Research report

NAD

Nordic Studies on Alcohol and Drugs
2022, Vol. 39(1) 50–63

DOI: 10.1177/14550725211003417
journals.sagepub.com/home/nad
SAGE

Factors associated with non-medical use of prescription drugs among individuals with a legitimate prescription for medical purposes: A population-based study

Minna Pylväs-Korolainen
University of Helsinki, Finland

Karoliina Karjalainen
Finnish Institute for Health and Welfare, Helsinki, Finland

Tomi Lintonen
Finnish Foundation for Alcohol Studies, Helsinki, Finland

Abstract

Background: Psychoactive prescription drugs are known to have abuse potential. This study was aimed at studying the non-medical use of prescription drugs (NMUPD) among individuals with prescriptions for anxiolytics, sedatives, or strong analgesics. We examined the association of socio-demographics, binge drinking, the number of drug prescriptions, and drug types prescribed for medical purposes with NMUPD among the general Finnish population. **Methods:** Data were derived from population-based (ages 15–69 years) Drug Surveys conducted in Finland in 2006, 2010, and 2014. The response rates varied between 48% and 55%. Individuals with prescriptions for one or more prescription drugs in the last 12 months were included ($n = 1{,}602$) and divided into three groups: medical use only, NMUPD, and NMUPD with illicit drug use (ILLICIT USE). Multinomial logistic regression was used. **Results:** Among individuals with a prescription for at least one prescription drug, 5.7% reported NMUPD. Living alone and being outside the labour

Submitted: 22 February 2021; accepted: 1 March 2021

Corresponding author:
Minna Pylväs-Korolainen, Faculty of Medicine, University of Helsinki, P.O. Box 63, FI-00014, Helsinki, Finland.
Email: minna.pylvas-korolainen@helsinki.fi

force were associated with NMUPD. Younger age, living in a large city, living alone, and unemployment were associated with ILLICIT USE. Frequent binge drinking and a high number of drug prescriptions were associated with both NMUPD and ILLICIT USE. Those reporting ILLICIT USE were more likely to have a prescription for sedatives. **Conclusions:** Although NMUPD is on a rather low level among those who have a prescription for legitimate purposes, having multiple prescriptions increased the likelihood of NMUPD. Low socio-economic position and binge drinking are associated with NMUPD and this should be taken into account when planning interventions and preventive actions.

Keywords
Finland, illicit drug use, non-medical use of prescription drugs, population-based survey, prescription drug use

Introduction

Psychoactive prescription drugs (later also simply prescription drugs), such as opioids, tranquilisers (also referred to as benzodiazepines or sedatives), and sleep medications (z-drugs), are effective for treating conditions including pain, anxiety, and insomnia. These drugs influence the central nervous system (CNS) and can be used for treating conditions other than those for which they were originally intended. Psychoactive prescription drug misuse has been defined as the use of a medication for another indication or in another way than prescribed, abuse as use for intentional intoxication, such as getting high, and addiction as chronic disease meeting diagnostical criteria (Smith et al., 2013) by ICD-10 or DSM-V (American Psychiatric Association, 2013; World Health Organization, 1992). The use of drugs originally prescribed to another person is also considered misuse of prescription drugs (Barrett et al., 2008; Beyene et al., 2018). In the present article, the term "non-medical use of prescription drugs" (NMUPD) is used to refer to all of these practices.

In 2016, 7.4% of the Finnish population between the ages of 15 and 64 years used prescription opioids, according to a recent population-based study (Böckerman et al., 2021). This is around the same level as in other Nordic countries, based on a repeated cross-sectional study focusing on prescription opioid dispensation levels in Norway, Sweden and Denmark (Muller et al., 2019). Kurko et al. (2018) found in their register-based study that 3.6% of the Finnish adult population in 2014 were considered long-term benzodiazepine users. This is in line with a systematic review of register-based studies from different countries and areas that stated long-term use of benzodiazepines to be around 3% in the general population (Kurko et al., 2015). As for prevalence of past-year NMUPD (sedatives, hypnotics, and/or analgesics), population-based surveys conducted in Finland during the 2000s have shown it to be around 2% among people aged 15–69 years (Karjalainen et al., 2020). This seems to be lower than in Denmark and Sweden, according to general population surveys conducted in 2014 among people aged 12–49 years, where the past-year prevalence of opioids was 4.4% and 3.8%, and for sedatives 3.8% and 7.5%, respectively, but study methods varied greatly (Novak et al., 2016). All in all, the prevalence of medical use and non-medical use of prescription drugs is difficult to compare between countries due to lack of common practices to compile statistics on prescription drug consumption.

Previous studies have extensively discussed the socio-demographic factors correlating with medical use of prescription drugs and NMUPD. A Finnish register-based cohort study, focusing

on those 18 years or older with a prescription for benzodiazepines, found that male sex was associated with long-term use of benzodiazepines (Taipale et al., 2020). Long-term medical use of benzodiazepines has also been associated with older age and low socio-economic position in a Norwegian retrospective cohort study which focused on individuals 20 years old or above residing in Nord-Trøndelag County (Nordfjærn et al., 2014) and these associations were also present in a French population-based cohort study among individuals aged 18–69 years (Airagnes et al., 2019). In addition, Airagnes et al. (2019) found that long-term benzodiazepine use was associated with living alone and a low level of education. These findings were in accordance with a population-based study from the United States that focused on people 18 years old or above by Blanco et al. (2018), and they also found a correlation between not living in a large city and medical benzodiazepine use. Becker et al. (2007) established in their cross-sectional study in the United States that, among people aged 18 years or older, non-medical use of sedatives was also associated with low socio-economic level and older age, whereas Blanco et al. (2018) found an association with younger age. Correlations between gender and non-medical use of tranquillisers are inconclusive. Blanco et al. (2018) found that male sex was associated with non-medical use of benzodiazepines, but as Simoni-Wastila et al. (2004) found in their population-based study in the United States, among those 12 years old and older, female sex was also associated with non-medical use of tranquilisers. Becker et al. (2007) had the same outcome in their study.

Factors associated with long-term medical use of prescription opioids have similarities to long-term medical benzodiazepine use. In a Norwegian population-based study focusing on individuals 35 years old and above, medical use of prescription opioids was found to be associated with low income, not working, a low level of education and being divorced (Svendsen et al., 2014). Böckerman et al. (2021) also found a correlation between low socio-economic status and prescription opioid use. Parsells Kelly et al. (2008) found that older age was associated with opioid use among American adults (aged 18+ years), although they did not distinguish between medical and non-medical use. In a systematic review and meta-analysis of studies reporting on risk factors for prescription opioid misuse, Cragg et al. (2019) found that younger age was associated with misuse of prescription opioids.

Those who use prescription drugs non-medically often also use illicit drugs or multiple prescription drugs, either medically or non-medically, based on a study that used data from surveys conducted in five countries (Australia, Germany, France, the United Kingdom and the United States) among those willing to answer and who were at least 16 years old. Among the respondents who had a prescription for opioids, 4.4% reported benzodiazepine use during the past year, 42.3% reported past-year illicit drug use and 7.9% reported both past-year benzodiazepine use and illicit drug use (Morley et al., 2017). In the Finnish general population aged 15–69 years, from 2002 and 2014, illicit drug use among those with NMUPD increased from 21% to 70%. This increase was notably higher than the illicit drug use increase (from 2.5% to 5.4%) among those without NMUPD during the same time period (Karjalainen et al., 2017). Mowbray and Quinn (2015) found in their population-based study that past-year illicit drug use is a predictor of misuse of pain relievers among American adults (aged 18+ years). Grigsby and Howard (2019) studied past-month prescription opioid misuse and co-occurring use of other substances, and in their nationally representative data from the United States of people at least 18 years old, young people were found to be at risk of misusing prescription opioids and illicit drugs.

Alcohol consumption has also been associated with medical use and non-medical use of opioids, tranquillisers and sleep medication. Ives et al. (2006) found in their clinical study from the United States that alcohol abuse was associated with opioid misuse among patients with chronic

pain. Tevik et al. (2017) found in their population-based study from Norway that, among individuals aged 65 years and older who consumed alcohol regularly, 29% used drugs with addiction potential. Nordfjærn et al. (2014) drew similar conclusions in their study: benzodiazepine or z-drug use was associated with regular alcohol consumption and older age. There are some disparate findings as well. Hargreave et al. (2010) found that in a Danish population-based study among individuals aged 18–45 years, long-term prescription opioid use was associated with binge drinking, but it was also associated with abstinence from alcohol. In addition, younger age among those with alcohol use disorder was associated with NMUPD in a national survey conducted from 2001–2002 in the United States (McCabe et al., 2006). All in all, alcohol use disorder and NMUPD often co-occur.

The source of drug diversion has been discussed in previous studies and age has been defined as one factor that defines the source of prescription drugs that are used for non-medical purposes. A study based on 2009–2011 National Survey on Drug Use and Health surveys from the United States found that older people are more likely to misuse their own prescription pain relievers while younger people more often obtain prescription drugs for misuse from friends or other sources (Mowbray & Quinn, 2015). The same study also found that older people obtain their prescriptions from multiple doctors. On the other hand, Hulme et al. (2018) found in their meta-analysis that obtaining many prescriptions from different doctors was uncommon, although drug monitoring programmes are considered to be tools for decreasing NMUPD (Ostling et al., 2018).

Along with other factors, NMUPD is also associated with psychiatric disorders such as depression and mood disorders (Blanco et al., 2013; Taipale et al., 2020). On the other hand, different socio-demographic factors and medical conditions also predict remission probability from the substance use disorder. Having another substance use problem or mental health issues decreases the probability of the remission of prescription drug use disorder (Blanco et al., 2013). Acquiring information about NMUPD risk factors enables physicians and other professionals to identify individuals prone to misuse prescription drugs and improve preventive procedures (Pätsi et al., 2020).

Most studies seem to focus on correlations between prescription drug misuse and other substance use problems or correlates between two different prescription drugs that are misused. Also, the majority of the studies come from the United States, so the outcomes might not be comparable to Europe. In a Swedish study, it was found that there may be significant socio-demographic differences between those misusing prescription analgesics, prescription sedatives, or both (Abrahamsson & Hakansson, 2015), but there is still a lack of knowledge about NMUPD and different factors associated with it, especially in the Nordic countries.

The purpose of this study was hence to examine NMUPD in Finland among those with legitimate prescriptions for psychoactive prescription drugs by using data from a series of cross-sectional, population-based surveys. In particular, we aimed to examine (1) the proportion of medical users of psychoactive prescription drugs who also used them non-medically among the general Finnish population; (2) whether socio-demographics, binge drinking, and the number of drug prescriptions for psychoactive prescription drugs were associated with NMUPD among medical users; and (3) whether the type of drugs (anxiolytics, sedatives, or strong analgesics) prescribed for medical purposes is associated with NMUPD.

Material and methods

Data

The Finnish Institute for Health and Welfare has conducted population-based Drug Surveys every four years since 1992. Data collection was organised by Statistics Finland. The surveys focused on documenting changes in drug use behaviour in Finland. In this study, the data used consisted

of data from surveys conducted in the years 2006, 2010, and 2014. These data were pooled into one dataset to increase their statistical relevance. The surveys were sent to people by mail, and in 2010 and 2014 it was also possible to take the surveys via the internet. Representative samples were randomly selected from the Finnish Population Information System. The samples included people aged 15 to 69 years with a permanent address in Finland. People without a permanent address, residents of the Åland Islands, and institutionalised people were excluded.

The random sample sizes were 5,500, 4,250, and 7,000 persons in 2006, 2010, and 2014, respectively. Because younger individuals tend to be more active with regard to drug use, the age groups 15 to 34 years in 2006 and 15 to 39 years in 2010 and 2014 were oversampled to increase the studies' analytical reach. As the response rates were 55%, 48%, and 50% in 2006, 2010, and 2014, respectively, there were altogether 8,573 respondents in the data.

Measurements

In this study, those with prescription for at least one psychoactive prescription drug were identified with the question: "Have you had a prescription from a physician for (a) sedatives, (b) strong painkillers (opioids), (c) anxiolytics during the last 12 months?" (Yes/No). Those responding "Yes" regarding at least one of the options above were included in the analysis data ($n = 1{,}602$).

NMUPD was assessed using the following question: "Have you used or tried painkillers, anxiolytics, or sedatives during the last 12 months non-medically (e.g., without a prescription or at a dose higher than the prescribed dose)?" (Yes/No). All NMUPD was measured with this one question, i.e., there were no separate question on the non-medical use of different prescription drugs. Illicit drug use was evaluated with the following question: "Have you used illicit drugs (such as hashish, marijuana, amphetamine, heroin or other similar substances) during the last 12 months?" (Yes/No). Respondents with missing values on these questions were not included in the analysis data.

The respondents were divided into three mutually exclusive prescription drug user groups: (1) those with at least one prescription for either painkillers, anxiolytics or sedatives but no NMUPD or illicit drug use (i.e., medical drug use only, referred to as MED USE) ($n = 1{,}510$); (2) those with at least one prescription for either painkillers, anxiolytics or sedatives and NMUPD but no illicit drug use during the last 12 months (referred to as NON-MED USE) ($n = 50$); and (3) those with at least one prescription for either painkillers, anxiolytics or sedatives, NMUPD, and illicit drug use during the last 12 months (referred to as ILLICIT USE) ($n = 42$). This was used as an outcome measure, MED USE as a reference category. Those who reported at least one prescription for either painkillers, anxiolytics or sedatives and illicit drug use, but reported no NMUPD, were not included in the study.

The other indicators measured were socio-demographics, binge drinking frequency, and prescription drug variables. Socio-demographics included age group (15–29 and 30–69 years), sex, employment status (employed, unemployed, or temporarily laid off; or studying, retired, or otherwise outside the labour force), education (basic, secondary, or tertiary), household (living alone or living with other people or family), and place of residence (large city, small city, or countryside). Binge drinking frequency (once a week or more frequently; at least three times/year, but less than once a week; never or once or twice per year) was defined as drinking more than four and six units at a time for women and men, respectively.

Indicators considering drug prescriptions were assessed with the question "Have you had a prescription from a physician for (a) sedatives, (b) strong painkillers (opioids), (c) anxiolytics during the last 12 months?" (Yes/No). All "Yes" answers to each drug category were considered to be respondents' drug prescription type(s). In addition, for the number of drug prescriptions measure, each participant's "Yes"

Table 1. The associations between socio-demographics and non-medical use of prescription drugs among the general Finnish population ($n = 1{,}602$), adjusted for all the variables.

	MED USE ($n = 1{,}510$) %	NON-MED USE ($n = 50$) %	ILLICIT USE ($n = 42$) %	NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE	
				OR	95% CI	*OR*	95% CI
Sex							
Male	46.6	55.6	60.5	1.6	0.9–2.8	2.0	1.0–4.1
Female	53.4	44.4	39.5	1.0		1.0	
Age (years)							
15–29	16.8	22.2	63.2	1.2	0.6–2.4	**7.5**	3.7–15.4
30–69	83.2	77.8	36.8	1.0		1.0	
County type							
Large city	33.4	51.9	57.9	2.1	1.0–4.5	**2.9**	1.0–8.5
Small city	40.9	27.8	28.9	1.0	0.4–2.1	1.3	0.4–3.9
Countryside	25.7	20.4	13.2	1.0		1.0	
Household							
Living alone or with others excluding family	28.2	54.7	58.3	**2.7**	1.5–4.7	**2.6**	1.3–5.3
Living with family	71.8	45.3	41.7	1.0		1.0	
Education							
Basic	22.0	31.5	13.2	1.9	0.8–4.4	0.9	0.3–2.8
Secondary	50.5	48.1	63.2	1.4	0.7–3.0	1.6	0.7–3.6
Tertiary	27.5	20.4	23.7	1.0		1.0	
Employment status							
Unemployed or temporarily laid off	6.7	5.7	16.2	1.1	0.3–3.7	**2.9**	1.0–8.2
Studying, retired, or other	36.7	56.6	37.8	**1.9**	1.0–3.5	1.3	0.6–2.7
Employed	57.1	37.7	45.9	1.0		1.0	

Notes. MED USE = medical drug use only in the last 12 months; NON-MED USE = non-medical use of prescription drugs, no illicit drug use in last the 12 months; ILLICIT USE = non-medical use of prescription drugs and illicit drug use in last the 12 months.
*OR*s shown in bold type, $p < 0.05$.

answers for the previous question were calculated together.

Statistical analysis

Cross-tabulation was used to describe the distributions of socio-demographics, binge drinking frequency, number of drug prescriptions, and type of drug prescriptions in the three different prescription drug user groups (MED USE, NON-MED USE, and ILLICIT USE). Multinomial logistic regression models were used, with prescription drug user groups as an outcome measure and MED USE as a reference category. First, the association between socio-demographic variables (sex, age, county type, education and employment status) and NMUPD was estimated (Table 1). Second, we estimated the association between binge drinking frequency and the number of drug prescriptions and NMUPD (Table 2). Third, the association between drug prescription type and NMUPD was estimated (Table 3).

To ensure population representation, weighting coefficients were used in all analyses since there were differences between response activity and the younger age groups were oversampled. The weighting coefficients were

Table 2. The associations between non-medical use of prescription drugs and binge drinking frequency and the number of drug prescriptions in the general Finnish population ($n = 1{,}602$).

				Model 1				Model 2				Model 3			
	MED USE % ($n = 1{,}510$)	NON-MED USE % ($n = 50$)	ILLICIT USE % ($n = 42$)	NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE		NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE		NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE	
				OR	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI
Binge drinking frequency															
Once a week or more frequently	16.7	31.5	45.9	**2.3**	1.3–5.7	**11.0**	3.2–38.2	**2.8**	1.3–5.8	**11.4**	3.2–40.8				
At least 3 times per year, less than once a week	35.4	37.0	45.9	1.6	0.8–3.3	**4.0**	1.2–13.7	1.6	0.8–3.3	**4.0**	1.1–14.0				
Never or once or twice per year	47.9	31.5	8.1	1.0		1.0		1.0		1.0					
Number of drug prescriptions															
3	4.7	10.9	16.2	**9.0**	3.0–26.7	2.4	0.9–6.3					2.3	0.9–6.3	**9.1**	2.8–29.0
2	13.6	32.7	40.5	**5.9**	2.6–13.4	**3.0**	1.6–5.6					**3.0**	1.6–5.7	**6.4**	2.7–14.8
1	81.7	56.4	43.2	1.0		1.0						1.0		1.0	

Notes. Model 1: adjusted for sex, age, county type, household, education and employment status. Model 2: adjusted for sex, age, county type, household, education, employment status and number of drug prescriptions. Model 3: adjusted for sex, age, county type, household, education, employment status and binge drinking frequency. MED USE = medical drug use only in the last 12 months; NON-MED USE = non-medical use of prescription drugs, no illicit drug use in the last 12 months; ILLICIT USE = non-medical use of prescription drugs and illicit drug use in the last 12 months.

*OR*s shown in bold type, $p < 0.05$.

Table 3. The association between non-medical use of prescription drugs and drug prescription type in the general Finnish population ($n = 1{,}602$).

				Model 1				Model 2				Model 3			
	MED USE % ($n = 1{,}510$)	NON-MED USE % ($n = 50$)	ILLICIT USE % ($n = 42$)	NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE		NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE		NON-MED USE vs. MED USE		ILLICIT USE vs. MED USE	
				OR	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI	*OR*	95% CI
Painkillers															
Yes	72.2	57.4	48.6	**0.6**	0.3–0.1	**0.3**	0.2–0.7	**0.5**	0.3–1.0	**0.3**	0.1–0.7	0.6	0.3–1.0	**0.3**	0.1–0.7
No	27.8	42.6	51.4	1.0		1.0		1.0		1.0		1.0		1.0	
Anxiolytics															
Yes	16.6	42.6	48.6	**2.8**	1.6–5.1	**5.8**	2.8–12.3	2.0	0.9–4.5	2.4	0.8–7.2	2.1	0.9–4.6	2.6	0.8–8.1
No	83.4	57.4	51.4	1.0		1.0		1.0		1.0		1.0		1.0	
Sedatives															
Yes	34.1	53.7	67.6	**2.1**	1.2–3.7	**5.9**	2.7–12.9	1.3	0.6–2.8	**2.9**	1.1–7.7	1.3	0.6–2.6	**2.8**	1.0–7.5
No	65.9	46.3	32.4	1.0		1.0		1.0		1.0		1.0		1.0	

Notes. Model 1: adjusted for sex, age, county type, household, education, and employment status. Model 2: adjusted for sex, age, county type, household, education, employment status, and number of drug prescriptions. Model 3: adjusted for sex, age, county type, household, education, employment status, number of drug prescriptions, and binge drinking frequency. MEDUSE = medical drug use only in the last 12 months; NON-MEDUSE = non-medical use of prescription drugs, no illicit drug use in the last 12 months; ILLICIT USE = non-medical use of prescription drugs and illicit drug use in the last 12 months.
*OR*s shown in bold type, $p < 0.05$.

based on age, sex, education, and the level of urbanisation, and were calculated by Statistics Finland. SPSS software version 24 was used to analyse the data, and a p-value of < 0.05 was considered statistically significant. All results are presented as odds ratios (*OR*) and their 95% confidence intervals (CI).

Research ethics

The study protocol in each round of data collection was approved by the ethical review board of the Finnish Institute for Health and Welfare (THL/622/6.02.01/2014). In a cover letter attached to the questionnaire, participants were informed that the survey was anonymous and voluntary. Participants gave their consent by responding to and returning the questionnaire.

Results

We found that 19.4% of the Finnish population has at least one prescription for a psychoactive prescription drug obtained from a physician and 2.0% of the Finnish population reported past-year NMUPD. Of those with at least one prescription for psychoactive prescription drugs, 5.7% also used prescription drugs non-medically (3.1% NON-MED USE, 2.6% ILLICIT USE).

The socio-demographics of the three prescription drug user groups are shown in Table 1. As shown in the table, there was an association between age and ILLICIT USE: individuals aged 15 to 29 years were more likely to use prescription drugs non-medically and illicit drugs (*OR* 7.5) compared to those aged 30 years or above. Neither sex nor education was associated with NON-MED USE or ILLICIT USE. Those living in a large city were more likely to use illicit drugs (*OR* 2.9) than were those living in a rural area, and those living alone or with others excluding family were more likely to use illicit drugs and prescription drugs non-medically (*OR* 2.6) or just prescription drugs non-medically (*OR* 2.7). Those studying, retired, or otherwise outside the labour force were more likely to use prescription drugs non-medically (*OR* 1.9), whereas those unemployed or temporarily laid off were more likely to use illicit drugs (*OR* 2.9).

Binge drinking frequency and the number of drug prescriptions are shown in Table 2. When adjusted for socio-demographics (Model 1), those binge drinking once a week or more frequently were more likely to use prescription drugs non-medically and illicit drugs. Individuals binge drinking at least three times a year but less than once a week were more likely to use illicit drugs. The results were similar when adjusted for socio-demographics and the number of drug prescriptions (Model 2). When adjusted for socio-demographics (Model 1), having more than one drug prescription was associated with NON-MED USE. Having two prescriptions increased the odds of ILLICIT USE; however, the result did not reach statistical significance for having three prescriptions. When adjusted for both socio-demographics and binge drinking frequency (Model 3), having more than one prescription was associated with ILLICIT USE. Having two drug prescriptions was associated with NON-MED USE, however, the result did not establish statistical significance for having three prescriptions.

Drug prescription types and their association with NMUPD are shown in Table 3. When adjusted for socio-demographics (Model 1), two types of prescription drugs, anxiolytics and sedatives, were associated with increased odds of both NON-MED USE and ILLICIT USE. After adjusting for socio-demographics and the number of drug prescriptions (Model 2), the association between a prescription for anxiolytics and NON-MED USE and ILLICIT USE did not persist. The finding was the same for the association between a prescription for sedatives and NON-MED USE. However, the association between a prescription for sedatives and ILLICIT USE persisted even after adjusting for socio-demographics, the number of drug prescriptions, and binge drinking (Model 3). By contrast, a prescription for painkillers had the opposite association with

ILLICIT USE and NON-MED USE compared to prescriptions for other drugs. After adjusting for socio-demographics (Model 1) and for socio-demographics and the number of drug prescriptions (Model 2), a prescription for painkillers was found to be associated with decreased odds of both NON-MED USE and ILLICIT USE. However, after adjusting for socio-demographics, the number of drug prescriptions, and binge drinking (Model 3), only the association between a prescription for painkillers and ILLICIT USE persisted.

Discussion

This study focused on individuals in the Finnish population with a legitimate prescription for one or more CNS medications (painkillers, sedatives, and anxiolytics) and who also reported non-medical use of these drugs. Overall, the level of NMUPD was rather low (5.7%) among individuals with a prescription for legitimate purposes. Still, it is higher compared to the general Finnish population in total (whether they have prescriptions or not), as during the 2000s, past-year prevalence of NMUPD (sedatives, hypnotics, and/or analgesics) has been approximately 2% (Karjalainen et al., 2020), implying that those with a legitimate prescription may have a greater risk of NMUPD, as shown in other studies as well (Edlund et al., 2007; Votaw et al., 2019).

We found that having more than one different CNS drug prescription was associated with NMUPD. It has been shown in previous studies that tranquiliser and opioid misuse often coexist (Boggis & Feder, 2019) as well as benzodiazepine and opioid misuse (Bouvier et al., 2018). We also found that those who had a prescription for anxiolytics or sedatives were more likely to use prescription drugs non-medically. Even though it is at a low level in Finland (Kurko et al., 2018), long-term medical use of sedatives or anxiolytics has been shown to be one of the risk factors for NMUPD (Boyd et al., 2015). However, compared to sedatives or anxiolytics, those with prescriptions for opioids were less likely to use prescription drugs non-medically. In Finland, opioid prescriptions have multiplied since the 1990s and, in 2011, approximately 410,000 patients in Finland used opioids (in hospitals and outpatient care) based on prescription records (Nevantaus et al., 2013). The overall consumption of opioids has declined since 2012, but consumption of strong opioids, such as fentanyl and oxycodone, has increased (Kalso et al., 2019). Even while in this study, the likelihood of NMUPD was not increased by having a prescription for opioids, typically an increase in opioid prescriptions is associated with a higher level of NMUPD (Ostling et al., 2018).

Our findings may indicate that CNS drugs, originally prescribed for medical purposes, are also used non-medically, keeping in mind that the sources for misused prescription drugs were uncertain in our study. Previous studies suggest that having a prescription for a CNS drug increases the risk of misuse (McCabe et al., 2013; Votaw et al., 2019), but a prescription from a physician may not be the main source for misused prescription drugs (Hulme et al., 2018). Novak et al. (2016) found that friends and family were the main source of non-medically used drugs in the European Union, but that those who had their own prescription were more likely to use prescription drugs non-medically than those without a prescription.

Socio-demographic factors and NMPUD have been widely discussed in previous studies, and our findings are mostly in concordance with them. We found that those living alone or who were outside the labour force were more likely to use prescription drugs non-medically; this finding was consistent with those reported previously (Becker et al., 2007; Blanco et al., 2018; Mital et al., 2018). In our study, illicit drug use with NMUPD was associated with living alone, being young and being unemployed, although it is possible that this finding just describes the characteristics of illicit drug users in general. Our results concerning the association of age and alcohol use with NMUPD were not surprising since similar findings have been

reported in other studies: those misusing prescription drugs tend to be young (Blanco et al., 2018; Bouvier et al., 2018) and often polysubstance use, including binge drinking, is also present (Abrahamsson et al., 2015; Cragg et al., 2019; Schepis et al., 2018). However, non-medical use of prescription pain relievers obtained from physicians has been reported to be more common among older adults (Mowbray & Quinn, 2015), but older age was not associated with any prescription drug user groups in our study.

A low level of education has also been associated with NMUPD (Blanco et al., 2018); however, no such association was found in our study. The results concerning the association between sex and NMUPD are inconclusive. In our study, sex was not associated with NMUPD. In some previous studies, NMUPD was more commonly associated with female sex (Becker et al., 2007; Ford et al., 2014; Simoni-Wastila et al., 2004). In contrast, a recent study showed that men use prescription drugs non-medically more often than do women (Blanco et al., 2018).

Strengths and limitations

The data used in this study are from three population-based surveys conducted in 2006, 2010, and 2014. The questions used in the surveys remained comparable over the years. Nonetheless, the study design was cross-sectional and no causal inferences can be drawn. Individuals without a permanent address and those who were institutionalised were excluded because of the sampling protocol. Therefore, some groups, such as problem drug users, may be under-represented and the results may remain underestimated. In addition, although the surveys were performed confidentially and anonymously, they were based on self-reporting and respondents may have understated their use of illicit drugs or NMUPD. The true prevalence of NMUPD may be higher than our findings indicate. The source of the misused prescription drugs and the motive for NMUPD were not asked about in the survey. Therefore, no conclusion could be drawn considering these factors. Further, the response rate of approximately 50% should be noted when interpreting the results of this study.

Conclusions

Overall, the level of NMUPD is rather low among individuals with a prescription for legitimate purposes, although it is higher compared to the general Finnish population. Having more than one prescription for CNS drugs was associated with NMUPD and several socio-demographic factors were found to be associated to NMUPD. These risk factors should be taken into consideration when prescribing CNS medication as well as when planning interventions and preventive actions.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Minna Pylväs-Korolainen https://orcid.org/0000-0003-4685-6835

Tomi Lintonen https://orcid.org/0000-0003-3455-2439

References

Abrahamsson, T., Berglund, M., & Håkansson, A. (2015). Non-medical prescription drug use (NMPDU) and poor quality of life in the Swedish general population. *American Journal on Addictions*, *24*(3), 271–277. https://doi.org/10.1111/ajad.12184

Abrahamsson, T., & Hakansson, A. (2015). Nonmedical prescription drug use (NMPDU) in the Swedish general population-correlates of analgesic and sedative use. *Substance Use and Misuse*, *50*(2), 148–155. https://doi.org/10.3109/10826084.2014.962047

Airagnes, G., Lemogne, C., Renuy, A., Goldberg, M., Hoertel, N., Roquelaure, Y., Limosin, F., & Zins, M. (2019). Prevalence of prescribed benzodiazepine long-term use in the French general population according to sociodemographic and clinical factors: Findings from the CONSTANCES cohort. *BMC Public Health*, *19*(1), 6–8. https://doi.org/10.1186/s12889-019-6933-8

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (5th ed.). American Psychiatric Publishing.

Barrett, S. P., Meisner, J. R., & Stewart, S. H. (2008). What constitutes prescription drug misuse? Problems and pitfalls of current conceptualizations. *Current Drug Abuse Reviews*, *1*(3), 255–262. https://doi.org/10.2174/1874473710801030255

Becker, W. C., Fiellin, D. A., & Desai, R. A. (2007). Non-medical use, abuse and dependence on sedatives and tranquilizers among US adults: Psychiatric and socio-demographic correlates. *Drug and Alcohol Dependence*, *90*(2–3), 280–287. https://doi.org/10.1016/j.drugalcdep.2007.04.009

Beyene, K., Aspden, T., McNeill, R., & Sheridan, J. (2019). Modifiable risk factors for prescription medicine sharing behaviours. *Research in Social and Administrative Pharmacy*, *15*, 154–163. https://doi.org/10.1016/j.sapharm.2018.04.005

Blanco, C., Han, B., Jones, C. M., Johnson, K., & Compton, W. M. (2018). Prevalence and correlates of benzodiazepine use, misuse, and use disorders among adults in the United States. *Journal of Clinical Psychiatry*, *79*(6), Article 18m12174. https://doi.org/10.4088/JCP.18m12174

Blanco, C., Secades-Villa, R., García-Rodríguez, O., Labrador-Mendez, M., Wang, S., & Schwartz, R. P. (2013). Probability and predictors of remission from life-time prescription drug use disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Psychiatric Research*, *47*(1), 42–49. https://doi.org/10.1016/j.jpsychires.2012.08.019

Böckerman, P., Haapanen, M., Hakulinen, C., Karhunen, H., & Maczulskij, T. (2021). Determinants of prescription opioid use: Population-based evidence from Finland. *Addiction*, *116*(1), 170–175. https://doi.org/10.1111/add.15071

Boggis, J. S., & Feder, K. (2019). Trends in and correlates of tranquilizer misuse among adults who misuse opioids in the United States, 2002–2014. *Drug and Alcohol Dependence*, *198*(September 2018), 158–161. https://doi.org/10.1016/j.drugalcdep.2019.01.014

Bouvier, B. A., Waye, K. M., Elston, B., Hadland, S. E., Green, T. C., & Marshall, B. D. L. (2018). Prevalence and correlates of benzodiazepine use and misuse among young adults who use prescription opioids non-medically. *Drug and Alcohol Dependence*, *183*, 73–77. https://doi.org/10.1016/j.drugalcdep.2017.10.023

Boyd, C. J., Austic, E., Epstein-Ngo, Q., Veliz, P. T., & McCabe, S. E. (2015). A prospective study of adolescents' nonmedical use of anxiolytic and sleep medication. *Psychology of Addictive Behaviors*, *29*(1), 184–191. https://doi.org/10.1037/adb0000026

Cragg, A., Hau, J. P., Woo, S. A., Kitchen, S. A., Liu, C., Doyle-Waters, M. M., & Hohl, C. M. (2019). Risk factors for misuse of prescribed opioids: A systematic review and meta-analysis. *Annals of Emergency Medicine*, *74*(5), 634–646. https://doi.org/10.1016/j.annemergmed.2019.04.019

Edlund, M. J., Sullivan, M., Steffick, D., Harris, K. M., & Wells, K. B. (2007). Do users of regularly prescribed opioids have higher rates of substance use problems than nonusers? *Pain Medicine*, *8*(8), 647–656. https://doi.org/10.1111/j.1526-4637.2006.00200.x

Ford, J. A., Reckdenwald, A., & Marquardt, B. (2014). Prescription drug misuse and gender. *Substance Use and Misuse*, *49*(7), 842–851. https://doi.org/10.3109/10826084.2014.880723

Grigsby, T. J., & Howard, J. T. (2019). Prescription opioid misuse and comorbid substance use: Past 30-day prevalence, correlates and co-occurring behavioral indicators in the 2016 National Survey on Drug Use and Health. *American Journal on Addictions*, *28*(2), 111–118. https://doi.org/10.1111/ajad.12866

Hargreave, M., Andersen, T., Nielsen, A., Munk, C., Liaw, K.-L., & Kjaer, S. (2010). Factors associated with a continuous regular analgesic use: A population-based study of more than 45 000 Danish women and men 18–45 years of age.

Pharmacoepidemiology and Drug Safety, *19*(1), 65–74. https://doi.org/10.1002/pds

Hulme, S., Bright, D., & Nielsen, S. (2018). The source and diversion of pharmaceutical drugs for non-medical use: A systematic review and meta-analysis. *Drug and Alcohol Dependence*, *186*(March), 242–256. https://doi.org/10.1016/j.drugalcdep.2018.02.010

Ives, T. J., Chelminski, P. R., Hammett-Stabler, C. A., Malone, R. M., Perhac, J. S., Potisek, N. M., Shilliday, B. B., DeWalt, D. A., & Pignone, M. P. (2006). Predictors of opioid misuse in patients with chronic pain: A prospective cohort study. *BMC Health Services Research*, *6*, 1–10. https://doi.org/10.1186/1472-6963-6-46

Kalso, E., Klintrup, K., Kastarinen, H., Saastamoinen, L., Helminen, S., & Välimäki, J. (2019). Oksikodonin ja fentanyylin käyttö avohoidossa. *Finnish Medical Journal*, *74*(23), 1512–1514. https://www.laakarilehti.fi/pdf/2019/SLL232019-1512.pdf

Karjalainen, K., Lintonen, T., & Hakkarainen, P. (2017). Illicit drug use is increasing among non-medical users of prescription drugs: Results from population-based surveys 2002–2014. *Drug and Alcohol Dependence*, *178*(January), 430–434. https://doi.org/10.1016/j.drugalcdep.2017.05.041

Karjalainen, K., Pekkanen, N., & Hakkarainen, P. (2020). *Suomalaisten huumeiden käyttö ja huumeasenteet - Huumeaiheiset väestökyselyt Suomessa 1992–2018 [Drug use and drug attitudes among Finns – Drug-related population surveys in Finland 1992–2018]*. Finnish Institute for Health and Welfare. http://urn.fi/URN:ISBN:978-952-343-441-7

Kurko, T., Saastamoinen, L. K., Tähkäpää, S., Tuulio-Henriksson, A., Taiminen, T., Tiihonen, J., Airaksinen, M. S., & Hietala, J. (2015). Long-term use of benzodiazepines: Definitions, prevalence and usage patterns – A systematic review of register-based studies. *European Psychiatry*, *30*(8), 1037–1047. https://doi.org/10.1016/j.eurpsy.2015.09.003

Kurko, T., Saastamoinen, L. K., Tuulio-Henriksson, A., Taiminen, T., Tiihonen, J., Airaksinen, M., & Hietala, J. (2018). Trends in the long-term use of benzodiazepine anxiolytics and hypnotics: A national register study for 2006 to 2014. *Pharmacoepidemiology and Drug Safety*, *27*(6), 674–682. https://doi.org/10.1002/pds.4551

McCabe, S. E., Cranford, J. A., & Boyd, C. J. (2006). The relationship between past-year drinking behaviors and nonmedical use of prescription drugs: Prevalence of co-occurrence in a national sample. *Drug and Alcohol Dependence*, *84*(3), 281–288. https://doi.org/10.1016/j.drugalcdep.2006.03.006

McCabe, S. E., West, B. T., & Boyd, C. J. (2013). Leftover prescription opioids and nonmedical use among high school seniors: A multi-cohort national study. *Journal of Adolescent Health*, *52*(4), 480–485. https://doi.org/10.1016/j.jadohealth.2012.08.007

Mital, S., Windle, M., Cooper, H. L. F., & Crawford, N. D. (2018). Trends in non-medical prescription opioids and heroin co-use among adults, 2003–2014. *Addictive Behaviors*, *April*, 17–23. https://doi.org/10.1016/j.addbeh.2018.05.005

Morley, K. I., Ferris, J. A., Winstock, A. R., & Lynskey, M. T. (2017). Polysubstance use and misuse or abuse of prescription opioid analgesics: A multi-level analysis of international data. *Pain*, *158*(6), 1138–1144. https://doi.org/10.1097/j.pain.0000000000000892

Mowbray, O., & Quinn, A. (2015). Prescription pain reliever misuse prevalence, correlates, and origin of possession throughout the life course. *Addictive Behaviors*, *50*, 22–27. https://doi.org/10.1016/j.addbeh.2015.06.006

Muller, A. E., Clausen, T., Sjøgren, P., Odsbu, I., & Skurtveit, S. (2019). Prescribed opioid analgesic use developments in three Nordic countries, 2006–2017. *Scandinavian Journal of Pain*, *19*(2), 345–353. https://doi.org/10.1515/sjpain-2018-0307

Nevantaus, J., Simojoki, K., Hamunen, K., Heiskanen, T., & Kalso, E. (2013). Opioidit pitkäaikaisen kivun hoidossa [Opioids in the treatment of chronic pain]. *Finnish Medical Journal*, *68*(50–52), 3329–3335.

Nordfjærn, T., Bjerkeset, O., Bratberg, G., Moylan, S., Berk, M., & Gråwe, R. (2014). Socio-demographic, lifestyle and psychological predictors of benzodiazepine and z-hypnotic use

patterns. *Nordic Journal of Psychiatry*, *68*(2), 107–116. https://doi.org/10.3109/08039488.2013.775342

Novak, S. P., Håkansson, A., Martinez-Raga, J., Reimer, J., Krotki, K., & Varughese, S. (2016). Nonmedical use of prescription drugs in the European Union. *BMC Psychiatry*, *16*(1), 1–12. https://doi.org/10.1186/s12888-016-0909-3

Ostling, P. S., Davidson, K. S., Anyama, B. O., Helander, E. M., Wyche, M. Q., & Kaye, A. D. (2018). America's opioid epidemic: A comprehensive review and look into the rising crisis. *Current Pain and Headache Reports*, *22*(5). https://doi.org/10.1007/s11916-018-0685-5

Parsells Kelly, J., Cook, S. F., Kaufman, D. W., Anderson, T., Rosenberg, L., & Mitchell, A. A. (2008). Prevalence and characteristics of opioid use in the US adult population. *Pain*, *138*(3), 507–513. https://doi.org/10.1016/j.pain.2008.01.027

Pätsi, S.-M., Lintonen, T., & Karjalainen, K. (2020). Lääkkeiden väärinkäyttö suomalaisessa aikuisväestössä [Non-medical use of prescription drugs among the Finnish adult population]. *Finnish Medical Journal*, *75*(4), 188–210. https://www.laakarilehti.fi/pdf/2020/SLL42020-188.pdf

Schepis, T. S., Teter, C. J., Simoni-Wastila, L., & McCabe, S. E. (2018). Prescription tranquilizer/sedative misuse prevalence and correlates across age cohorts in the US. *Addictive Behaviors*, *87*(May), 24–32. https://doi.org/10.1016/j.addbeh.2018.06.013

Simoni-Wastila, L., Ritter, G., & Strickler, G. (2004). *Gender and other factors associated with nonmedical use of abusable prescription drugs*, *39*(1), 1–23. https://doi.org/10.1081/ja-120027764

Smith, S. M., Dart, R. C., Katz, N. P., Paillard, F., Adams, E. H., Comer, S. D., Degroot, A., Edwards, R. R., Haddox, J. D., Jaffe, J. H., Jones, C. M., Kleber, H. D., Kopecky, E. A., Markman, J. D., Montoya, I. D., O'Brien, C., Roland, C. L., Stanton, M., Strain, E. C., … Dworkin, R. H. (2013). Classification and definition of misuse, abuse, and related events in clinical trials: ACTTION systematic review and recommendations. *Pain*, *154*(11), 2287–2296. https://doi.org/10.1016/j.pain.2013.05.053

Svendsen, K., Fredheim, O. M., Romundstad, P., Borchgrevink, P. C., & Skurtveit, S. (2014). Persistent opioid use and socio-economic factors: A population-based study in Norway. *Acta Anaesthesiologica Scandinavica*, *58*(4), 437–445. https://doi.org/10.1111/aas.12281

Taipale, H., Särkilä, H., Tanskanen, A., Kurko, T., Taiminen, T., Tiihonen, J., Sund, R., Tuulio-Henriksson, A., Saastamoinen, L., & Hietala, J. (2020). Incidence of and characteristics associated with long-term benzodiazepine use in Finland. *JAMA Network Open*, *3*(10), e2019029. https://doi.org/10.1001/jamanetworkopen.2020.19029

Tevik, K., Selbaek, G., Engedal, K., Seim, A., Krokstad, S., & Helvik, A.-S. (2017). Use of alcohol and drugs with addiction potential among older women and men in a population-based study: The Nord-Trondelag Health Study 2006–2008 (HUNT3). *PloS One*, *12*(9), Article e0184428. https://doi.org/10.1371/journal.pone.0184428

Votaw, V. R., Geyer, R., Rieselbach, M. M., & McHugh, R. K. (2019). The epidemiology of benzodiazepine misuse: A systematic review. *Drug and Alcohol Dependence*, *200*, 95–114. https://doi.org/10.1016/j.drugalcdep.2019.02.033

World Health Organization. (1992). *The ICD-10 classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines*. World Health Organization. https://www.who.int/classifications/icd/en/bluebook.pdf