

Agreement between self-reported and registry-based use of sleep medications and tranquilizers

Running title: Self-reported and registry based medication use

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- Epidemiologic studies
- Hypnotics and sedatives
- Psychotropic drugs
- Registries
- Self-report
- Tranquilizing agents

Key points:

- Few studies have assessed the agreement between self-reported and registry-based use of sleep medications and tranquilizers in adult population-based samples.
- The agreement between drugs taken sporadically, including sleep medications and tranquilizers, seems to be lower than for drugs taken regularly for chronic condition.
- The present study showed moderate to good agreement between self-reported data on sleep medications and tranquilizers use and dispensed drugs.
- Due to the differences between self-reported drug use and prescription data, the limitations of each data source should be considered when applying sleep medications and tranquilizers as the exposure or outcome in epidemiological studies.

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Abstract

Purpose

The purpose of the present study was to assess the agreement between self-reported use of sleep medications and tranquilizers and dispensed hypnotics and anxiolytics.

Methods

Self-reported medication use was obtained from the population-based survey Health and Environment in Oslo (HELMILO) (2009-10) (n=13,019). Data on dispensed hypnotics and anxiolytics were obtained from the Norwegian Prescription Database (NorPD). As measures of validity, we calculated sensitivity and specificity using both self-reports and prescription records as the reference standard. Furthermore, we calculated Cohen's kappa. Current self-reported medication use was compared to prescription data in time windows of both 100 and 200 days preceding questionnaire completion.

Results

The highest sensitivity was observed for current sleep medication use in the 100-day time-window (sensitivity=0.76, 95 % confidence interval [CI]: 0.74, 0.79) when using prescription records as the reference standard. Sensitivity was generally lower for tranquilizers compared with sleep medications. Cohen's kappa showed the highest agreement for the 200-day time-window with substantial agreement for sleep medications (kappa=0.64; 95 % CI: 0.62, 0.67) and moderate agreement for tranquilizers (kappa=0.45; 95 % CI: 0.41, 0.48).

Conclusions

The present study suggests moderate to substantial agreement between self-reported use of sleep medications and tranquilizers and dispensed drugs in a general adult population. The magnitude of agreement varied according to drug category and time window. Since self-reported and registry-based use of these drug classes do not match each other accurately, limitations of each data source should be considered when such medications are applied as the exposure or outcome in epidemiologic studies.

Introduction

Medication use can be applied as an exposure or outcome variable in epidemiological studies. The medication use may be of interest in itself or the medication use may be an indicator of a certain medical condition ¹. For instance, sleep medication use may be an indicator of sleeping problems. Previous studies in the field of environmental epidemiology have used various medications as the outcome including anti-hypertensives ²⁻⁴, anti-asthmatics ³, and psychotropic medications including sleep medications and anxiolytics ³⁻⁸. In these studies, the medication use has either been self-reported or drawn from a prescription registry. Self-reported medication use has typically been collected via postal questionnaires or phone interviews ^{3-5,7,8}. Home visits where the participants have shown the researchers recently used medications have also been performed ³. There is an increasing trend of using electronic health data such as drug utilization data in epidemiologic studies due to their accuracy and availability ⁹. Furthermore, since registry data on medications is not affected by the participants' ability to recall medication use, it could be considered a more valid source of information than self-reported data ¹. On the other hand, prescription registries do not reflect actual use of medication.

Most studies on the agreement between self-reported and registry data on psychotropic medications have been performed in specific sub-groups such as the elderly ¹⁰⁻¹², adolescents ¹³, and pregnant women ^{14,15}. The agreement of hypnotics use have also been studied in infants, using parent reported data ¹⁶. Furthermore, one study assessed the agreement of psychotropic medication use in a study population of patients with schizophrenia and their siblings and parents ¹⁷. However, there are few studies having assessed the agreement of psychotropic medication use in a general adult population. One of the few such studies reported a fair to moderate agreement ¹⁸. That study also reported better agreement for drugs that are taken regularly for chronic conditions including antihypertensives and diabetes medication. This finding is consistent with other studies as well ^{19,20}. In addition to type of drug, the magnitude of the agreement has also been found to vary according to the time-window used for the assessment ²⁰. Since neither self-reports nor prescription registries measure medication use accurately, more agreement studies of psychotropic medications are warranted. Furthermore, such studies will provide important information for evaluating results of studies where medication use is the object of research ¹⁵.

In the present study, we assessed the agreement between self-reported data on sleep medications and tranquilizers and records

of dispensed prescriptions on hypnotics and anxiolytics, respectively, in an adult population-based sample.

Methods

We based the present study on data from the Health and Environment in Oslo survey (HELMILO) and the Norwegian Prescription Database (NorPD). Data from HELMILO and NorPD were linked using an encrypted version of the unique personal identity number assigned to all citizens in Norway. This enabled us to compare self-reported data on medication use from HELMILO with data on dispensed drugs recorded in NorPD.

The Health and Environment in Oslo study (HELMILO)

HELMILO (2009-10) is a cross-sectional study mainly designed for assessing health effects of environmental exposures. In this study, a questionnaire was received by 27,097 Oslo inhabitants born in the years 1924-25, 1940-41, 1955, 1960 and 1970. The response rate was 48 % ($n = 13,019$). From the HELMILO questionnaire, we used two items reflecting psychotropic medication use. The participants reported whether they currently, previously, or never had used sleep medication and tranquilizers, respectively. In the questionnaire, no list of drugs or definition of time-period regarding current use was provided. High blood pressure medication was used as a reference drug. The questions regarding medication use are presented in Table 1.

The Norwegian Prescription Database (NorPD)

Since January 2004, all pharmacies in Norway have been obliged to report all dispensed prescribed drugs electronically to the Norwegian Institute of Public Health on a monthly basis. The personal identification number makes it possible to access information on dispensed prescription drugs at an individual level²¹. The medications in the database are classified according to the Anatomical Therapeutic Chemical (ATC) classification system²². For the present study, we extracted information on hypnotics (ATC code N05C) and anxiolytics (ATC code N05B) and the dates the drugs were dispensed.

Statistical analyses

To assess the agreement between self-reported current medication use and dispensed prescriptions, we firstly dichotomized the questionnaire items into current vs. previous or never use. Furthermore, we extracted dispensed medications from the NorPD for both 100 and 200 days preceding questionnaire completion. Self-reported current drug use and dispensed prescriptions during each of these two time-windows was then compared. In cases when the date of questionnaire completion was missing ($n = 167$), we used the median completion date in the study population. In assessing the agreement of ever use, we dichotomized the items on drug use into current and previous use vs. never use and compared this to dispensed drugs since the start of NorPD (January 2004) until the date of questionnaire completion.

For assessing the validity of self-reported vs. registry based medication use, we calculated sensitivity and specificity. Since neither self-reports nor prescription records can be considered a true gold standard, we calculated sensitivity and specificity in two ways where we firstly used prescription records as the reference standard and then self-reports.

As a measure of overall agreement, we estimated Cohen's kappa, which is defined as the proportion of agreement exceeding that expected by chance²³. For interpreting kappa, we followed the guidelines proposed by Landis and Koch²⁴. According to these guidelines, kappa values can be considered poor (<0.00), slight (<0.20), fair (0.21-0.40), moderate (0.41-0.60), substantial (0.61-0.80), or almost perfect (0.81- 1.00).

In addition to assessing the agreement for sleep medications and tranquilizers, we included blood pressure medications as a reference drug. Since sleep medications and tranquilizers are drugs that can be taken as needed¹², the user pattern of these drugs may in many cases be sporadic. Furthermore, these drugs are generally advised to only be used for short periods at a time (< 4 weeks) due to potential harmful effects^{25 25}. By also assessing the agreement of blood pressure medications, we could see whether the results were different for a drug used on a regular basis. The questionnaire asked about current, previous, and never use of blood pressure medications in the same way as for sleep medications and tranquilizers. We compared self-reported high blood pressure medication to prescription data on the following drugs: antihypertensives (ATC code C02), diuretics (ATC code C03), beta blockers (ATC code C07), calcium channel blockers (ATC code C08), and renin-angiotensin system medications (ATC code C09).

We performed sensitivity analyses were we excluded the participants in the oldest age group (84-85 years old) who had not

filled a prescription on any kind of drug during the year 2009 ($n=77$). We did this because most individuals of this age use some kind of prescription drug²⁶ and the NorPD does not include individual level data on medications distributed at health care facilities. Thus, if no medication was registered in the NorPD for these individuals, this could indicate that they were living in a health care facility at the time they filled in the questionnaire.

In order to get an indication of the representativeness of the sample used in the present study, we obtained the one-year prevalence of dispensed hypnotics and anxiolytics for 2009 from NorPD and compared this to the prevalence in the HELMILO population.

The statistical analyses were carried out in STATA version 15 (StataCorp, College Station, Texas, USA).

Results

In Table 2, the prevalence of both self-reported medication use and dispensed drugs according to NorPD is shown. For self-reported current medication use, the prevalence was 11.0 % for sleep medications and 6.4 % for tranquilizers. According to the NorPD, 7.4 % had filled at least one prescription of hypnotics and 3.4 % had filled at least one prescription of anxiolytics within 100 days before filling out the questionnaire. The corresponding proportions for the time-window of 200 days were 10.4% for hypnotics and 5.7 % for anxiolytics. The proportion of self-reported ever medication use was 19.6 % for sleep medications and 13.8 % for tranquilizers. Since NorPD started collecting data in 2004, 23.6 % had filled prescriptions of hypnotics and 16.4 % had filled prescriptions anxiolytics.

Table 3 shows the agreement between self-reported medication use and dispensed prescriptions. For current use, we found that the sensitivity was highest when NorPD was used as the reference standard. When assessing ever use, the sensitivity was higher when self-reports was the reference standard. The specificity was higher or the same for current use when HELMILO was the reference standard, compared with using NorPD as the reference standard. Furthermore, regarding, ever use we found that the specificity was highest when NorPD was used as the reference standard. In the analyses using NorPD as the reference standard, within a time-window of 100 days, the sensitivity was 0.76 (95 % confidence interval [CI]: 0.74, 0.79) when comparing self-reported current use of sleep medication to dispensed hypnotics. For self-reported current use of tranquilizers vs. dispensed anxiolytics, the sensitivity was 0.58 (95

% CI: 0.54, 0.63). When using a time-window of 200 days, the sensitivity decreased to 0.70 (95 % CI: 0.67, 0.72) for sleep medication use and to 0.50 for tranquilizers (95 % CI: 0.47, 0.54). Regarding ever use, the sensitivity was 0.63 (95 % CI: 0.61, 0.65) for sleep medications and 0.47 (95 % CI: 0.45, 0.49) for tranquilizers. The specificity was quite high for all the conditions we assessed. When assessing the validity of medication use using self-reports as the reference standard, we found that the sensitivity was lower for both sleep medications and tranquilizers for current use. However, regarding ever use, the sensitivity was higher for when HELMILO was the reference standard for both hypnotics (sensitivity=0.76; 95 % CI: 0.74, 0.78) and anxiolytics (sensitivity = 0.56; 95 % CI: 0.53, 0.58). The specificity was 0.89 (95 % CI: 0.88, 0.90) for hypnotics and 0.90 (95 % CI: 0.89, 0.90) for anxiolytics. Following the guidelines for interpreting Cohen's kappa²⁴, there was moderate agreement between both current and ever use of self-reported sleep medication use and dispensed hypnotics using a time-window of 100 days. When using the time-window of 200 days, the agreement was substantial according to these guidelines (kappa = 0.64; 95 % CI: 0.62, 0.67). Regarding tranquilizers, we observed moderate agreement for all conditions.

The reference drug, blood pressure medications, showed almost perfect agreement for both current and ever medication use with kappa values ranging from 0.81 to 0.88.

Exclusion of the oldest participants who had not filled a prescription during 2009 yielded only minimal changes in agreement.

Table 4 shows the prevalence of dispensed hypnotics and anxiolytics in 2009 by age group and sex for both the Oslo population and the HELMILO study population. Generally, the prevalence of dispensed medications was the highest in the Oslo population, except for the prevalence of hypnotics among 84-85 year olds, which was higher in the HELMILO population.

Discussion

In the present study, we compared self-reported and registry-based use of sleep medication and tranquilizers according to various measures of agreement. In each medication group, the sensitivity was highest for having two or more prescriptions during the past 200 days when prescription records was the reference standard. The specificity was high in all the conditions we assessed. The measure of overall agreement, kappa, indicated moderate to substantial agreement between self-reported sleep medications and dispensed

hypnotics and moderate agreement for self-reported use of tranquilizers and dispensed anxiolytics, with the highest level of agreement when having filled one prescription in a 200-day time-window. Furthermore, the agreement was stronger for current medication use than ever medication use.

For current medication use, there was a higher prevalence in the self-reported data than in the registry data. We observed this tendency mostly for the 100-day time window of dispensed prescriptions. For the 200-day time window with one prescription, the proportion of medication users in the two data sources were more similar. Previous studies of the agreement of psychotropic drug use have commonly reported a higher prevalence of medication use in the registry data than in the self-reported data^{10,16,18}. This could be explained by underreporting due to poor recall and reluctance to report sensitive information^{1,27}. Furthermore, the difference in prevalence of self-reported vs. registry-based use is very likely to depend on the time-window chosen for comparison. Since hypnotics and anxiolytics are drugs that may be purchased with the intent of only using it when needed, it is a challenge to choose a time-window of dispensed medications that is going to match self-reported current use accurately. By applying two different time-windows, we could explore what would be a better match for self-reported current use. The kappa values we observed revealed better agreement when using a time-window of 200 days rather than 100 days. However, when measuring agreement in terms of sensitivity we found that the agreement was highest when using the 100-day time window. Still, it seems that a time-window of 200 days with one filled prescription better captures what is considered current medication use among the participants as the prevalence of self-reported and registry based use was more similar in the 200-day time-window.

In the comparison of self-reported ever medication use and dispensed prescriptions, the proportion of medication users was higher in the registry data. This was a surprising finding considering that NorPD did not start until 2004 and any medication dispensed prior to this is not included in the comparison. Thus, it would be reasonable to expect a higher prevalence of self-reported medication use than filled prescriptions. Poor recall may be a central factor for explaining this unexpected discrepancy, which has been shown to increase according to the length of the recall period²⁸. Since the participants only needed to recall drug use dating back to 2004 in order to match the registry data, poor recall is likely not the only explanation of the higher prevalence of dispensed prescriptions in our study. Some participants may also have found it unnecessary to report previous use if they had only used it on a few occasions.

Furthermore, it is possible to fill prescriptions at the pharmacy and keep the drugs until they are needed or never actually use them. This may particularly be an issue for hypnotics and anxiolytics, medications that patients can take depending on whether they have trouble sleeping or if they feel anxious.

Previous studies have shown that the accuracy of self-reported drug use may depend on the wording of the questionnaire; the more detailed information a questionnaire asks for, the better it will compare to records of dispensed drugs²⁹. Such details include whether the medication is physician prescribed, the name of the drug, and frequency and duration of use. In some studies, self-reported drugs may also be coded according to ATC^{10,12}. A study of agreement between self-reported and registry based paternal medication use³⁰, reported lower agreement for hypnotics and anxiolytics compared to our study. However, in the mentioned study, the questions were more open ended and reflected a time-period 4-10 months from use to assessment, rather than current use, which may explain the lower agreement. There are many factors in the present study that makes it unreasonable to expect that the two data sources will reflect each other accurately. For instance, the questionnaire we used does not contain very detailed information on drug use. By only asking for sleep medications and tranquilizers in general, there is a chance that participants report medication use if they use over-the-counter (OTC) medication or medication bought in foreign countries, neither of which are recorded in the NorPD. Furthermore, people may also use their spouse's or other close relatives' medications. In some countries, melatonin is sold OTC, which could have affected the agreement. However, in Norway, a prescription is required in order to obtain melatonin.

We compared the self-reported data to information on dispensed hypnotics and anxiolytics, but other prescription medication such as anti-depressants and antipsychotics may also be used as sleep medication and tranquilizers³¹. Furthermore, the participants reported drug use according to the time-frames current, previous, and never use. However, since sleep medications may be used intermittently, it may have been difficult for the participants to distinguish between previous and current use. The questionnaire also lacked a definition of current use and it was left up to the participants to define current use. Thus, the participants' definitions of current use should be expected to vary. This is also likely to have a stronger impact on the data on a medication type taken sporadically than regularly used drugs and may further have contributed to uncertainty in the data. By using a reference drug, we were able to compare the agreement of drugs taken as needed to the agreement of drugs taken regularly for a chronic condition. We used

blood pressure medications as the reference drug in the present study, which showed better agreement than for sleep medications and tranquilizers. Previous studies have also shown that self-reported and registry data on drugs taken regularly for chronic conditions compare better than psychotropic medications. Such drugs include diabetes medication and cardiovascular drugs^{10,11,14,15,18}. The lower agreement for intermittently used drugs, including psychotropic drugs, may, among other things, be due to both non-reporting and non-compliance¹⁴.

When comparing the prevalence of hypnotics and anxiolytics in the HELMILO and the Oslo population, we found that the prevalence of medication use was lower in the HELMILO population for most age groups. This may imply that the HELMILO study population is healthier than the Oslo population. There was, however, one exception; in the oldest age group, the prevalence of hypnotics was higher in the HELMILO population. Still, this may not be contradictory to the possibility that the study population was healthier, since it is more likely that elderly people are living in health care facilities and medications distributed there are not recorded in the NorPD. If those in the oldest age group who participated were more likely to be living at home, they would probably also be registered with more dispensed hypnotics than those living at health care facilities, but still be healthier. This indicates that dispensed hypnotics are underreported at an individual level in NorPD among the elderly in the general population as could be expected. Although we did not observe the same tendency for anxiolytics, hypnotics have been shown to be more commonly prescribed among elderly than benzodiazepine anxiolytics²⁵. Furthermore, sleep problems and hypnotics use have been found to be more common among older rather than younger people³².

A limitation in comparing self-reported and registry-based medication use is that neither can be considered a gold standard²⁸. The prescription registry does not record actual use of the medication, and self-reports may involve poor recall and could be affected by how the questions on medication use are framed. A true gold standard could perhaps be measurements of traces of medication in biological samples such as blood, urine and hair. However, such measurements would be highly dependent on the half-life of the drug and type of biological sample. This would, thus, pose a challenge, particularly for drugs that are taken infrequently. Furthermore, this type of sampling would be very impractical and expensive to conduct in a large study population and would only provide a snapshot.

We used blood pressure medications as the reference drug because it is a type of drug that is used regularly for a chronic

condition. Thus, better agreement between self-reports and prescription records can be expected. However, a limitation in using blood pressure medications as the reference drug is that multiple drugs from this class may be used at the same time. This makes it easier to recall at least one drug of blood pressure medication compared with sleep medications and tranquilizers, for which it is more common to take only one drug at the time

In the comparison of current medication use, using self-reports as the reference standard, the specificity was higher than when prescription records were the reference standard. However, the sensitivity was lower. An effect estimate's departure from its true value is a function of sensitivity and specificity and it has been demonstrated that specificity of the exposure measurement may be more important than sensitivity in determining the bias in the effect estimate³³. For the present study, this may imply that using data from the prescription registry may yield the least biased results in an epidemiological study compared with using self-reports when it comes to current medication use. Regarding ever medication use, using self-reports as the outcome is likely to yield the least bias since the specificity was highest in the analyses where prescription records were the reference standard.

Although the response rate in HELMILO was 48 %, the study sample is quite large and covers various age groups. We were also able to get an indication of the representativeness by comparing the prevalence of dispensed prescriptions in the HELMILO with the Oslo population. A problem when assessing the agreement of ever medication use was that the NorPD did not start recording dispensed prescriptions until 2004. Still, the prevalence of medication use was higher in the registry data, indicating that poor recall was a large problem in assessing previous use. A strength of the present study was that we considered two time-windows when assessing the agreement of current medication use. Thus, we could evaluate which length of the time-window of dispensed prescriptions reflects current use better. Although NorPD has 100% coverage for pharmacy records in Norway²¹, it does not include individual level data on medications distributed at institutions. Thus, if a participant was staying at a hospital or another type of health care facility around the time of the study, the medication will not have been captured in the NorPD. Furthermore, no information on OTC medication is recorded in the NorPD.

Conclusion

The present study suggests that there is moderate to substantial agreement between self-reported data on sleep medications and tranquilizers and records of dispensed prescriptions in a general adult population. The magnitude of agreement varied according to drug category and time window. Neither self-reported nor registry data may provide complete information on sleep medications and tranquilizers. Thus, it is important to critically assess the limitations in each data source when examining use of these drugs in epidemiological studies.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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Table 1. Questionnaire items on medication use in HELMILO.

Do you use:	Yes, now	Before, but not now	Never used
Sleep medication?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tranquilizers?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medication for high blood pressure?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Abbreviation: HELMILO, The Health and Environment in Oslo Study.

Table 2. Prevalence of self-reported medication use in HELMILO and dispensed medication in NorPD.

Drug category (missing)	Self-reported in HELMILO <i>n</i> (%)		Drug category	Dispensed drugs in NorPD <i>n</i> (%)		
	Current use	Ever use		100 days	200 days	Since 2004
Sleep medication (365)	1,385 (11.0)	2,478 (19.6)	Hypnotics [†]	939 (7.4)	1,314 (10.4)	2,991 (23.6)
Tranquilizers (421)	802 (6.4)	1,739 (13.8)	Anxiolytics [‡]	488 (3.4)	723 (5.7)	2,062 (16.4)
BP medication (264)	2,716 (21.3)	3,020 (23.7)	BP medication [§]	2,717 (21.3)	3,031 (23.8)	4,479 (28.7)

Abbreviations: NorPD, Norwegian prescription database; HELMILO, The Health and Environment in Oslo Study; BP, blood pressure.

[†]ATC code N05C (hypnotics)

[‡]ATC code N05B (anxiolytics)

[§]ATC code C02 (antihypertensives), ATC code C03 (diuretics), ATC code C07 (beta blockers), ATC code C08 (calcium channel blockers), and ATC code C09 (renin-angiotensin system medications)

Table 3. Self-reported medication use in HELMILO vs. dispensed drugs according to NorPD.

Drug type in HELMILO	Drug type in NorPD	In both (a)	Only in HELMILO (b)	Only in NorPD (c)	Neither (d)	Sensitivity [†] NorPD ref. (95% CI)	Specificity [‡] NorPD ref. (95% CI)	Sensitivity [§] HELMILO ref. (95% CI)	Specificity [¶] HELMILO ref. (95% CI)	Kappa (95% CI)
Sleep medication, current use	Hypnotics, 100 days	718	667	221	11,048	0.76 (0.74, 0.79)	0.94 (0.94, 0.95)	0.52 (0.49, 0.54)	0.98 (0.98, 0.98)	0.58 (0.56, 0.60)
Sleep medication, current use	Hypnotics, 200 days	919	466	395	10,874	0.70 (0.67, 0.72)	0.96 (0.96, 0.96)	0.66 (0.64, 0.69)	0.96 (0.96, 0.97)	0.64 (0.62, 0.66)
Sleep medication, current use	Hypnotics (>1), 200 days	578	807	97	11,172	0.86 (0.83, 0.88)	0.93 (0.93, 0.94)	0.42 (0.39, 0.44)	0.99 (0.99, 0.99)	0.53 (0.50, 0.56)
Sleep medication, ever use	Hypnotics, since 2004	1,884	594	1,107	9,069	0.63 (0.61, 0.65)	0.94 (0.93, 0.94)	0.76 (0.74, 0.78)	0.89 (0.88, 0.90)	0.60 (0.59, 0.61)
Tranquillizers, current use	Anxiolytics, 100 days	285	517	203	11,593	0.58 (0.54, 0.63)	0.96 (0.95, 0.96)	0.36 (0.32, 0.39)	0.98 (0.98, 0.99)	0.41 (0.38, 0.44)
Tranquillizers, current use	Anxiolytics, 200 days	365	437	358	11,438	0.50 (0.47, 0.54)	0.96 (0.96, 0.97)	0.46 (0.42, 0.49)	0.97 (0.97, 0.97)	0.45 (0.41, 0.49)
Tranquillizers, current use	Anxiolytics (>1), 200 days	235	567	107	11,689	0.69 (0.63, 0.74)	0.95 (0.95, 0.96)	0.33 (0.30, 0.37)	0.99 (0.99, 0.99)	0.39 (0.35, 0.43)
Tranquillizers, ever use	Anxiolytics, since 2004	966	773	1,096	9,763	0.47 (0.45, 0.49)	0.93 (0.92, 0.93)	0.56 (0.53, 0.58)	0.90 (0.89, 0.90)	0.42 (0.40, 0.44)
BP medication, current use	BP medication, 100 days	2,381	335	336	9,703	0.88 (0.86, 0.89)	0.97 (0.96, 0.97)	0.88 (0.86, 0.89)	0.97 (0.96, 0.97)	0.84 (0.83, 0.85)
BP medication, current use	BP medication, 200 days	2,598	433	118	9,606	0.96 (0.95, 0.96)	0.96 (0.95, 0.96)	0.86 (0.84, 0.87)	0.99 (0.99, 0.99)	0.88 (0.87, 0.89)
BP medication, current use	BP medication (>1), 200 days	1,557	1,159	65	9,974	0.96 (0.95, 0.97)	0.90 (0.89, 0.90)	0.93 (0.92, 0.94)	0.99 (0.99, 0.99)	0.66 (0.65, 0.67)
BP medication, ever use	BP medication, since 2004	2,877	143	777	8,958	0.79 (0.77, 0.80)	0.98 (0.98, 0.99)	0.95 (0.94, 0.96)	0.92 (0.91, 0.93)	0.81 (0.80, 0.82)

Abbreviations: NorPD, Norwegian Prescription Database; HELMILO, The Health and environment in Oslo Study; CI, confidence interval; BP, blood pressure.

[†]Sensitivity with prescription registry as reference standard = $a/(a+c)$

[‡]Specificity with prescription registry as reference standard = $d/(b+d)$

[§]Sensitivity with self-reports as reference standard = $a/(a+b)$

[¶]Specificity with self-reports as reference standard = $d/(c+d)$

Table 4. Prevalence of dispensed hypnotics and anxiolytics according to NorPD in 2009 for both the Oslo population (n = 34,405) and the HELMILO study population (n = 13,019).

Women					
Hypnotics			Anxiolytics		
Age	Oslo	HELMILO	Age	Oslo	HELMILO
39	7.0 %	6.9 %	39	4.9 %	3.8 %
49	12.5 %	10.8 %	49	8.5 %	6.9 %
54	16.7 %	14.9 %	54	11.8 %	9.1 %
68-69	25.3 %	22.8 %	68-69	16.6 %	12.7 %
84-85	36.5 %	39.4 %	84-85	21.6 %	18.2 %

Men					
Hypnotics			Anxiolytics		
Age	Oslo	HELMILO	Age	Oslo	HELMILO
39	5.4 %	3.7 %	39	3.8 %	2.8 %
49	7.7 %	5.5 %	49	6.0 %	3.7 %
54	10.8 %	9.2 %	54	7.2 %	5.8 %
68-69	14.7 %	12.5 %	68-69	8.7 %	6.6 %
84-85	25.6 %	26.7 %	84-85	12.8 %	10.4 %

Abbreviations: NorPD, Norwegian prescription database; HELMILO, The Health and Environment in Oslo Study.