Patients Admitted to Treatment for Substance Use Disorder in Norway: A Case-Control Study of Socio-Demographic Correlates and Comparative Analyses Across Substance Use Disorders

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Abstract

Background

Improved knowledge regarding sociodemographic correlates of people with substance use disorders (SUD) is essential for several purposes: to better plan and provide adequate services for SUD patients and their families, and to supplement our understanding of the complex mechanisms underlying progression into and development of various SUDs. This study aimed to: i) describe demographic, economic, and social correlates of people with SUDs in comparison with those of the general population; ii) compare these correlates across SUDs from licit versus illicit substances, as well as across specific SUDs.

Methods

A national cross-sectional study of *all* SUD patients enrolled in specialized drug treatment in Norway in 2009-2010 (N=31 245) and a population control cohort, frequency-matched on age and gender (N=31 275). Data on gender, age, education level, income level and sources, and family/living arrangement were obtained by linkages to national registers.

Results

Demographic, economic and social correlates of SUD patients differed substantially from those of the general population, and across specific SUDs. Among SUD patients, those with illicit – as compared to licit – SUDs were younger (mean quotient=0.72 [0.71-0.72]), more often had low education level (RR=1.68 [1.64-1.72]), were less often in paid work (RR=0.76 [0.74-0.77]) and had lower income (mean quotient=0.61 [0.61-0.62]). Comparison of patients with different SUD diagnoses revealed substantial demographic differences, including the relatively low mean age among cannabis patients and the high share of females among sedatives/hypnotics patients. Opioid patients stood out by being older, and more often out of work, receiving social security benefits, and living alone. Cocaine and alcohol patients were more often better educated, included in the work force, and had a better financial situation.

Conclusion

Findings revealed substantial and important differences in sociodemographic correlates between SUD patients and the general population, between SUD patients with illicit and with licit substance use, and across specific SUD patient groups.

Introduction

Substance use disorders (SUDs) are among the most common psychiatric disorders in high-income countries. They often result from long-term extensive use of one or several addictive substances, they are strongly co-morbid with other psychiatric and somatic diseases, they are not easily treatable, and they often place high economic and welfare burdens on their immediate social networks as well as society at large [1–4]. Thus, SUDs constitute a significant public health problem in several respects: i) by

accounting for a substantial fraction of the global health burden [5], ii) by affecting health and well-being of family and other close relations, and iii) by contributing to socioeconomic inequality in overall mortality [6, 7]. The latter reflects that SUDs overall are typically more prevalent in low socio-economic status (SES) groups [8, 9]. In the present study, we examine the demographic, economic and social correlates of people with various substance use disorders and how these correlates may vary by primary drug (main diagnosis at treatment entry). By way of introduction, we motivate research on such socio-demographic correlates of people with substance use disorder (PWSUD), and we review previous literature and knowledge gaps.

In the epidemiological literature, socio-demographic correlates of PWSUD are often presented merely as background information in studies with another scope or focus. However, such correlates – and particularly how they vary across different substance user groups – are important in their own right. There are several reasons for this. First, more systematic insight into the demographic, economic and social correlates of PWSUD is important for planning and providing adequate services for them, as well as for their family members and other close relations. Second, it is also relevant for assessing choice of measures and task force areas in strategies to reduce social inequality in alcohol- and drug-related health problems. Finally, it may contribute to better understanding of the complex mechanisms underlying progression into and continuance of various SUDs.

Current knowledge about socio-demographic correlates of PWSUD mainly stems from one of two types of study samples: general population samples and SUD patients in treatment [10, 11]. Large population surveys provide important knowledge about sociodemographic correlates of PWSUD compared to the general population, but mainly so for the more common types of SUD, including alcohol use disorder (AUD) and cannabis use disorder (CUD) (e.g. [8, 10, 12, 13]. They are, however, inherently limited in their capacity to differentiate between various drug use disorders (DUD)[13]. Another limitation with general population surveys is that survey participants who report extensive substance use, may not be representative of the group as such [14]. Treatment samples, on the other hand, often include patients with one specific SUD (e.g. [15–18], precluding comparisons of sociodemographic correlates across specific SUDs. Overall, the literature suggests that the prevalence of SUDs is elevated among males and younger adults [10, 11, 13, 19], among non-married individuals and among those with low education or/and income level [8–10]. However, findings are mixed and seem to vary across jurisdictions and substance use cultures [11], and the literature is sparse with regard to several sociodemographic correlates, including urban dwelling [10],

In the present study, we applied another approach to describe the socio-demographic correlates of PWSUD, by employing national data on all patients treated for SUDs in Norway and matched controls from the general population in a case-control design. Norway may be particularly well suited for such a study, as SUD treatment is part of the specialized public health services, which is offered basically free of charge to the patients. Few previous studies have, apparently, examined the socio-demographic correlates of PWSUD in treatment across different substance user groups. Through extensive literature searches, we identified only four such studies [20–23] in adult populations. One study [20] distinguished between three

groups of SUDs: AUD, cannabis use disorder (CUD) and opioid use disorder (OUD), whereas the remaining three [21–23] distinguished only between AUD and DUD. In these studies, correlates of SUDs from stimulant drugs or sedatives/hypnotics were not examined specifically in relation to other SUDs. Thus, there seems to be little knowledge about sociodemographic correlates across a range of specific SUDs.

We highlight the issue of extensive use of sedatives/hypnotics (e.g. benzodiazepines), which is often overlooked by policymakers and the scientific community [24–26]. While population surveys suggest that the prevalence of extensive use/misuse or dependence is relatively high compared to most other drugs [26], treatment rates are very low, especially in addiction service centres [27]. For this group of SUDs, demographic correlates are described in population surveys, where prevalence of 'extensive' use (which encompasses a broader category of users than those fulfilling criteria for DUD) is highest in young adults and equally distributed by gender [26]. In this comparative study of PWSUD in Norway, patients with sedatives/hypnotics dependence are also included, and we may thus provide a broader and more nuanced picture of the socio-demographic correlates of PWSUD with respect to various licit versus illicit psychotropic substances.

The aim of this study was to describe socio-demographic correlates of people admitted to treatment for SUD and to compare these correlates to those of the general population. Moreover, we compared the socio-demographic correlates of patients with licit SUDs to those with illicit SUDs, and finally, we compared these correlates across SUDs.

Methods

Design and participants

We employed data from the Norwegian Patient Registry, which covers the entire population of patients in the publicly financed specialized healthcare system in Norway. The patient sample encompasses all those who were admitted to specialized SUD treatment or to a psychiatric hospital in 2009 or 2010 with a SUD main diagnosis, that is ICD-10 diagnoses F10 (alcohol)(N=12 448), F11 (opioids)(N=5860), F12 (cannabis)(N=3584), F14 (sedatives and hypnotics)(N=1466), F15 (cocaine)(N=197), F16 (other stimulants)(N=2354) or F19 (other or several substances, which may include alcohol, sedatives or hypnotics)(N=5336) (total N=31 245). For the sake of brevity, in the following, we will refer to patients with main diagnosis F10 as "alcohol patients", patients with main diagnosis F11 as "opioid patients" etc. In addition to the abbreviation PWSUD (people with substance use disorder), we use PWAUD (people with alcohol use disorder) and PWDUD (people with drug use disorder).

To compare PWSUD with the general population, we obtained data from a control cohort, which was provided by Statistics Norway. The sample was randomly drawn from the Norway's National Population Register on 1 January 2010 (midpoint of the patient recruitment period) and frequency-matched with the SUD patient sample by birth year and gender (N=31 275). Some patients (N=353) happened by chance to

be in the control cohort. They were not excluded from the control cohort since we wanted to compare patients to a random sample from the whole population and not just to non-patients.

Using unique national ID numbers, the data from the patient sample and the control cohort were linked to national administrative registries for the whole population to obtain individual data on socio-demographic correlates.

Setting

In Norway, treatment for SUDs (in-patient and out-patient) is mainly provided by the Norwegian public healthcare system, which has universal coverage and is basically free of charge for the patients. Treatment for AUD and DUD is uniformly organized within the specialized health services and is typically offered by drug treatment centres and psychiatric units within public hospitals and by private enterprises (i.e. non-governmental organisations) within the publicly financed scheme.

Measures

For most socio-demographic correlates, we employed information registered the year before study entry. Year of birth and gender were obtained from Statistics Norway and age was calculated as year of study entry minus year of birth.

Data on completed education was extracted from the National Education Database (NUDB). We separated those with low education level; that is those who had only (or not even) completed mandatory education (i.e. 7, 9 or 10 years depending on birth cohort) from the others. We applied this dichotomization also for the father's completed education level at age 16 of the study participants (data extracted from NUDB).

Data on whether study participants lived alone (i.e. in single-person households) or with young children (in families with child(ren) under six years of age) were extracted from the National Population Register at 1 January for the year of study entry. Data on urban dwelling were obtained from the National Population Register, and we separated those living in cities with more than 50 000 inhabitants from the others, as of 1 January 2010. Hence, data on urban dwelling is missing for patients who died in 2009 (N=267).

Data on personal income and wealth (e.g. value of property, bank deposits) include sources of income and magnitude of income and wealth and were obtained from the Income Registry, Statistics Norway. From these data, we constructed variables on labour market participation (in paid work), receipt of social security benefits, and total income and wealth.

We used dummy variables for two categories of social security benefits: financial assistance/supplementary benefit and disability pension. Financial assistance is a temporary economic

help to cover necessary expenses (e.g. for food, clothes, house rent, etc.). Disability pension is a permanent source of income, granted to persons with a minimum 50% permanent reduction of work capacity due to illness or injury. For total income and wealth, we applied mean values for the three-year period prior to study entry.

Missing data

The administrative registers were not entirely complete. There was missing information totalling less than 3%, except for father's education, where 13% of the sample had no registration.

Analyses

Socio-demographic correlates were compared between three sets of groups; i) between patients and controls; ii) between patients with illicit versus licit substance use, and iii) between patients with specific SUDs. Confidence intervals of relative risks in Table 1 and 2 were calculated using Medcalcs statistical calculator [28], while confidence intervals of mean quotients were calculated using GraphPads Quick Calcs [29]. STATA 16 was used for other calculations.

Table 1

Patient[1] and control[2] cohort, by socio-demographic correlates

	Patient cohort (N=31 245)	Population cohort (N=31 275)	Relative risk/ mean quotient 95% CI []
	Range (), 95% CI []	Range (), 95% CI []	
Demographic and social correlates			
Age. Mean (range)	39.3 (14-93)	40.0 (14-94)	0.98 [0.98-0.99]
Males. %	68.8 [68.2-69.3]	68.8 [68.2-69.3]	1.00 [0.99-1.02]
Low education level. %	57.7 [57.1-58.2]	24.5 [24.0-25.0]	2.38 [2.33-2.43]
Father's education (low level). %	42.1 [41.4-42.7]	33.2 [32.6-33.8]	1.27 [1.24-1.30]
Living alone. %	47.5 [47.0-48.1]	20.9 [20.5-21.4]	2.27 [2.21-2.33]
Living with young children. %	7.0 [6.7-7.3]	17.7 [17.3-18.2]	0.40 [0.38-0.42]
Urban dwelling. %	44.7 [44.2-45.3]	38.4 [37.9-38.9]	1.16 [1.14-1.19]
Economic correlates			
In paid work. %	51.9 [51.4-52.5]	88.3 [88.0-88.7]	0.59 [0.58-0.60]
Total income. Three years' median. 1000 NOK	223 [222-225]	378 [374 -382]	0.59 [0.58-0.59]
Wealth. Three years' median. 1000 NOK	182 [173 -190]	606 [577 -634]	0.30 [0.28-0.32]
Disability pension[3]. %	18.0 [17.6-18.5]	5.8 [5.5-6.1]	3.10 [2.96-3.27]
Financial assistance/supplementary benefit. %	44.5 [43.9-45.0]	3.9 [3.7-4.1]	11.36 [10.74-12.02]

[1] Substance use disorder patients with treatment admission 2009-2010 [2] Control cohort per1 January 2010 with same age and gender distribution as the patient cohort [3] Granted to persons 18-66 years of age

Table 2

Patients[1] with illicit and licit substance use disorders, by socio-demographic correlates

	Illicit substance use disorder[2] **(N=17 331)**	**Licit substance use disorder[2]** **(N=13 914)**	**Relative risk/** **Mean quotient**
	Range (), 95% CI []	**Range (), 95% CI [**	**95% CI []**
Demographic and social correlates			
Age. Mean (range)	33.4 (14-88)	46.6 (15-93)	0.72 [0.71-0.72]
Males. %	69.6 [69.0-70.3]	67.6 [66.9-68.4]	1.03 [1.01-1.05]
Low education level. %			
Unadjusted	70.4 [69.7-71.1]	41.9 [41.1-42.8]	1.68 [1.64-1.72]
Adjusted[3]	65.4 [64.5-66.3]	49.2 [48.3-50.1]	1.33 [1.31-1.36]
Father's education (low level). %			
Unadjusted	40.6 [39.9-41.4]	44.0 [43.1-44.9]	0.92 [0.90-0.95]
Adjusted[3]	43.0 [42.0-43.9]	40.8 [39.8-41.9]	1.05 [1.02-1.08]
Living alone. %			
Unadjusted	48.8 [48.0-49.5]	46.0 [45.2-46.8]	1.06 [1.04-1.09]
Adjusted[3]	52.8 [51.9-53.7]	43.7 [42.8-44.6]	1.21 [1.18-1.24]
Living with young children. %			
Unadjusted	7.6 [7.2-8.0]	6.3 [5.9-6.7]	1.22 [1.12-1.32]
Adjusted[3]	6.2 [5.9-6.6]	8.4 [7.8-9.0]	0.74 [0.68-0.80]
Urban dwelling. %			

[1] Substance use disorder patients with treatment admission 2009-2010 [2] Licit SUD includes alcohol use disorder and sedatives/hypnotics disorder, while illicit includes opioid, cannabis, and stimulant disorders, as well as disorders including several or other drugs [3] Adjusted to the gender and age distribution among all patients in the study

	Illicit substance use disorder[2] (N=17 331)	Licit substance use disorder[2] (N=13 914)	Relative risk/ Mean quotient
	Range (), 95% CI []	Range (), 95% CI [	95% CI []
Unadjusted	46.1 [45.3-46.8]	43.0 [42.2-43.9]	1.07 [1.04-1.10]
Adjusted[3]	47.3 [46.4-48.3]	42.9 [41.9-43.8]	1.10 [1.08-1.13]
Economic correlates			
In paid work. %			
Unadjusted	45.5 [44.7-46.2]	60.0 [59.2-60.9]	0.76 [0.74-0.77]
Adjusted[3]	40.7 [39.9-41.6]	63.7 [62.8-64.6]	0.64 [0.62-0.65]
Total income. Three years' mean. 1000 NOK			
Unadjusted	175 (173 -176)	285 (283 -287)	0.61 [0.61-0.62]
Adjusted[3]	192 (189 -195)	256 (254 -258)	0.75 [0.73-0.76]
Wealth. Three years' mean. 1000 NOK			
Unadjusted	71 [62 -80]	320 [304 -335]	0.22 [0.19-0.25]
Adjusted[3]	114 [98 -131]	232 [220 -244]	0.49 [0.42-0.58]
Disability pension. %.			
Unadjusted	14.4 [13.9-15.0]	22.7 [22.0-23.4]	0.64 [0.61-0.67]
Adjusted[3]	24.7 [23.9-25.4]	15.1 [14.6-15.7]	1.64 [1.56-1.72]

[1] Substance use disorder patients with treatment admission 2009-2010 [2] Licit SUD includes alcohol use disorder and sedatives/hypnotics disorder, while illicit includes opioid, cannabis, and stimulant disorders, as well as disorders including several or other drugs [3] Adjusted to the gender and age distribution among all patients in the study

	Illicit substance use disorder[2] (N=17 331)	Licit substance use disorder[2] (N=13 914)	Relative risk/ Mean quotient
	Range (), 95% CI []	Range (), 95% CI [	95% CI []
Financial assistance/supplementary benefit. %			
Unadjusted	58.8 [58.1-59.6]	26.6 [25.9-27.4]	2.21 [2.14-2.28]
Adjusted[3]	57.3 [56.4-58.2]	30.7 [29.8-31.6]	1.87 [1.81-1.92]

[1] Substance use disorder patients with treatment admission 2009-2010 [2] Licit SUD includes alcohol use disorder and sedatives/hypnotics disorder, while illicit includes opioid, cannabis, and stimulant disorders, as well as disorders including several or other drugs [3] Adjusted to the gender and age distribution among all patients in the study

As controls were frequency-matched for year of birth and gender, the differences between the patients and controls were automatically adjusted for age and gender. Differences between groups of patients have been provided as raw figures to show actual group correlates. In addition, figures are shown adjusted for age and gender (direct standardized values) to the age and gender distribution in the whole patient population to illustrate the impact of these effect modifiers.

As this is an explorative study, no hypothesis tests were carried out comparing groups. Non-overlapping confidence intervals were used as a criterion for statements of differences between groups.

Results

The SUD patients differed substantially from the population control cohort on all socio-demographic correlates (Table 1). Thus, compared to the control cohort, the SUD patients had lower education level, were more often living in single-person households, were less likely to live in a family with young children, and were more likely to live in an urban area. Moreover, SUD patients were less likely to be in paid work, they had lower personal income and wealth, and they were more likely to receive social security benefits. A low education level was more frequent among the patients than among their fathers (57.7% and 42.1%, respectively), while it was the other way around among controls (see Table 1).

In the following, we focus on patients only. Table 2 presents the corresponding correlates and compares patients with SUDs from illicit substances (opioids, cannabis, cocaine, other stimulants, or “several or other drugs”) to patients with SUDs from licit substances (alcohol or hypnotic/sedatives). Overall, those with SUDs from illicit drug use were considerably younger, they had a lower education level, were less

likely to be in paid work, had lower income and wealth and were more likely to receive social security benefits, compared to their licit drug use counterparts.

Next, we compared socio-demographic correlates across specific SUD categories. We illustrated the differences by presenting for each specific SUD the relative deviance (in per cent) from the mean for all patients. Among patients with SUDs from illicit substances, opioid patients stood out by being older, less often in paid work, and more often receiving social security benefits, and living alone (Figures 1 and 2. See also supplementary Tables S1 and S2 which include means for each SUD with confidence intervals). The cocaine patients, on the other hand, more often had paid work and had higher income. Cannabis patients were the youngest and had a low level of education. In addition, both cocaine and cannabis patients included more males than the other SUD patients, had a high level of workforce participation and a low level of receiving social security benefits. Among patients with SUDs from licit substances, alcohol patients were, compared to sedatives/hypnotics patients, better educated, more often in paid work, had higher income and wealth and less often in receipt of social security benefits and disability pension. They more often lived alone, and a higher proportion were male (see Figures 1 and 2 and Supplementary Tables S1 and S2, for more details).

Adjustment for age and gender amplified, attenuated, or even reversed the unadjusted differences in socio-demographic correlates across patient groups (Figures 1 and 2). We observed the largest differences between unadjusted and adjusted deviations with regard to own education level and father's education level.

Discussion

This study is likely the first to report on demographic, economic and social correlates of a complete national SUD patient cohort and to compare a broad range of correlates across patients with different SUDs, including sedatives/hypnotics patients. Compared to the general population, the SUD patients had on average substantially lower education level, income, and wealth, they were less often in paid work and more often recipients of social security benefits. Among SUD patients, users of illicit substances scored worse on all socio-economic status indicators, compared to users of licit substances. Comparison of patients with different SUD diagnoses further revealed important differences within and across patient groups. Demographic differences, such as the relatively low mean age among cannabis patients or the high share of females among sedatives/hypnotics patients should be noted, as should the large differences in education level, labour market participation, income and wealth across patient groups, since these factors are likely to impact on treatment outcome and on the potential for future individual welfare and economic independence.

Our findings corroborate those from previous studies with regard to correlates of PWSUD [8, 9, 18, 30, 31]. Moreover, our findings accord with those in previous studies with regard to comparisons between people with AUD and DUD, finding that the former group is characterized by higher age [20, 22, 23], higher proportion in paid work [22, 23] and higher income [22]. Focussing on sedatives/hypnotics patients

specifically, we found that these were older and more often women compared to other SUD patients, whereas, for most other socio-demographic correlates, these patients did not deviate from other patients. A recent review of the epidemiology of sedatives/hypnotics misuse (i.e. benzodiazepines) showed that the literature is mixed, with no clear patterning of socio-demographic correlates of this group [26]. These mixed findings may, however, reflect the fact that the primary studies included in the review were based on heterogenous samples, including patients in SUD treatment and general population samples.

What can explain the observed socio-demographic differences between PWSUD and the general population and between substance-specific groups of PWSUD? Overall, it seems likely that the underlying mechanisms are complex, and, in the following, we will briefly discuss three possible main pathways.

The first pathway pertains to socio-demographic selection mechanisms into extensive or problematic substance use. With regard to alcohol and illicit drugs, socio-demographic differences are more prominent when use has evolved to extensive use, and this occurs more often among males and in low socio-economic status groups [19]. On the other hand, extensive use of sedatives/hypnotics is equally or more often seen in women [26]. Moreover, it is well established that impulsivity, or poor inhibitory control, is a precursor for SUD vulnerability [32], and as impulsivity is also associated with low academic achievement [33], this individual correlate may, in part, explain the association between low education level and SUD. Moreover, impulsivity occurs more frequently in PWDUD compared to PWAUD [34], which may partly explain the higher share of low education level in the former group. The tendency for those with SUDs from illicit drugs to live in urban areas may, in part, reflect easier access to illegal drugs at a lower price, and a possible influx of drug users from rural areas.

The second pathway pertains to socio-demographic differences in the utilization of SUD treatment services. Studies from the US and European countries reported higher likelihood of specialized treatment utilization among those with low income and those with psychiatric co-morbidity [35, 36]. Other factors that seem to increase treatment-seeking include younger age and lower education level [36]. Moreover, while women are generally more likely than men to seek treatment in general health and mental health care services, some studies found that women are less likely to seek treatment for alcohol problems [37, 38]. We found an elevated likelihood of urban dwelling among SUD patients. This may possibly be explained by easier access to treatment services, even in a treatment system with universal coverage, such as the Norwegian one. Some evidence suggests that PWAUD are less likely than PWDUD to seek treatment [36], and as impulsivity is associated with lower academic achievement and also occurs more frequently among PWDUD than among PWAUD, differential treatment utilization by PWAUD and PWDUD may contribute to the higher proportion of low education level among patients with illicit SUDs compared to other SUD patients.

The third pathway pertains to the social drift reflecting consequences of extensive substance use. People with SUDs are at elevated risk of early retirement, unemployment, low income and need of social assistance [39, 40]. Further, SUDs affect the ability to commit in family life and they are associated with family dysfunction and child abuse and neglect [41]. The impact of SUDs on unemployment and

financial difficulties seems to be larger for PWDUD compared to PWAUD [40], which corroborates our findings. Also in this regard, the more frequent occurrence of impulsivity in PWDUD compared to PWAUD is likely important; impulsivity and low self-control are found to be important predictors of unemployment [42], and may thus in part explain our observations of a lower proportion in paid work, and thereby also lower income and greater financial difficulties, among patients with illicit SUDs compared to other SUD patients. Moreover, the high financial costs of extensive substance use, and particularly so for illicit drugs [43], may also in part explain the lower participation rate in legal employment among PWSUD from illicit, as compared to licit, substances.

Although we cannot determine which of these three pathways, or what combination of them, are at work here, improved knowledge of the socio-demographic correlates of SUD patients is warranted for several purposes. More exact knowledge regarding socio-economic patient correlates may help to better design, implement and evaluate drug treatment services to improve outcome and the potential for future individual welfare and economic independence. For instance, opioid patients with a high level of marginalization and a low level of own resources are in need of far more societal efforts to reach a stable situation than cocaine and alcohol patients who are better educated, included in the work force and with a better financial situation. Cannabis patients also have a low level of education and economic means, although younger than opioid patients and thus with fewer drug consuming years. These and other observed differences between patients with respect to gender, age, education, income (including stable income like disability pension and short term income like supplementary benefits) and labour market participation may be taken into account when designing treatment programs for subgroups of PWSUD. They may also help explain differences in treatment outcomes across patient groups. Better knowledge of patient characteristics may further improve measures aimed at reducing social inequality related to SUD as it may reveal for which subgroups inequality is particularly distinctive.

Further, the complex mechanisms underlying progression into, and development of, various specific SUDs is currently not well understood. Using linked administrative datasets of national cohorts of SUD patients to describe and compare a range of demographic, economic and social correlates may contribute to this end, as suggested by the possible pathways discussed above.

Limitations

While register-based data, as employed here, are not hampered by the typical limitations found in survey studies (selection and attrition bias, response biases and few observations of PWSUD), register data come with other limitations. Routine data may vary in data quality, coding may vary between persons and institutions, and it is often difficult to gain exact information on how such data were generated [44]. In our context, we do not know precisely what underlies the making of a specific SUD diagnosis, and as co-use of several substances is typical in PWSUD [45], it is possible that a single substance diagnosis (e.g. alcohol use disorder) may be somewhat arbitrarily assigned. This type of misclassification, however, is relevant only if it is systematic and correlated with socio-demographic correlates, which cannot be

precluded. Further, our findings reflect a cross-sectional ‘snap-shot’ of patients in treatment for SUDs. Thus, time dynamics, for instance with regard to changes in substance use careers and changes in social drift, could not be assessed in this study. Finally, transferability of our findings to other settings may depend on the extent to which they differ from the Norwegian setting, for instance when there are substantial differences in prevalence of substance use, the type of treatment system and treatment coverage, and the type of welfare schemes.

Adjustment for age and gender amplified, attenuated, or even reversed the unadjusted differences in socio-demographic correlates across patient groups. This complexity is noteworthy with regard to understanding likely underlying mechanisms and for external validation of findings from other patients populations.

Conclusion

This study revealed that demographic, economic and social correlates differ substantially between SUD patients and the general population. They also differ substantially between SUD patients with illicit versus licit substance use, and they differ across specific SUD patient groups. A broadened and more nuanced insight into socio-demographic correlates of patients with substance use disorder is important to inform the planning and provision of adequate treatment and care services for these vulnerable patients and their families, as well as to better understand the complex mechanisms underlying progression into and development of various substance use disorders.

Abbreviations

AUD Alcohol use disorder

CUD Cannabis use disorder

DUD Drug use disorder

NUDB National Education Database

OUD Opioid use disorder

PWAUD People with alcohol use disorder

PWDUD People with drug use disorder

PWSUD People with substance use disorder

SES Socio-economic status

SUD Substance use disorder

Declarations

Ethical approval and consent to participate

The study was approved by the Regional Committees for Medical and Health Research Ethics in November 2014 (2014/438), which also waived the need of informed consent. In addition, approval of the registry linkages was obtained from all registry owners. These approvals included the duty of confidentiality and use of indirectly identifiable health information for research without the data subjects' consent or right of reservation. All experiments were performed in accordance with relevant guidelines and regulations.

Consent for publication

Not applicable

Availability of data and materials

The data that support the findings of this study are available from the Norwegian Patient Registry and registries in Statistics Norway. The data were linked and kept at the Norwegian institute of Public Health. The linked data were used under license for the current study, and so are not publicly available. Data are however available for approved scientists upon reasonable request and with permission of Regional Committees for Medical and Health Research Ethics, as well as the registries included. Co-author of this paper, Anne Line Bretteville-Jensen, can be contacted.

Competing interests

The authors declare that there are no competing interests

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Consent for publication

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Author contributions

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Not applicable

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Figures

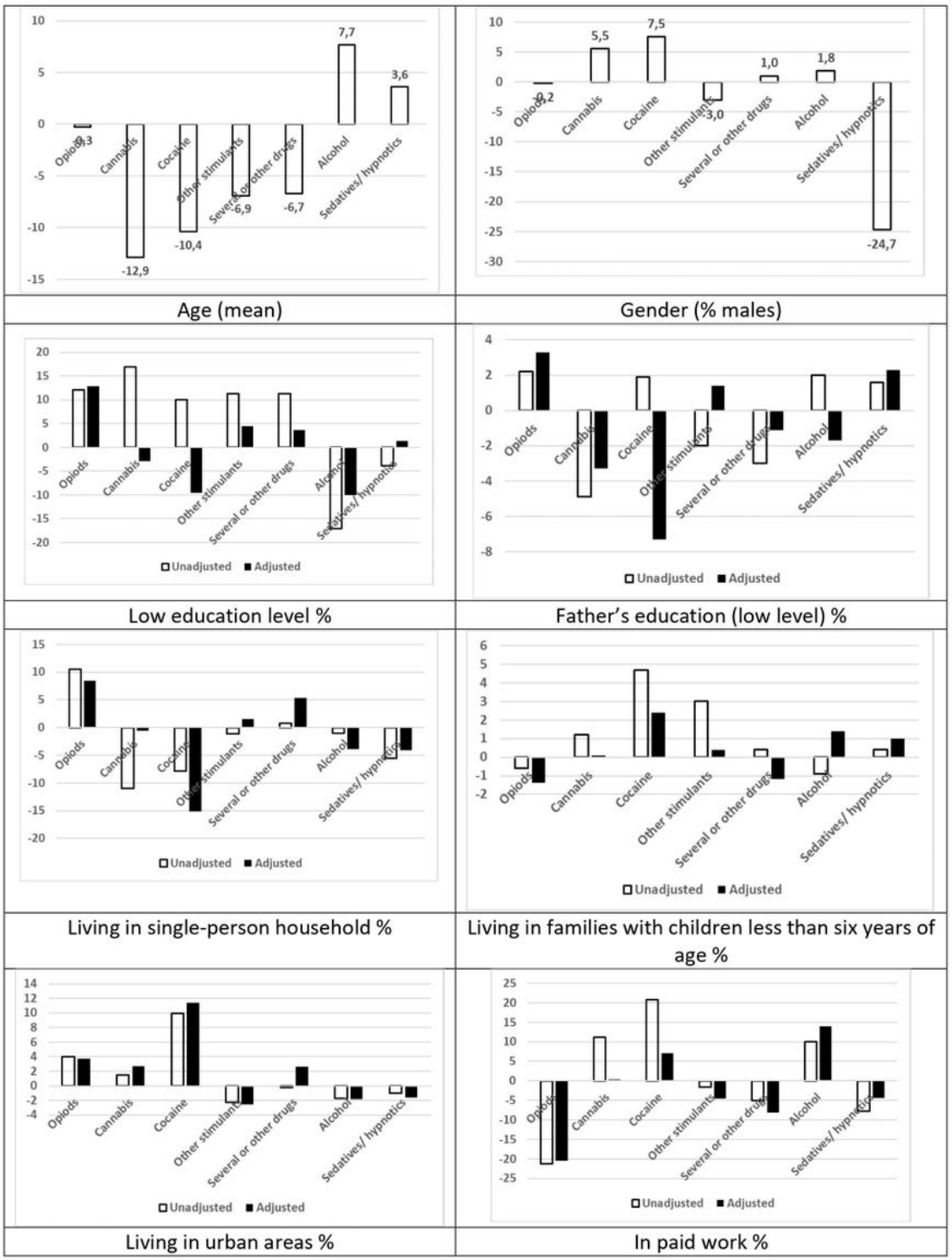

Figure 1

Patients1 by main diagnosis2 and socio-demographic correlates. Percentage point difference from mean value for all patients. Unadjusted and adjusted3 1 Substance use disorder patients with treatment admission 2009-2010 2 Main diagnosis by ICD 10 3 Adjusted to the gender and age distribution among all patients in the study

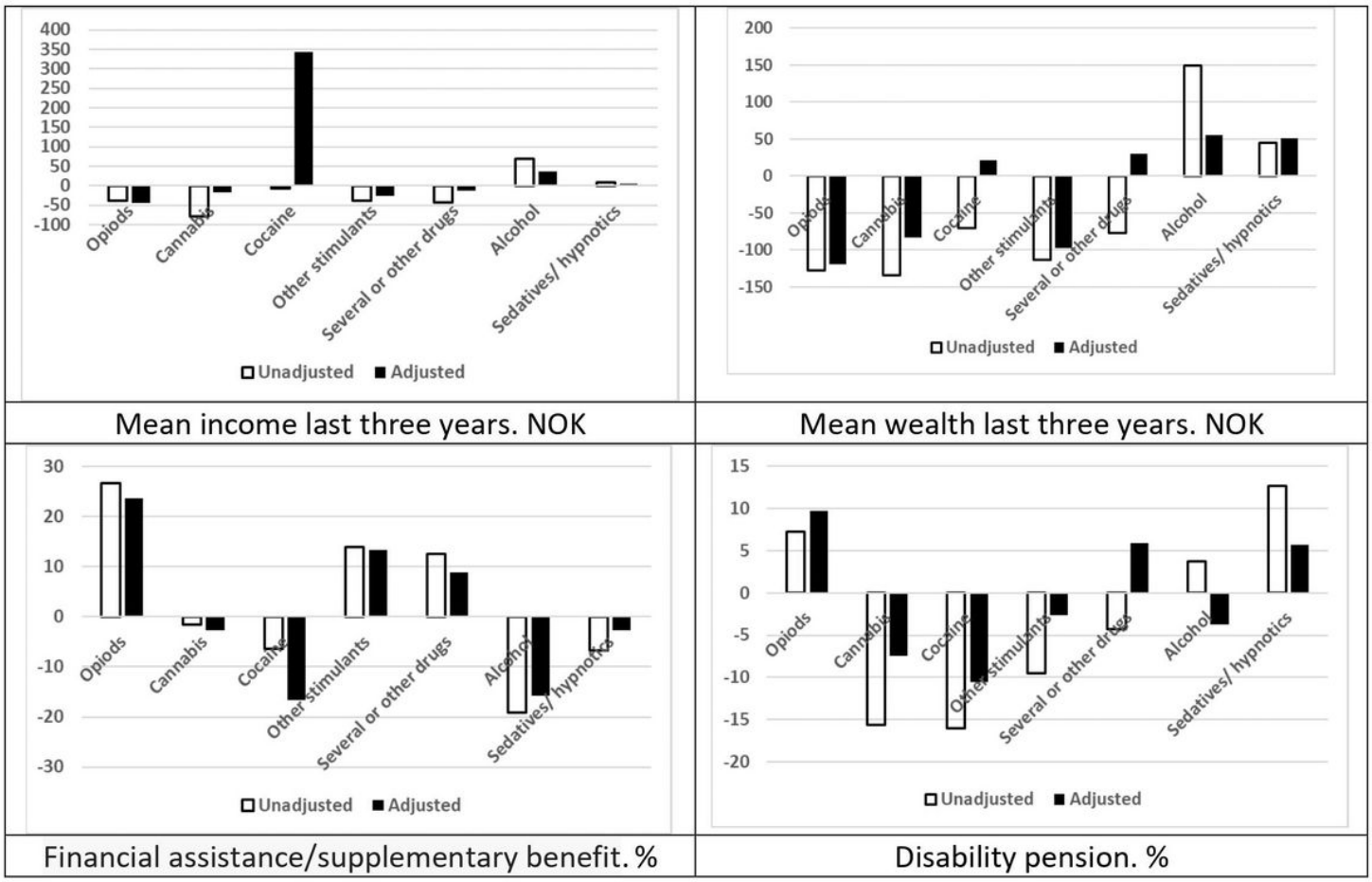

Figure 2

Patients1 by main diagnosis2 and economic correlates. Percentage point and NOK difference from mean value for all patients. Unadjusted and adjusted3 1 Substance use disorder patients with treatment admission 2009-2010 2 Main diagnosis by ICD 10 3 Adjusted to the gender and age distribution among all patients in the study

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