risk health behaviour.

As in many other studies[3,32-34], forgetting to take medication, i.e. unintentional NA, was the most frequently reported NA behaviour for both sexes in this study. Men seemed to be more prone to forget which has also been shown in other studies.[34] The passivity of unintentional NA have been questioned, since medication concerns have been found a predictor for forgetting to take medication.[34] Forgetfulness could also be a sign of disease denial in some cases; taking the medication could be an unwanted reminder of the condition. However, it has been found that the severity of the disease and the patient´s understanding of the severity, i.e. the perceived threat, can influence and predict adherence.[35,36] Also, a belief in the necessity for the medication has been found to be strongly associated with adherence, i.e. a disbelief in the necessity will be associated to NA.[14,35] These factors may also affect unintentional NA, although the intentional non-adherers have been found to have a greater disbelief in the need for their medication and to have greater concerns about their medication compared to unintentional non-adherers.[37]

Adverse drug reactions and gender

The patient´s attitude toward drugs in general can greatly influence adherence.[1,2] These attitudes, which reflect evaluation of the object (i.e. the drug) as good or bad, harmful or beneficial[38], are thought to influence behavior and, consequently, adherence.[39] A belief that medication is harmful has been associated with decreased adherence[35,40], and our study confirmed that a negative attitude toward drugs seemed to be connected with NA. In previous studies, women were more frequently found to be negative about drugs than men were[14,19,20] and it seems reasonable to assume that a negative attitude toward drugs would be associated with poor adherence. The development of ADRs, which were frequently reported by women in our study, could be a reason for this negative attitude and subsequent decreased adherence. Various models, including the Health Belief Model, have been used to determine the relationships between health beliefs and health behaviour in terms of perceived benefits (belief in efficacy) and perceived barriers (potential negative aspects, such as ADRs).[1,2,41,42] Previous studies that have addressed adherence and ADRs found the experience of ADRs was a common reason for poor medication adherence and was strongly associated with primary discontinuation.[1,2,5,12-16] Some studies, like ours, found that ADRs were a reason for NA in particular amongst women.[14,16] In a related study, which analysed self-reported ADRs in the same study population as ours, female and male users reported ADRs to a similar extent.[43] Although women reported similar numbers of ADRs, they used the ADRs as the reason for NA almost twice as often as men did. Thus, the development of ADRs, i.e. perceived barriers, appeared to be much more important reasons for NA for women than for men. This could have been because women experience more severe ADRs than men, but the severity of the ADRs was not investigated in the study mentioned. However, other studies have found female gender to be a risk factor for developing ADRs[44] and the reasons for the preponderance of ADRs have been discussed. Women could either be more sensitive to drugs compared to men due to pharmacokinetic differences[45] or could be given wrong doses or unsuitable drugs more often than men, thus emphasising the necessity to find the optimal treatment in order to minimize ADRs. Alternatively, women might actually not have more severe ADRs than men but just be more likely to recall minor health problems, to connect them with their medical treatment, and maybe also to report them. It has been shown that women report medical problems more often than men do[17], but this should not directly lead to the conclusion that they actually have more problems since differences in health reporting behaviour could be responsible.[17] Additional studies, investigating the potential

relationship between the severity of ADRs and NA from a gender perspective are warranted.

The gender difference could also have been influenced by women judging the ADRs as more serious than men did. The frequent reports in the media citing risks associated with drug-taking when pregnant or nursing could make women feel more susceptible to the risks associated with drugs in general and fear the development of ADRs more.[46] For example, pregnancy was found to be a major reason for discontinuation of medical treatment.[47,48] Most studies, including ours, have also found women to be greater consumers of drugs than men are[17,43,49], which could provide a previous history of ADRs and a consequent greater fear of drugs. Similarly, changing the dosage, as reported more frequently by men in this study, may well be associated with ADRs; perhaps when ADRs are experienced, women stop taking the drugs and men change the dosage.

Implications for pharmacists

Improving adherence will greatly enhance the effectiveness of medical treatments. Interventions by pharmacists, often as a part of the care team, have been found effective in improving medication adherence.[50-53] To be able to make progress in this area it is essential to have a broad understanding of the complexity of medication adherence. However, it appears that pharmacy schools in many countries provide insufficient education on the subject[54,55], and it is generally believed that pharmacists in the community setting do not focus on it enough.[56] Community pharmacists are the most accessible health care professionals[1,57], and are in the unique position of being the last contact with the patient before they start their medication.[54] They are thus well positioned to address NA and to play a key role in providing counselling about medication and subsequently improving adherence.[58] It is therefore necessary for pharmacists to have a wide understanding of the topic, particularly with respect to the patient's whole medication usage and all the various reasons for NA. An understanding of the role of gender in this respect is also valuable, since gender appears to influence both NA itself and the reasons for NA. The focus of the education and counselling is thus important for the improvement of adherence; it should focus on obstacles to adherence and, according to our study, probably not as much on the cost of the medications as previous studies have shown.[59] It is also crucial to distinguish between intentional and unintentional NA when offering individualised counselling.[60] It is currently common to direct methods of improving adherence mainly to improving forgetfulness, via memory aids for example. While these methods are necessary, since forgetfulness has been repeatedly found to be a common reason for NA[3,32,33], particularly among men[34], our findings indicate that the development of ADRs require more attention from health care professionals, particularly among women, than generally is the case. Thus, in interactions with patients, it is important to discuss any potential or perceived ADRs, as well as dealing with any fear of developing ADRs. It is also essential to clearly explain, especially to women, the benefits of the treatment with respect to the potential or actual ADRs. Most patients want more information about their medical treatment[12] and education has been found to be an effective approach to overcoming patient barriers to treatment[2,6]. The pharmacist´s part in improving medication adherence has recently been developed and growing evidence indicates that pharmacists have an increasingly important role in this respect.[58,61,62] Even though it is probably less problematic for patients to speak about matters concerning NA with someone other than the prescriber, it is still important to approach issues around NA with a positive attitude and in a nonautocratic atmosphere.[57] An open discussion is required between the pharmacist and the patient regarding obstacles to following the prescription.[63] Lack of communication between patient and pharmacist can prevent the patient from spontaneously sharing their concerns factors that this study found can considerably affect adherence.

Strengths and limitations of the study

This study has some obvious limitations. For example, a cross-sectional design does not allow causal relationships to be firmly established. Furthermore, participation in this study was voluntary and, as a result, there may have been a selection bias. The non-response rate was 38.9% and included, for example, a larger proportion of men than women. It is also worthy of note that the response rate was higher among those with higher incomes. Higher income has, in previous studies, been found to be associated with improved adherence.[2,21] In contrast to other studies, where costs are often given as a reason for NA[1], only a few participants in our study reported that they were non-adherent because they wanted to save money. However, it should be noted that health care and reimbursement systems differ between countries and that the international generalisability of this could thus be compromised. Sweden has a public insurance system that sets a limit on personal annual drug expenses (currently 180EUR) and, therefore, some of our results may not be applicable to other countries. These factors could explain why saving money appeared less important in our study than in others. Nevertheless, it is notable that an earlier Swedish population-based study found that primary NA was associated with socioeconomic disadvantages in Sweden[64], i.e. the public insurance system seems not to cover all cost barriers.

One problem, which has already been pointed out in the result section, is the numerous statistical tests performed. In all, 11 outcomes were analysed and many variables were included in the separate multivariate analyses. This means that some of the statically significant findings could occur by chance rather than due to a true relationship. Even though most of the medical problems that were statistically significant in the various analyses are very plausible, we have decided not to comment on them in this article. Instead we hope that the results can serve as food for thought in this complicated field of research. However, in this study the problem with

mass-significance is not crucial since the aim was to test and adjust for confounders in analysing differences in NA between women and men.

We find that the main strength of this study was the gender perspective since studies focusing on gender and NA are scarce. Moreover, controlling for different variables that could affect the influence of gender on adherence was an advantage, since gender is not an independent variable detached from other factors like age and socioeconomic class.[26] We were, for ethical reasons, not able to include information on ethnicity, which previous studies have found to considerably affect health behaviours[26], this is of course is a weakness. The inclusion in the questionnaire of questions on both the occurrence of and the reason for NA also provides an extra dimension to the topic, where our study confirms results from other researchers; for example attitudes toward drugs and educational level influence NA. The study was also strengthened by the inclusion of a randomized sample from the general population in Sweden that included all prescription drug users.

The assessment of adherence in our study was based on self-reporting. Self-reporting could be a subject to recall bias and has been suggested to overestimate the rate of satisfactory adherence.[1,2] However, several self-reporting tools have shown high reliability and high accordance with other measurements.[65,66] Questionnaires are a self-reporting tool that is relatively simple and economical to use while also being practical for a larger sample like ours. Furthermore, a questionnaire allows for the possibility of discovering the reasons for NA.

CONCLUSIONS

Non-adherence to medication regimens is common and should always be considered when evaluating a patient with poor treatment outcomes or when providing patient counselling about the medication. This nationwide survey gives an overview, with a gender perspective, of NA behaviour and the reasons for NA. Although it was not possible in this study to confirm causal relationships, it highlights the different reasons for NA and, in particular, yields information about important gender differences. Female and male users reported different patterns of adherence behaviour and different reasons for NA, which, in most cases, remained after controlling for confounders. Consequently, when providing counselling and education about medication with the aim of improving patient adherence to treatment regimens, a wide knowledge of all the reasons for NA is required, along with an understanding of the impact of gender on the outcomes.

CONFLICT OF INTEREST

No conflicts of interest to report.

The study was funded by the National Corporation of Swedish Pharmacies Research Foundation.

References

1. Sabaté E. Adherence to long-term therapies: evidence for action. Geneva, Switzerland: WHO; 2003.
2. Vermeire E, Hearnshaw H, Van Royen P, Denekens J. Patient adherence to treatment: three decades of research. A comprehensive review. J Clin Pharm Ther. 2001;26(5):331-342.
3. Osterberg L, Blaschke T. Adherence to medication. N Engl J Med. 2005;353(5):487-497.
4. DiMatteo MR. Variations in patients' adherence to medical recommendations: a quantitative review of 50 years of research. Med Care. 2004;42(3):200-209.
5. Burnier M. Medication adherence and persistence as the cornerstone of effective antihypertensive therapy. Am J Hypertens. 2006;19(11):1190-1196.
6. Haynes RB, Ackloo E, Sahota N, McDonald HP, Yao X. Interventions for enhancing medication adherence. Cochrane Database Syst Rev. 2008(2):CD000011.
7. Lehane E, McCarthy G. Intentional and unintentional medication non-adherence: A comprehensive framework for clinical research and practice? A discussion paper. Int J Nurs Stud. 2007;44:1468-77.
8. Horne R. Representations of medication and treatment: advances in theory assessment. In: Petrie KJ, Weinman J, editors. Perceptions of health and illness. Chur (Switzerland):Harwood; 1997. p. 155-88.
9. Wilke T, Müller S, Morisky DE. Toward identifying the causes and combinations of causes increasing the risks of nonadherence to medical regimens: combined results of two German self-report surveys. Value Health. 2011;14(8):1092-100.
10. Horne R, Weinman J. Patients' beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. J Psychosom Res. 1999;47:555.567.
11. Horne R, Weinman J. Self regulation and self management in asthma: exploring the role of illness perceptions and treatment beliefs in explaining non-adherence to preventer medication. Psychology and Health. 2002;17(1):17-32.
12. Donovan JL, Blake DR. Patient non-compliance: deviance or reasoned decision-making? Soc Sci Med. 1992:34(5);507-513.
13. Demyttenaere K, Enzlin P, Dewe W, Boulanger B, De Bie J, De Troyer W, Mesters P. Compliance with antidepressants in a primary care setting, 1: Beyond lack of efficacy and adverse events. J Clin Psychiatry. 2001;62(22):30-33.
14. Pound P, Britten N, Morgan M, Yardley L, Pope C, Daker-White G, Campbell R. Resisting medicines: a synthesis of qualitative studies of medicine taking. Soc Sci Med. 2005;61(1):133-155.
15. Bull SA, Hu XH, Hunkeler EM, Lee JY, Rowland CR, Williamson TE, Schwab JR, Hurt SW. Discontinuation of use and switching of antidepressants: influence of patient-physician communication. JAMA. 2002;288(11):1403-1409.

16. Applebaum AJ, Richardson MA, Brady SM, Brief DJ, Keane TM. Gender and other psychosocial factors as predictors of adherence to highly active antiretroviral therapy (HAART) in adults with comorbid HIV/AIDS, psychiatric and substance-related disorder. AIDS Behav. 2009;13(1):60-65.
17. Verbrugge LM. Gender and health: an update on hypotheses and evidence. J Health Soc Behav. 1985;26(3):156-182.
18. Courtenay WH. Constructions of masculinity and their influence on men's well-being: a theory of gender and health. Soc Sci Med. 2000;50(10):1385-1401.
19. Isacson D, Bingefors K. Attitudes towards drugs--a survey in the general population. Pharm World Sci. 2002;24(3):104-110.
20. Horne R, Graupner L, Frost S, Weinman J, Wright SM, Hankins M. Medicine in a multi-cultural society: the effect of cultural background on beliefs about medication. Soc Sci Med. 2004;59(6):1307-13.
21. Chan CD, Shrank WH, Cutler D. Patient, physician, and payment predictors of statin adherence. Med Care. 2010;48:196-202.
22. Granger BB, Ekman I, Granger CB, Ostergren J, Olofsson B, Michelson E, McMurray JJV, Ysuf S, Pfeffer MA, Swedberg K. Adherence to medication according to sex and age in the CHARM programme. Eur J Heart Fail. 2009:11(11):1092-8.
23. Beardon PH, McGilchrist MM, McKendrick AD, McDevitt DG, MacDonald TM. Primary non-compliance with prescribed medication in primary care. BMJ. 1993;307(6908):846-848.
24. Puskas CM, Forrest JI, Parashar S, Salters KA, Cescon AM, Kaida A, Miller CL, Bangsberg DR, Hogg RS. Women and vulnerability to HAART non-adherence: a literature review of treatment non-adherence by gender from 2000 to 2011. Curr HIV/AIDS Rep. 2011;8(4):277-87.
25. Nahon S, Lahmek P, Saas C, Durance C, Olympie A, Lesgourgues B, Gendre JP. Socioeconomic and psychological factors associated with nonadherence to treatment in inflammatory bowel disease patients: results of the ISSEO survey. Inflamm Bowel Dis. 2011;17(6):1270-6.
26. Hankivsky O. Women's health, men's health, and gender and health: implications of intersectionality. Soc Sci Med. 2012;74:1712-1720
27. Statistics Sweden. Living conditions. Appendix 13. Technical report for surveys conducted during 1984-1989. Surveys of Living Conditions. Örebro: SCB-Tryck, 1992.
28. Morisky DE, Green LW, Levine DM. Concurrent and predictive validity of a self-reported measure of medication adherence. Med Care. 1986;24(1):67-74.
29. Vetting the ethics of research involving humans. Available from: http://www.epn.se/start/startsida.aspx (accessed 6th April 2012).
30. Hawthorne AB, Rubin G, Ghosh S. Review article: medication non-adherence in ulcerative colitis – strategies to improve adherence with mesalazine and other maintenance therapies. Aliment Pharmacol Ther. 2008;27:1157-1166.
31. Demyttenaere K, Enzlin P, Dewe W, Boulanger B, De Bie J, De Troyer W, Mesters P. Compliance with antidepressants in a primary care setting, 2: the influence of gender and type of impairment. J Clin Psychiatry. 2001;62(22):34-37.
32. Culig J, Leppée M, Boskovic J, Eric M. Determining the difference in medication compliance between the general patient population and patients receiving antihypertensive therapy: a case study. Arch Pharm Res. 2011;34(7):1143-1152.
33. Bulloch AGM, Patten SB. Non-adherence with psychotropic medications in the general population. Soc Psychiat Epidemiol. 2010;45:47-56.
34. Abhijit SG, McHorney CA. Unintentional non-adherence to chronic prescription medications: How unintentional is it really? BMC Health Serv Res. 2012;12:98.
35. Phatak HM, Thomas J. Relationship between beliefs about medications and nonadherence to prescribed chronic medication. Ann Pharmacother. 2006;40(10):1737-42.
36. DiMatteo MR, Haskard KB, Williams SL. Health beliefs, disease severity, and patient adherence. A meta-analysis. Med Care. 2007;45(6):521-528.
37. Clifford S, Barber N, Horne R. Understanding different beliefs held by adherers, unintentional nonadherers, and intentional nonadherers: Application of the Necessity-Concerns Framework. J Psychosom Res. 2008;64(1):41-46.
38. Ajzen I. Nature and operation of attitudes. Annu Rev Psychol. 2001;52:27-58.
39. Petty RE, Wegener DT, Fabrigar LR. Attitudes and attitude change. Annu Rev Psychol. 1997;48:609-647.
40. Mardby AC, Akerlind I, Jorgensen T. Beliefs about medicines and self-reported adherence among pharmacy clients. Patient Educ Couns. 2007;69(1-3):158-164.
41. Janz NK, Becker MH. The Health Belief Model: a decade later. Health Educ Q. 1984;11(1):1-47.
42. Harrison JA, Mullen PD, Green LW. A meta-analysis of studies of the health belief model with adults. Health Educ Res. 1992;7:107-116.
43. Isacson D, Johansson L, Bingefors K. Nationwide survey of subjectively reported adverse drug reactions in Sweden. Ann Pharmacother. 2008;42(3):347-353.
44. Tran C, Knowles SR, Liu BA, Shear NH. Gender differences in adverse drug reactions. J Clin Pharmacol. 1998;38:1003-1009
45. Harris RZ, Benet LZ, Schwartz JB. Gender effects in pharmacokinetics and pharmacodynamics. Drugs. 1995;50:222-239.
46. Koren G, Klein N. Bias against negative studies in newspaper reports of medical research. JAMA. 1991;266(13):1824-6.
47. Petersen I, Gilbert RE, Evans SJ, Man SL, Nazareth I. Pregnancy as a major determinant for discontinuation of antidepressants: an analysis of data from the Health Improvement Network. J Clin Psychiarty. 2011;72(7):979-85.

48. Einarson A, Selby P, Koren G. Abrupt discontinuation of psychotropic drugs during pregnancy: fear of teratogenic risk and impact of counselling. J Psychiatry Neurosci. 2001;26(1):44-8.
49. Eggen AE. Pattern of drug use in a general population – prevalence and predicting factors: The Tromsø study. Int J Epidemiol. 1994;23:1262-1272.
50. Lim PC, Lim K. Evaluation of a pharmacist-managed diabetes medication therapy adherence clinic. Pharm Pract (Internet). 2010;8(4):250-254.
51. Van Wijk BL, Klungel OH, Heerdink ER, de Boer A. Effectiveness of interventions by community pharmacists to improve patient adherence to chronic medication: a systematic review. Ann Pharmacother. 2005;39(2):319-328.
52. Nkansah N, Mostovetsky O, Yu C, Cheng T, Beney J, Bond CM, Bero L. Effect of outpatient pharmacists' non-dispensing roles on patient outcomes and prescribing patterns. Cochrane Database Syst Rev. 2010;7(7):CD000336.
53. Chumney EC, Robinson LC. The effects of pharmacist interventions on patients with polypharmacy. Pharm Pract (Internet). 2006;4(3):103-109.
54. Fikri-Benbrahim N, García-Cárdenas V, Sáez-Benito L, Gastelurrutia MA, Faus MJ. Adherence: a review of education, research, practice and policy in Spain. Pharm Pract (Internet). 2009;7(3):125-138.
55. Södergård B. Adherence to treatment: what is done in Sweden? Practice, education and research. Pharm Pract (Internet). 2008;6(4):171-177.
56. Rickles NM, Brown TA, McGivney MS, Snyder ME, White KA. Adherence: a review of education, research, practice, and policy in United States. Pharm Pract (Internet). 2010;8(1):1-17.
57. Schneider MP, Krummenacher I, Figueiredo H, Marquis J, Bugnon O. Adherence: a review of education, research, practice and policy in Switzerland. Pharm Pract (Internet). 2009;7(2):63-73.
58. Haugbølle LS, Herborg H. Adherence to treatment: practice, education and research in Danish community pharmacy. Pharm Pract (Internet). 2009;7(4):185-194.
59. Bell JS, Enlund H, Vainio K. Medication adherence: a review of pharmacy education, research, practice and policy in Finland. Pharm Pract (Internet). 2010;8(3):147-161.
60. Herborg H, Haugbølle LS, Sørensen L, Rossing C, Dam P. Developing generic, individualised adherence programme for chronic medication users. Pharm Pract (Internet). 2008;6(3):148-157.
61. Clifford S, Garfield S, Eliasson L, Barber N. Medication adherence and community pharmacy: a review of education, policy and research in England. Pharm Pract (Internet). 2010;8(2):77-88.
62. Clifford S, Barber N, Elliot R, Hartley E, Horne R. Patient centered advice is effective in improving adherence to medicines. Pharm World Sci. 2006;28:165-170.
63. Rubio-Valera M, Serrano-Blanco A, Magdalena-Belío J, Fernández A, García-Campayo J, Pujol MM, del Hoyo YL. Effectiveness of pharmacist care in the improvement of adherence to antidepressants: a systematic review and meta-analysis. Ann Pharmacother. 2011;45(1):39-48.
64. Wamala S, Merlo J, Bostrom G, Hogstedt C, Agren G. Socioeconomic disadvantage and primary non-adherence with medication in Sweden. Int J Qual Health Care. 2007;19(3):134-140.
65. Rickles NM, Svarstad BL. Relationships between multiple self-reported nonadherence measures and pharmacy records. Res Social Adm Pharm. 2007;3(4):363-377.
66. Garber MC, Nau DP, Erickson SR, Aikens JE, Lawrence JB. The concordance of self-report with other measures of medication adherence: a summary of the literature. Med Care. 2004;42(7):649-652.

Table 1. Descriptive statistics of participants (n=4709), users[a] (n=2802) and non-adherent[b] users (n=1860) in the study population, by gender and age; Sweden 2004/05.

	Women					Men				
Age	Number in study population	Number users in study population	Percentage users in study population	Number non-adherent users	Percentage non-adherent users	Number in study population	Number users in study population	Percentage users in study population	Number non-adherent users	Percentage non-adherent users
18-34	610	369	60.5	287	77.8	452	107	23.7	78	72.9
35-44	466	264	56.7	212	80.3	363	128	35.3	105	82.0
45-54	442	264	59.7	201	76.1	388	173	44.6	121	69.9
55-64	472	352	74.6	226	64.2	456	287	62.9	201	70.0
65-74	337	272	80.7	138	50.7	319	235	73.7	128	54.5
75-84	222	197	88.7	87	44.2	182	154	84.6	76	49.4
Total	2549	1718	67.4	1151	67.0	2160	1084	50.2	709	65.4

[a]Participants who reported use of one or several prescription drugs during the two weeks previous to receiving the questionnaire.
[b]Participants who responded positively to any of the NA variables, intentional as well as unintentional, in the questionnaire (forgot to take medication, filled prescription but did not use medication, changed dosage on own accord, discontinued a medical treatment, did not fill prescription).

Table 2. Descriptive statistics of marital status, education, economic problems, attitudes toward drugs and medical problems among prescription drug users, by gender; Sweden 2004/05

	Percentage			Percentage
	Women (n=1718)	Men (n=1084)	*p*	Women and Men (n=2802)
Marital status: Married/cohabiting	48.7	58.5	<0.001	52.5
Single	28.3	23.7		26.5
Divorced/widowed	23.0	17.8		21.0
Education: 9 years or less	21.1	27.7		23.6
10-12 years	46.8	45.6	<0.001	46.3
University	32.1	26.7		30.1
Economic problems: No	73.5	81.3	<0.001	76.5
Yes	26.5	18.7		23.5
Attitudes toward drugs: Positive	58.0	56.5		57.4
Negative	40.1	42.2		40.9
Dangerous	1.9	1.3		1.7
Medical Problems: Vision problems	22.8	20.1		21.7
Hearing problems	12.1	23.3	<0.001	16.4
Hypertension	23.1	28.9	<0.001	25.3
Heart problems	6.6	17.5	<0.001	10.8
Obstructive lung problems	11.1	12.6		11.7
Diabetes	5.3	11.4	<0.001	7.7
Cancer	6.1	5.8		6.0
Gastrointestinal problems	29.9	21.8	<0.001	26.8
Rheumatism	6.2	4.6		5.6
Musculoskeletal pain	67.9	58.8	<0.001	64.4
Headache	26.6	14.9	<0.001	22.0
Anxiety	29.5	22.5	<0.001	26.8
Sleeping problems	41.9	32.9	<0.001	38.4
Depression	17.6	14.3	<0.05	16.3
Missing values: Economic problems: 50, Education: 318, Attitudes: 57.				

Table 3. Self-reported non-adherent behaviour as a percentage of the total number of users in the study population[a] by gender and age and odds ratios for women vs. men obtained from logistic regression analyses[b]; Sweden 2004/05

	Unintentional non-adherence			Intentional non-adherence											
	Forgot to take medication			Filled prescription but did not use the medication			Changed dosage on own accord			Discontinued medical treatment			Did not fill prescription		
Age	Women	Men	*p*	Women	Men	*p*	Women	Men	*p*	Women	Men	*p*	Women	Men	*p*
18-34	61.8	57.9		31.2	29.1		19.2	31.8	<0.01	32.8	32.7		32.0	29.9	
35-44	59.5	60.9		33.7	31.2		25.4	35.2	<0.05	28.4	36.7	<0.01	36.7	32.8	
45-54	54.6	57.8		33.3	21.4	< 0.01	15.5	23.1	<0.05	29.9	20.2	<0.05	29.9	23.7	
55-64	45.2	57.8	<0.01	26.1	18.8	<0.05	19.6	19.5		23.3	20.2		17.6	17.4	
65-74	33.1	40.8		15.8	11.1		11.0	16.2		13.2	8.9		8.1	8.5	
75-84	32.0	38.3		12.2	13.6		6.1	12.3	<0.05	8.1	9.7		7.6	5.8	
Total	49.0	51.8		26.2	19.3	<0.001	16.9	21.4	<0.001	23.8	19.5	<0.01	22.9	17.9	<0.01
Logistic regression analysis controlling for age (women vs. men). OR (95% CI)															
OR (CI)	0.79 (0.67:0.92)			1.35 (1.12:1.64)			0.67 (0.55:0.82)			1.12 (0.93:1.36)			1.14 (0.94:1.40)		
Logistic regression analysis controlling for age + socioeconomic factors (women vs. men). OR (95% CI)															
OR (CI)	0.75 (0.63:0.89)			1.36 (1.11:1.67)			0.65 (0.53:0.80)			1.12 (0.91:1.37)			1.08 (0.87:1.33)		
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs (women vs. men). OR (95% CI)															
OR (CI)	0.76 (0.64:0.90)			1.36 (1.10:1.66)			0.64 (0.52:0.79)			1.10 (0.90:1.36)			1.09 (0.88:1.35)		
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs + somatic problems (women vs. men). OR (95% CI)															
OR (CI)	0.81 (0.68:0.97)			1.24 (1.00:1.54)			0.63 (0.50:0.78)			1.03 (0.83:1.28)			1.06 (0.84:1.32)		
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs + somatic problems + mental problems (women vs. men). OR (95% CI)															
OR (CI)	0.81 (0.67:0.97)			1.25 (1.01:1.55)			0.62 (0.50:0.78)			1.03 (0.83:1.28)			1.05 (0.84:1.31)		
Final Models. OR (95% CI)															
OR (CI)	0.77 (0.65:0.92)			1.25 (1.02:1.54)			0.64 (0.52:0.79)			1.01 (0.82:1.24)			1.05 (0.85:1.30)		

[a] The number of users in the study population in the different age groups can be found in Table 1.
[b] In the logistic regression analyses the different sets of confounders were included in a consecutive order.

Table 4. Logistic regression analyses relating gender, age, socioeconomic variables, attitudes towards drugs, somatic problems and mental problems to various types of self-reported non-adherent behaviour; Sweden 2004/05

	Unintentional non-adherence		Intentional non-adherence							
	Forgot to take medication		Filled prescription but did not use the medication		Changed dosage on own accord		Discontinued medical treatment		Did not fill prescription	
	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI	OR	95%CI
Women vs. Men	0.77	0.65:0.92	1.25	1.02:1.54	0.64	0.52:0.79	1.01	0.82:1.24	1.05	0.85:1.30
Age (75-84[1])										
18-34	2.30	1.22:4.34	2.75	1.11:6.83	1.19	0.55:2.59	3.25	1.32:8.02	2.68	1.00:7.16
35-44	2.22	1.18:4.21	2.85	1.15:7.07	1.54	0.71:3.34	2.80	1.13:6.93	3.23	1.21:8.62
45-54	1.83	0.97:3.43	2.26	0.91:5.61	0.86	0.39:1.87	2.04	0.83:5.04	2.34	0.88:6.22
55-64	1.58	0.85:2.92	1.85	0.75:4.56	0.95	0.44:2.03	1.81	0.74:4.44	1.49	0.56:3.96
65-74	0.97	0.52:1.81	1.13	0.45:2.84	0.69	0.32:1.51	0.89	0.36:2.24	0.73	0.27:2.01
Education (10-12 year[1])										
9 years or less	0.73	0.59:0.91	0.72	0.54:0.94	0.68	0.51:0.91	0.84	0.64:1.10	0.77	0.57:1.03
University	1.39	1.15:1.69	1.66	1.34:2.05	1.44	1.15:1.80	1.34	1.08:1.67	1.65	1.32:2.07
Economic problems (No[1])										
Yes	1.32	1.07:1.61	.	.	.	.	.	.	1.71	1.37:2.14
Attitudes toward drugs (positive[1])										
Negative	.	.	1.47	1.21:1.79	.	.	1.37	1.12:1.67	1.51	1.23:1.86
Dangerous	.	.	2.50	1.31:4.75	.	.	3.42	1.79:6.54	5.17	2.61:10.24
Medical Problems (No[1])										
Obstructive lung problems	1.33	1.03:1.72	.	.	1.64	1.23:2.18	.	.	.	.
Diabetes	1.60	1.15:2.23	.	.	1.78	1.22:2.60	.	.	.	.
Gastrointestinal problems	1.39	1.14:1.69	1.51	1.23:1.86	.	.	1.69	1.37:2.09	1.51	1.21:1.89
Rheumatism	.	.	1.53	1.02:2.31	.	.	.	.	.	.
Musculoskeletal pain	.	.	1.59	1.27:1.98	1.35	1.07:1.69	1.78	1.42:2.24	1.34	1.06:1.68
Headache	0.75	0.61:0.92	.	.	.	.	.	.	.	.
Anxiety	.	.	.	.	1.44	1.10:1.90	.	.	.	.
Depression	1.35	1.07:1.70	.	.	1.70	1.25:2.30	.	.	.	.

[1]Reference group.

Table 5. Self-reported reasons for non-adherence as a percentage of the total number of users in the study population[a] by gender and age and odds ratios for women vs. men obtained from logistic regression analyses[b]; Sweden 2004/05.

	Did not need the medication			Recovered		Developed unpleasant adverse drug reactions			Fear of potential adverse drug reactions			Treatment was not effective			Wanted to save money[c]	
Age	Women	Men	*p*	Women	Men	Women	Men	*p*	Women	Men	*p*	Women	Men	*p*	Women	Men
18-34	26.0	21.5	.	23.3	28.0	12.2	5.6	<0.05	9.2	8.4	.	10.3	17.8	<0.05	6.0	10.3
35-44	24.2	28.1	.	20.5	27.3	13.6	7.8	.	13.3	10.2	.	14.4	10.9	.	6.1	5.5
45-54	18.2	17.3	.	13.6	16.8	15.9	4.1	<0.001	12.1	6.9	.	8.3	8.7	.	2.3	2.9
55-64	13.1	9.4	.	10.8	12.9	10.2	5.2	<0.05	8.0	5.9	.	6.8	4.5	.	2.6	2.8
65-74	7.0	6.8	.	5.2	6.8	6.6	5.5	.	8.5	2.6	<0.01	6.6	3.8	.	0.4	1.7
75-84	4.1	4.6	.	3.6	5.2	4.1	5.2	.	3.1	2.6	.	1.5	5.8	.	1.0	0.0
Total	16.4	12.8	<0.05	13.7	14.3	10.8	5.4	<0.001	9.2	5.6	<0.001	8.3	7.3	.	3.3	3.2
Logistic regression analysis controlling for age (women vs. men). OR (95 % CI)																
OR (CI)	1.10 (0.87:1.38)			0.76 (0.60:0.95)		1.98 (1.46:2.69)			1.59 (1.17:2.17)			0.97 (0.74:1.34)			0.77 (0.50:1.21)	
Logistic regression analysis controlling for age + socioeconomic factors (women vs. men). OR (95 % CI)																
OR (CI)	1.10 (0.87:1.40)			0.74 (0.58:0.94)		2.08 (1.50:2.89)			1.57 (1.14:2.17)			1.05 (0.77:1.43)			0.74 (0.47:1.16)	
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs (women vs. men). OR (95 % CI)																
OR (CI)	1.11 (0.87:1.41)			0.74 (0.59:0.94)		2.19 (1.57:3.05)			1.57 (1.13:2.17)			1.04 (0.76:1.43)			0.72 (0.46:1.13)	
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs + somatic problems (women vs. men). OR (95 % CI)																
OR (CI)	1.10 (0.85:1.41)			0.72 (0.56:0.92)		2.15 (1.51:3.04)			1.40 (1.00:1.97)			0.89 (0.65:1.24)			0.68 (0.42:1.10)	
Logistic regression analysis controlling for age + socioeconomic factors + attitudes toward drugs + somatic problems + mental problems (women vs. men). OR (95 % CI)																
OR (CI)	1.12 (0.87:1.44)			0.72 (0.56:0.93)		2.14 (1.51:3.04)			1.40 (1.00:1.98)			0.89 (0.64:1.24)			0.70 (0.43:1.13)	
Final Models. OR (95 % CI)																
OR (CI)	1.07 (0.84:1.35)			0.71 (0.56:0.90)		1.89 (1.37:2.59)			1.36 (0.99:1.87)			0.92 (0.67:1.26)			0.78 (0.50:1.21)	

[a] The number of users in the study population in the different age groups can be found in Table 1.
[b] In the logistic regression analyses the different sets of confounders were included in a consecutive order.
[c] Age was not controlled for.

Table 6. Logistic regression analyses relating gender, age, socioeconomic variables, attitudes towards drugs, somatic problems and mental problems to various types of self-reported reasons for non-adherence; Sweden 2004/05.

	Did not need the medication		Recovered		Developed unpleasant adverse drug reactions		Fear of potential adverse drug reactions		Treatment was not effective		Wanted to save money[a]	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Women vs. Men	1.07	0.84:1.35	0.71	0.56:0.90	1.89	1.37:2.59	1.36	0.99:1.87	0.92	0.67:1.26	0.78	0.50:1.21
Age (75-84[1])												
18-34	1.29	0.55:3.03	2.31	0.94:5.65	2.19	1.21:3.96	2.56	1.19:5.50	3.57	0.82:15.56	.	.
35-44	1.35	0.57:3.19	1.90	0.77:4.67	2.46	1.35:4.47	3.57	1.69:7.54	3.68	0.84:16.08	.	.
45-54	0.94	0.40:2.22	1.10	0.45:2.73	2.29	1.27:4.14	3.00	1.42:6.33	1.96	0.45:8.64	.	.
55-64	0.65	0.28:1.53	0.89	0.36:2.18	1.63	0.91:2.94	2.50	1.20:5.22	1.34	0.30:5.88	.	.
65-74	0.44	0.18:1.07	0.47	0.18:1.20	1.30	0.69:2.44	2.16	1.00:4.66	1.39	0.31:6.16	.	.
Education (10-12 year[1])												
9 or less	0.63	0.44:0.91	0.63	0.44:0.89	.	.	.	.	1.10	0.73:1.65	.	.
University	2.00	1.58:2.52	1.40	1.10:1.79	.	.	.	.	1.50	1.08:2.09	.	.
Economic problems (No[1])												
Yes	.	.	.	.	.	.	1.52	1.11:2.10	.	.	9.27	5.64:15.24
Attitudes toward drugs (positive[1])												
Negative	.	.	.	.	1.90	1.43:2.51	1.78	1.32:2.40	1.51	1.11:2.04	.	.
Dangerous	.	.	.	.	2.76	1.26:6.04	6.30	3.12:12.72	2.44	1.09:5.48	.	.
Medical Problems (No[1])												
Vision problems	.	.	.	.	.	.	.	.	1.52	1.09:2.12	.	.
Hypertension	0.55	0.39:0.78	.	.	.	.	.	.	.	.	.	.
Diabetes	.	.	.	.	.	.	0.26	0.10:0.72	.	.	.	.
Gastrointestinal problems	1.41	1.10:1.81	.	.	1.89	1.43:2.51	.	.	1.51	1.10:2.08	.	.
Musculoskeletal pain	.	.	1.33	1.04:1.69	1.93	1.36:2.75	1.73	1.20:2.49	2.08	1.41:3.06	.	.
Sleeping problems	0.72	0.57:0.92	.	.	.	.	1.57	1.17:2.12	1.57	1.14:2.14	.	.
Depression	.	.	.	.	.	.	.	.	.	.	2.00	1.26:3.16

[a]Age was not controlled for.
[1]Reference group