



Can routine data from prisoners' files be used to estimate prevalence rates of illicit drug use among prisoners?

Beatrice Annaheim¹ · Tenzin Wangmo¹ · Wiebke Bretschneider¹ · Marc Vogel² · Bernice S. Elger^{1,3}

Received: 13 March 2017 / Revised: 15 August 2017 / Accepted: 17 August 2017 / Published online: 23 August 2017
© Swiss School of Public Health (SSPH+) 2017

Abstract

Objectives The paper examines whether routine data from prisoners' files is a useful basis to estimate prevalence rates of illicit drug use among prisoners.

Methods Medico-legal files of 190 younger (20–49 years) and 190 older (50–75 years) male prisoners from 13 prisons in Switzerland were analysed. Indications of illicit drug use were extracted based on recorded legal measures, notes from health care professionals, diagnoses related to the use of illicit substances, prescribed medications, other treatment indicators, and results from mandatory drug tests in prison.

Results Estimated lifetime prevalence of illicit drug use based on those indicators is 50.0% for younger and 24.2% for older prisoners. Current cannabis use is an estimated 10.0% and current cocaine, opioids, or other drug use 4.7% for younger prisoners. Among older prisoners, prevalence of current cannabis use is an estimated 3.2% and of other drug use 0.5%.

Conclusions The paper concludes that analysing routine data is a reasonable alternative to surveys if prisoners' files are kept more complete and concise and if data is collected for no other purpose than to benefit prisoners' health.

Keywords Prison · Health · Drug use · Routine data · Prisoners' files · Switzerland

Introduction

“Prison health is public health” (WHO 2013, p. 3), and in prison populations, the illicit drug use is an important issue. Prisoners go on leave, receive visitors, and most of them will eventually leave the prisons (WHO 2013). Thus, illicit drug use among prisoners is a relevant public health issue.

Among prisoners, prevalence rates of illicit psychoactive substance use are high, compared to the general population (EMCDDA 2012; Fazel et al. 2006). However, research on the use of illicit psychoactive substances by inmates remains scarce (Carpentier et al. 2012; Stöver et al. 2008). Scientific knowledge on prisoners' drug use is needed to assess treatment needs for prevention and policy measures. To address this research gap, the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) developed the European Questionnaire on Drug Use among Prisoners (EQDP) (EMCDDA 2014), which can be used as a basic module for national surveys that monitor illicit drug use in prisons. The EMCDDA, however, specifies that data collected through surveys has several limitations and points to the need to triangulate survey results with other information sources. Routine data collection is one of these “other sources” (EMCDDA 2014). The goal of this paper is to employ data from a Swiss prison population to evaluate if routine data from prisoners' files is useful to estimate prevalence rates of illicit drug use. Drug use includes both lifetime use and “current”, that is, in-prison use.

Switzerland has approximately 85 prisoners per 100,000 inhabitants, one of the lowest incarceration rates

✉ Beatrice Annaheim
beatrice.annaheim@unibas.ch

¹ Institute for Biomedical Ethics (IBMB), University of Basel, Bernoullistrasse 28, 4056 Basel, Switzerland

² Division of Addictive Disorders, University of Basel Psychiatric Hospital, Basel, Switzerland

³ Center for Legal Medicine (CURML), University of Geneva, Geneva, Switzerland

worldwide. The Swiss Federal Office for Public Health (FOPH) explicitly guarantees adequate, individualised treatment to every prisoner, including the continuation or start of opioid agonist treatment (OAT) (FOPH 2012). Thus, OAT is available in many Swiss prisons (Pfefferle 2015). Other prevention measures such as free condoms or psycho-social addiction therapy are also—at least theoretically—available to prisoners. However, harm reduction measures, such as needle exchange programs, are provided in only about 10% of Swiss prisons (Pfefferle 2015), and heroin-assisted treatment was offered in only one prison in 2016 (Ursula Hofmann, FOPH, 12.1.17, personal communication). In accordance with international standards (United Nations 1955), every prisoner should be granted a visit to a health care professional shortly after prison entry and have, based on the principle of equivalence (Elger 2008, 2011), access to medical care upon request. Yet, from the prisoners' perspective, this is not always implemented satisfactorily (Galli et al. 2016). Moreover, a FOPH-mandated study (Masia et al. 2007) concludes that less than half of surveyed prisons regularly carry out medical examinations upon admission.

In Switzerland there are 26 different prison health care systems, one for each canton (WHO 2017). Consequently, the collection of routine data varies widely between cantons, and even between prisons within a canton. Every prison, however, collects and records health-related and other information in prisoners' files.

Routine data come in the form of “legal” files and “medical” files. Both can provide possible information on the use of illicit substances. Legal files include information on the reasons for incarceration. For example, information on violations of the Federal Act on Narcotics and Psychotropic Substances (Narcotics Act) or legal measures that resulted in inpatient treatment for drug abuse, according to the Swiss Criminal Code (article 60). Medical files contain information on symptoms and diseases related to illicit substance use (ICD-10 diagnoses), as well as information on treatment related to opioid or other substance use dependence (OAT or counselling for detoxification). These files also list all medications prescribed and dispensed to the prisoners. Finally, there are files containing information from mandatory drug testing in prison. In practice, the way files are kept and stored varies between different prisons.

Methods

The present study is based on data from a large project on health and health care of ageing prisoners (“Agequake in prisons”), funded by the Swiss National Science Foundation.

Twenty-six prisons, housing 2879 prisoners, out of a total of 109 prisons with a capacity of 6978 (2012) fulfilled the “Agequake” project's inclusion criteria. That is, they were from French or German speaking cantons, had long-term imprisonments, more than 20 places, did not hold juvenile prisoners, and were housing elderly prisoners (aged 50 years and above). Fifteen prisons holding 2198 prisoners, out of the eligible 26 prisons (i.e. 76.3% of the eligible population), agreed to participate in the study (Wangmo et al. 2016). The remaining eleven prisons declined participation due to a lack of time and resources. Participating prisons were either closed, in which inmates are never allowed to leave the prison; open, where inmates are allowed to leave the prison for vacation or other reasons; or semi-open, where some parts of the prison hold prisoners that can have temporarily leave, while other parts hold inmates who are not allowed to go outside.

Ethics committees ($n = 10$) in all involved cantons approved the study. Prison health service staff advertised the study to the prisoners, and prisoners were informed of their rights to opt out. Fourteen individuals from the participating prisons chose to opt out.

Files of all remaining prisoners, aged 50 and older were collected in all prisons, except for one. The same number of files of younger prisoners were randomly chosen for comparisons between younger and older prisoners. Data collection took place between November 2011 and April 2014. Two researchers recorded data from the files of 406 male and female prisoners. A more detailed description of the study sample selection and data collection is described by Wangmo et al. (2015, 2016).

As data were not collected for the purpose of the present study, but to analyse elderly prisoners' health status in general, it has shortcomings. Although growing in numbers, prisoners aged 50 and more are still a minority in prison populations. In 2016, they made up roughly 14% of the Swiss prison population (FSO 2016). In the “Agequake” project, the sampling procedure was designed such that elderly prisoners were over-represented, comprising 50% of the sample. Therefore, age groups were analysed separately. Female prisoners generally show higher prevalence rates of illicit drug use and have different health needs than males (Fazel et al. 2006; Moschetti et al. 2015), so they should not be treated as a homogenous group. Because the number of files from female prisoners ($n = 26$) was too small to carry out a representative separate analysis, we excluded them.

The following indicators, available in the prisoners' files and potentially useful to estimate prevalence rates of (a) lifetime illicit drug use and (b) illicit drug use during imprisonment (named “current” use), were included in our analyses:

1. Legal measures for inpatient treatment for drug abuse (a).
2. Violations of the Swiss Narcotics Act (a).
3. Illicit drug use according to notes from health care professionals (a/b).
4. ICD-10 diagnoses related to the use of illicit substances: ICD-10 F11 (opioids), F12 (cannabis), F14 (cocaine), and F16 (hallucinogens) (a).
5. Medications typically used in the treatment of opioid dependence: methadone, slow-release oral morphine (SROM), buprenorphine, levomethadone or diacetylmorphine (a).
6. Opioid agonist treatments noted in medical files (a).
7. Counselling for detoxification (a).
8. Drug tests in prison (a/b).

First, we assessed the number of individuals with lifetime drug use (a) and “current” drug use (b), according to one of the eight indicators. The percentages were calculated based on $n = 190$ younger and $n = 190$ older prisoners. Second, indicators with proven utility were used to construct two “overall-indicators” of either lifetime use or “current” use of illicit drugs. If one or more of the eight indicators showing lifetime (a) illicit drug use was positive, the overall-indicator was set as lifetime positive (i.e. lifetime illicit drug use). If at least one of the two indicators showing “current” (b) illicit drug use were positive, the overall-indicator was set as “current” use positive.

Results

Sample description

According to the sampling strategy, 190 male prisoners were aged 20–49 years (“young”) and 190 male prisoners 50–75 years (“old”) at the day of data recording. Mean age was 34.3 (SD 7.4) years for young prisoners and 58.8 (SD 5.8) years for old prisoners. The majority was not of Swiss nationality (young: 70.5%, old: 35.8%). Of the 13 prisons holding male prisoners, six are closed prisons, and seven are open or semi-open prisons. Roughly two-thirds of prisoners (64.2%) are in closed institutions. The mean time already served in prison is 2.5 (SD 2.5) years for younger and 5.2 (SD 6.3) years for older prisoners.

Legal measures for inpatient treatment for drug abuse and Violations of the Swiss Narcotics Act.

As shown in Table 1, 1.1% of younger and 2.6% of older prisoners are imprisoned with a legal measure for inpatient treatment for drug abuse, while 33.2% of younger and 11.6% of older prisoners are imprisoned for violations of the Narcotics Act. Of the subgroup of younger prisoners with violations of the Narcotics Act ($n = 63$, not in Table),

61.9% have at least one other positive indicator for lifetime illicit drug use.

Illicit drug use according to notes from health care professionals

According to the notes from prison’s health care professionals in medical files, lifetime prevalence of cannabis use was 35.3% for younger and 11.6% for older prisoners (Table 1). Lifetime prevalence was 24.2% (young) and 6.8% (old) for cocaine use, 14.7% (young) and 5.8% (old) for opioids, and 4.7% (young) and 1.6% (old) for other illicit substance use (e.g. amphetamines, MDMA (ecstasy), and LSD). Information on “current” use was only available for cannabis: 3.7% of younger and 1.6% of older prisoners used cannabis during their present imprisonment.

ICD-10 diagnoses related to the use of illicit substances

Data from medical files indicated that 6.8% of younger and 2.1% of older prisoners have a cannabis-related disorder (Table 1). Prevalence rates of cocaine-, opioids- and hallucinogens-related disorders were very low.

Medications typically used in treatment of opioid dependence

During imprisonment (but a maximum of 5 years from the date of data collection), 7.4% of younger and 4.7% of older prisoners took medications typically used as treatment of opioid dependence (Table 1). Such medications include methadone and/or SROM, for example Sevre-Long® or MST®.

Opioid agonist treatment and Counselling for detoxification

According to notes from health care professions in the medical files, at least 6.3% of younger and 2.6% of older prisoners were in OAT during imprisonment (Table 1). Very few prisoners made use of counselling for detoxification.

Drug tests in prison

In the analysed prisons, mandatory drug tests are performed regularly, either upon suspected use or at random. Of the sample, 92 individuals (24.2%) were tested at least once during imprisonment for THC, 74 (19.5%) for cocaine, six (1.6%) for opioids, and 41 (10.8%) for amphetamines.

Table 1 Prevalence (%) of illicit drug use among prisoners in Switzerland (2011–2014), according different indicators

Indicator	Young 20–49 years (<i>n</i> = 190)	Old 50–75 years (<i>n</i> = 190)	Used for overall-indicator (yes = ×)			
			lifetime	current	cannabis	other drugs
Legal measures and violations of the Narcotics Act						
Legal measures for inpatient treatment for drug abuse	2 (1.1%)	5 (2.6%)	×			×
Violations of the Swiss Narcotics Act	63 (33.2%)	22 (11.6%)	Variable not used			
Illicit drug use according to notes from health care professionals						
Cannabis, lifetime	67 (35.3%)	22 (11.6%)	×		×	
Cocaine, lifetime	46 (24.2%)	13 (6.8%)	×			×
Opioids, lifetime	28 (14.7%)	7 (5.8%)	×			×
Other (amphetamines, MDMA/Ecstasy, LSD), lifetime	9 (4.7%)	3 (1.6%)	×			×
Cannabis, current	7 (3.7%)	3 (1.6%)		×	×	
ICD-10 diagnoses related to the use of illicit substances						
Cannabis (F12)	13 (6.8%)	4 (2.1%)	×		×	
Cocaine (F14)	2 (1.1%)	2 (1.1%)	×			×
Opioids (F11)	2 (1.1%)	3 (1.6%)	×			×
Hallucinogens (F16)	1 (0.5%)	0 (0.0%)	×			×
Medications typically used in treatment of opioid dependence						
Methadone and/or slow-release oral morphine (SROM) prescriptions	14 (7.4%)	9 (4.7%)	×			×
Opioid agonist treatment and counselling for detoxification						
Opioid agonist treatment (OAT)	12 (6.3%)	3 (2.6%)	×			×
Counselling for detoxification	3 (1.6%)	1 (0.5%)	×			×
Drug tests in prison						
THC + (cannabis)	12 (6.3%)	4 (2.1%)		×	×	
Cocaine +	4 (2.1%)	0 (0.0%)		×		×
Opioids +	1 (0.5%)	1 (0.5%)		×		×
Other drugs + (amphetamines, unknown illicit substance)	6 (3.2%)	0 (0.0%)		×		×
Overall-indicator						
Cannabis, lifetime	71 (37.4%)	24 (12.6%)				
Cocaine, opioids and other (unknown) drugs ^a , lifetime	64 (33.7%)	29 (15.3%)				
Cannabis, current	19 (10.0%)	6 (3.2%)				
Cocaine, opioids and other drugs, current	9 (4.7%)	1 (0.5%)				
Any illicit drug, lifetime	95 (50.0%)	46 (24.2%)				
Any illicit drug, current	23 (12.1%)	6 (3.2%)				

^a Results for cocaine, opioids and other (unknown) drugs are reported in one group because of low numbers

As Table 1 shows, prisoners' files indicated at least one positive test result in 6.3% of younger and 2.1% of older prisoners for THC. Very few prisoners tested positive for other substances.

Overall-indicators

The overall-indicators of illicit drug use included all indicators described in Table 1, without Violations of the

Narcotics Act, as this indicator turned out to be unreliable (see "Discussion").

As Table 1 shows, estimated overall prevalence rates were 37.4% (young prisoners) and 12.6% (old) for lifetime cannabis use; 33.7% (young) and 15.3% (old) for lifetime use of other drugs (mainly cocaine and opioids). Estimated prevalence rates for "current" (i.e. use during prison stay) cannabis use were 10.0% (young) and 3.2% (old), while

prevalence rates for “current” drug use other than cannabis were 4.7% (young) and 0.5% (old).

This means that among younger prisoners ($n = 190$), there were indications of lifetime illicit drug use for exactly half of the sample (50.0%). Lifetime cannabis-only users were 18.9%, while lifetime cocaine or opioids—often in combination with cannabis—users were 14.2% or 15.3% of this subsample (Fig. 1). For a few individuals (1.6%), there were indications of lifetime illicit drug use, either for other (e.g. amphetamines) or unknown substances (e.g. we do not know if a legal measure was given for problems related to cocaine or opioid use). In the older age group ($n = 190$), there were indications of lifetime illicit drug use for a fourth of individuals (24.2%). In this subsample, 8.9% were cannabis only users, while 4.2 or 7.9% were lifetime cocaine or opioid (with cannabis) users. For 3.2% of the older prisoners, there were indications of lifetime illicit drug use of other or unknown substances.

Concerning “current” use, an estimated 7.4% of younger individuals used cannabis, only, and 4.7% used other substances, mainly cocaine or opioids (often with cannabis) (Fig. 2). In the older age group, available data allowed an estimation of 2.6% of “current” cannabis only users and 0.5% of “current” other drug (often with cannabis) users. (Except for cannabis, a separation of different substances is not meaningful, due to small numbers).

There are some differences when comparing prevalence rates of “current” use of younger individuals in closed prisons ($n = 123$) with those of younger individuals in open or semi-open prisons ($n = 67$) (Table 2). In closed prisons, 6.5% had an indication of cannabis use during

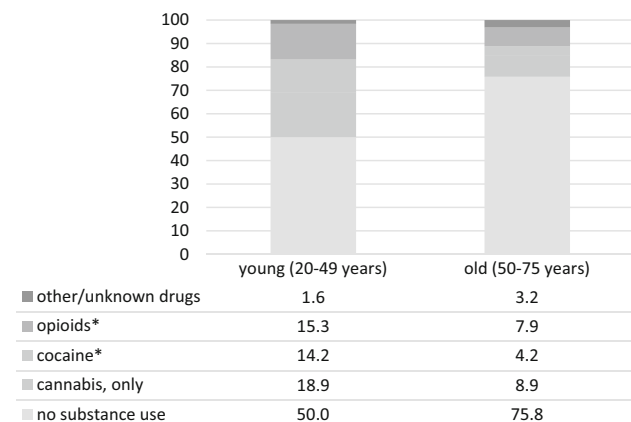


Fig. 1 Overall-indicator lifetime prevalence (%) of illicit drug use among prisoners in Switzerland (2011–2014). *Asterisk* cocaine and opioids are often used with cannabis; lifetime prevalence is calculated based on legal measures for inpatient treatment for drug abuse, notes from health care professionals in the prisoners' files, diagnoses and prescriptions of methadone/slow-release oral morphine (SRM), opioid agonist treatment and counselling for detoxification, as well as results from drug screening tests in prison (i.e. overall-indicator lifetime)

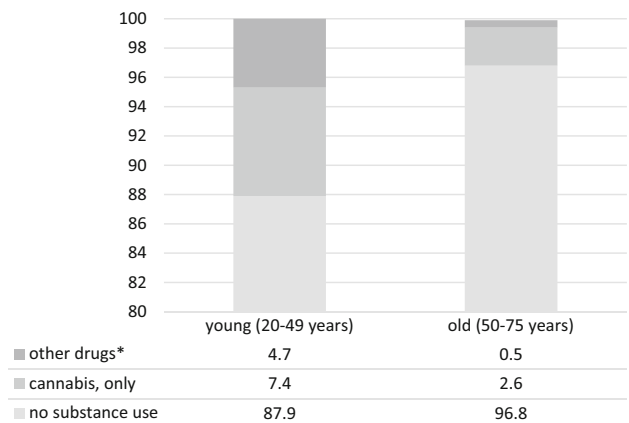


Fig. 2 Overall-indicator prevalence (%) of current illicit drug use among prisoners in Switzerland (2011–2014). *Asterisk* other drugs are often used with cannabis; prevalence “current” illicit drug use is calculated based on notes from health care professionals in the prisoners' files and results from drug screening tests in prison (i.e. overall-indicator “current”)

Table 2 Prevalence (%) of current drug use among prisoners in Switzerland (2011–2014), by prison type

	Closed prisons	(semi-) Open prisons
Young (20–49 years)	($n = 123$)	($n = 67$)
Cannabis	8 (6.5%)	6 (9.0%)
Other illicit drugs	4 (3.3%)	5 (7.5%)
Old (50–75 years)	($n = 121$)	($n = 69$)
Cannabis	2 (1.7%)	3 (4.3%)
Other illicit drugs	0 (0.0%)	1 (1.4%)

“Current” drug use is calculated based on notes from health care professionals in the prisoners' files and results from drug screening tests in prison (i.e. overall-indicator “current”)

prison stay, while in (semi-) open prisons, it was 9.0%. Differences between prison types were more evident for other illicit drugs. In closed prisons, 3.3% had an indication of cocaine, opioids, or other drug use during prison stay, while in (semi-) open prisons it was 7.5%. Discrepancies in prevalence of “current” use between different prison types were also observed in the older age group, although prevalence rates were markedly lower.

Discussion

Available data on prevalence rates of illicit drug use among prisoners are scarce and often limited to prisoner surveys. Our results demonstrate that prisoners' files can be used as a cost-effective data source. Using data from medico-legal files of prisoners, we identified several indicators of illicit drug use and built overall-indicators of lifetime and “current” drug use.

We find that at least half of younger prisoners had a lifetime experience of illicit drug use, most commonly cannabis, followed by other drugs such as cocaine and opioids. Roughly one out of ten young prisoners used drugs during incarceration, primarily cannabis. One-fourth of older prisoners had a lifetime history of drug use, mainly opioids and cocaine, followed by cannabis. However, only 3% used drugs during incarceration, primarily cannabis.

Several reasons for the lower prevalence rates of illicit drug use among older inmates are conceivable, such as cohort effects (drug use is typically initiated in young adulthood, and when the older inmates in our sample were teenagers or young adults, drug use was not as widespread in Swiss society as today) (FOPH 2006). Furthermore, many opioid users may have died prematurely. Last, prisoners' files do not trace drug use in the (distant) past. Because older prisoners are a minority of the prison population and the data sampled for this group was an overrepresentation, we focus on the younger age group when comparing the study findings with available literature.

A comparison between our results with lifetime illicit drug use data on the Swiss general population (Gmel et al. 2013) is of limited validity as samples differ. Nevertheless, our results are similar to prevalence rates of cannabis use of the general male population (our study: 37.4%, Addiction Monitoring: 35%), but markedly higher concerning other illicit drugs (our study: 33.7%, Addiction Monitoring: cocaine: 5%, heroin: 1.6%). These findings may reflect that cannabis use is widespread in the Swiss population and to some degree, a "normalised" behaviour (Sznitman 2009). However, the use of other illicit drugs (mainly heroin) is more typical for deviant subgroups and marginalised populations including prisoners (Eisenbach-Stangl et al. 2010; EMCDDA 2003, 2012). The prevalence of "current" cannabis use among younger prisoners is also comparable to that of the general population: according to Addiction Monitoring, 8.8% of males have used cannabis in the past 12 months. These rates are similar to the prevalence of cannabis use in (semi-) open prisons (9.0%), but higher than the prevalence in closed prisons (6.5%). For "current" cocaine and heroin use, no data are available from the general Swiss population.

The EMCDDA (2012) reports prevalence rates of lifetime illicit drug use among prisoners, ranging between 16 and 79% for different European countries. Unfortunately, as Switzerland is not an EMCDDA member state, we do not have such data to triangulate our results. However, our finding of 50.0% lies in the middle of this range and is thus plausible for Switzerland. Future studies should aim to compare data from the routine parameters described in this paper with data from self-reported measures collected in the same setting.

Concerning "current" illicit drug use among prisoners, rates vary between 20 and 40% in most European countries (EMCDDA 2012). Our estimation of 12.1% is comparatively low. There are several explanations for this finding. Drug use experiences among inmates of Swiss prisons may be lower because since the 1990s, low-threshold treatment for drug use, particularly heroin, has been widely available and covered by mandatory health insurance. However, this is also the case for the Netherlands, which does not have similarly low rates (EMCDDA 2012). The other explanation is that the information gathered in medico-legal files provides a conservative estimate of true use, because use may be underreported or unrecognised.

Lacking indicators of drug use in existing prisoner files

We report several variables (called "indicators") that may help to capture the prevalence of illicit drug use in Swiss prisons. These include legal measures and violations of the Narcotics Act, lifetime and current use according to health care professionals' notes, diagnoses, medications, OAT, counselling for detoxification, and results from screening tests in prisons.

In Europe, drug offences are a main reason for incarceration (Aebi et al. 2015). Nevertheless, having committed a drug crime does not necessarily mean using drugs. In our sample of younger prisoners sentenced for a violation of the Narcotics Act ($n = 63$), 38.1% had no other indication of illicit drug use according to the prisoners' files. That is, there were no corresponding diagnoses, no positive drug tests, etc. This reveals the possibility that there are prisoners sentenced for violations of the Narcotics Act without having ever used illicit drugs. Therefore, the validity of this indicator for estimating illicit drug use is questionable. Consequently, we excluded this indicator when building the overall variable.

Concerning illicit drug use, notes from health care professionals in the medical files are incomplete. Data on "current" illicit drug use is available for only cannabis. For all other substances, notes available in the medical files do not allow the estimation of "current" drug use prevalence. In addition, only a few files contain information on the frequency of use or the administration of drugs (e.g. injecting drug use). Thus, the available data do not allow meaningful statements about frequency or route of administration. We have to assume, thus, that health care professionals do not record all illicit drug use.

Not all 13 prisons included in this analysis were able to provide access to mental health data (i.e. in three cases data were stored outside the prison and one prison only had partial data). Thus, our prevalence rates of ICD-10 diagnoses related to illicit drug use are based upon incomplete

data. Further, prevalence rates may also be underestimated because in our analyses we only include illicit substances. We do not include disorders related to sedatives and hypnotics, stimulants, or multiple substance use disorders as those might possibly imply legal substances (e.g. benzodiazepines).

From the 92 individuals that were tested for THC, the prisoners' files only cover test results—either positive or negative—for 38 individuals (41%), while results for cocaine tests ($n = 74$ individuals) are available for only 24 individuals (32.4%). Thus, for a majority of prisoners known to be tested for illicit substance use, test results are not recorded in the medical files. We can only hypothesise about the reasons for recording tests, but not test results. Maybe test results were negative and, thus not considered as worth noting. Or, test results were positive, but not recorded by the health care professionals because they did not want to stigmatise prisoners by recording health data that is not in the prisoners' best interest. Another explanation might be an inconsistent management of medical files between different health care professionals, combined with fluctuation of personnel in the prisons' medical services.

In prison, it seems very unlikely that methadone or SROM is prescribed as pain medication (cf. Elger 2008, 2011; Elger et al. 2002) and the prescription of those substances is, thus a clear indication of OAT. However, when comparing the indication of prisoners in OAT according to health care professionals' notes in the medical files with lists of medications prescribed during imprisonment, we find nine younger individuals who received prescriptions of methadone or SROM, without a note about OAT in the medical file. Concerning those treatment indicators, we also suspect files' incompleteness.

Finally, we note that medication lists as found in medical records are very complex, often even handwritten. Thus, prescriptions of medications are difficult to read and copy. We choose a careful approach for our analysis, that is, prescriptions that are not possible to identify with certainty (e.g. if prescription start date was not readable), such medications are excluded from the analysis. As a result, some data on medications were lost, and thus our estimation of the prevalence of lifetime illicit drug use based on prescribed methadone and SROM, is an underestimation.

Limitations of our study

As the project sought to collect data on older prisoners' health and health needs and compare them with a sample of younger prisoners, the main limitation remains that the data was not collected for the purpose of this study. This study is a secondary analysis of the available data from the overall project, which may also (to some extent) explain

the incompleteness of the data that we reported above. Second, as the aim of the project was to study older prisoners, they were over-sampled. We overcame this limitation by analysing the two age groups separately. In addition, we did not apply statistical tests to contrast the two age groups, because it is well known from existing studies that older prisoners have lower prevalence rates of illicit drug use than younger prisoners (e.g. Moschetti et al. 2015; Omolade 2014). Third, due to small sample size and rather low prevalence rates, a distinct analysis of different psychoactive substances (cocaine, heroin, amphetamines) is not possible. Still, prevalence of cannabis use is high enough to treat it separately. This makes sense, as cannabis is different from other illicit psychoactive substances, and its health risks are probably more similar to tobacco than to cocaine or heroin. Legal substances are not included in the present study although their use is widespread in prison populations and bears relevant health risks (EMCDDA 2012; Fazel et al. 2006; Moschetti et al. 2015). Finally, it would have been conclusive to compare the prevalence rates obtained in our study to EQDP or other Swiss prison survey data. However, this was not possible as currently there are no such data available.

Conclusions

To conclude, routine data indicators of illicit drug use are often incomplete with the related shortcomings. However, our data show that they can be combined to create “overall-indicators” with better validity, which provide useful data on illicit drug use among prisoners. As such, when it comes to the estimation of prevalence rates of illicit drug use, prisoners' files are a reasonable alternative, or, ideally, supplement, to surveys among prisoners if the following conditions are met. First, prisoners' files have to be kept more complete and concise concerning drug use. Second, all data that are collected and recorded in medical files should benefit prisoners, and should not be used for any other purposes than improving their health.

Acknowledgements We are very grateful to the prisons and prisoners who gave us access to their files. The “Agequake” study was funded by the Swiss National Science Foundation (Grant no. CR1311_135035). BA was supported by the University of Basel “stay on track” measure for highly qualified female postdoctoral researchers in early stages of motherhood. The authors would also like to thank Dr. Violet Handtke for data collection, Angelo Belardi for data management, Dr. Edi Kradolfer for data analyses, and Dorit Barlevy for English revision of the manuscript.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethics committees ($n = 10$) of all involved Swiss cantons approved the study.

Informed consent Individual consent was not obtained in our study. Prisoners were informed about the study using flyers in different languages that were posted in the prisons and orally by prison health service staff. Those prisoners who did not wish their data to be anonymously extracted, had the possibility to opt-out from the study (i.e. denying access to their medico-legal files) by informing the prison health service. This procedure was approved by ethics committees of all involved cantons.

References

- Aebi MF, Tiago MM, Burkhardt C (2015) SPACE I—Council of Europe annual penal statistics: prison populations. Survey 2014. Council of Europe, Strasbourg
- Carpentier C, Royuela L, Noor A, Hedrich D (2012) Ten years of monitoring illicit drug use in prison populations in Europe: issues and challenges. *Howard J Crim Justice* 51:37–66. doi:10.1111/j.1468-2311.2011.00677.x
- Eisenbach-Stangl I, Moskalewicz J, Thom B (2010) Two worlds of drug consumption in late modern societies. European Centre, Vienna
- Elger BS (2008) Towards equivalent health care of prisoners: European soft law and public health policy in Geneva. *J Public Health Policy* 29:192–206. doi:10.1057/jphp.2008.6
- Elger BS (2011) Prison medicine, public health policy and ethics: the Geneva experience. *Swiss Med Wkly* 141:w13273. doi:10.4414/smw.2011.13273
- Elger BS, Goehring C, Revaz SA, Morabia A (2002) Prescription of hypnotics and tranquilisers at the Geneva prison's outpatient service in comparison to an urban outpatient medical service. *Soz Praventivmed* 47:39–43
- European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (2003) Social exclusion and reintegration. In: European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (ed) EMCDDA 2003 Annual report on the state of the drugs problem in the European Union and Norway, EMCDDA 2003 selected issue. EMCDDA, Lisbon, pp 65–68
- European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (2012) Prisons and drugs in Europe: the problem and responses. Publication Office of the European Union, Luxembourg
- European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) (2014) European questionnaire on drug use among prisoners (EQDP). http://www.emcdda.europa.eu/system/files/publications/782/Questionnaire_on_Drug_Use_among_Prisoners_%28EQDP%29_479898_1.pdf. Accessed 10 Mar 2017
- Fazel S, Bains P, Doll H (2006) Substance abuse and dependence in prisoners: a systematic review. *Addiction* 101:181–191. doi:10.1111/j.1360-0443.2006.01316.x
- Federal Office for Public Health (FOPH) [Bundesamt für Gesundheit (BAG)] (2006) Switzerland's Drug Policy 2006–2011 [Die Drogenpolitik der Schweiz. Drittes Massnahmepaket des Bundes zur Verminderung der Drogenprobleme (MaPaDro III) 2006–2011]. FOPH, Bern
- Federal Office for Public Health (FOPH) [Bundesamt für Gesundheit (BAG)] (2012) Communicable diseases and addictions in prison. *Vade mecum* [Übertragbare Krankheiten und Abhängigkeiten im Gefängnis. Vademecum]. FOPH, Bern
- Federal Statistical Office (FSO) [Bundesamt für Statistik (BFS)] (2016) Prison sentences and measures: Mean number of detainees of the people over 49 years [Straf- und Massnahmenvollzug: Mittlerer Insassenbestand der über 49-jährigen Personen]. <https://www.bfs.admin.ch/bfs/de/home/statistiken/kriminalitaet-strafrecht.assetdetail.303596.html>. Accessed 28 Feb 2017
- Galli S, Bretschneider W, Elger BS, Handtke V, Shaw D (2016) Aging prisoners' views on healthcare services in Swiss prisons. *J Appl Gerontol*. doi:10.1177/0733464816681150
- Gmel G, Kuendig H, Notari L, Gmel C, Flury R (2013) Addiction monitoring in Switzerland—alcohol, tobacco and illegal drug use in Switzerland in 2012 [Monitoring suisse des addictions—Consumation d'alcool, tabac et drogues illégales en Suisse en 2012]. *Addiction Suisse*, Lausanne
- Masia M, Achermann C, Richter M, Hostettler U (2007) Survey report: “Analysis of preventive measures and treatment availability for infectious diseases and drug addiction in Swiss correctional facilities” [Auswertungsbericht zur Fragebogenerhebung: „Analyse von Präventionsmassnahmen und Behandlungsangeboten von Infektionskrankheiten und Drogenabhängigkeit in Schweizer Anstalten des Freiheitsentzugs“]. University of Fribourg (Switzerland), Fribourg
- Moschetti K, Stadelmann P, Wangmo T et al (2015) Disease profiles of detainees in the Canton of Vaud in Switzerland: gender and age differences in substance abuse, mental health and chronic health conditions. *BMC Public Health* 15:872. doi:10.1186/s12889-015-2211-6
- Omolade S (2014) The needs and characteristics of older prisoners: results from the surveying prisoner crime reduction (SPCR) survey. Analytical summary 2014. Ministry of Justice (UK), London
- Pfefferle M (2015) Substitution in correctional facilities in Switzerland [Substitution in den Haftanstalten der Schweiz]. In: Prison medicine days 2015. Substitution in correctional facilities in Germany and the treatment of diseases related to addictions [Gefängnismedizintage 2015, Substitution im Justizvollzug Deutschlands und die Behandlung von Suchtfolge- und Sucht-begleit-Erkrankungen unter Substitution. 3./4. Dezember 2015] University of Applied Sciences, Frankfurt, pp 64–69
- Stöver H, Weilandt C, Zurhold H, Hartwig C, Thane K (2008) Final report on prevention, treatment, and harm reduction services in prison, on reintegration services on release from prison and methods to monitor/analyse drug use among prisoners. WIAD, Bonn
- Sznitman SR (2009) An examination of the normalisation of cannabis use among 9th grade school students in Sweden and Switzerland. *Addict Res Theory* 15:601–616. doi:10.1080/16066350701433233
- United Nations (1955) Standard minimum rules for the treatment of prisoners. <http://www.refworld.org/docid/3ae6b36e8.html>. Accessed 28 Feb 2017
- Wangmo T, Meyer AH, Bretschneider W et al (2015) Ageing prisoners' disease burden: is being old a better predictor than time served in prison? *Gerontology* 61:116–123. doi:10.1159/000363766
- Wangmo T, Meyer AH, Handtke V et al (2016) Aging prisoners in Switzerland: an analysis of their health care utilization. *J Aging Health* 28:481–502. doi:10.1177/0898264315594137
- World Health Organisation (WHO) (2013) Good governance for prison health in the 21st century. A policy brief on the organization of prison health. WHO Regional Office for Europe, Copenhagen
- World Health Organisation (WHO) (2017) Switzerland: a snapshot of prison health. <http://www.euro.who.int/en/health-topics/health-determinants/prisons-and-health/activities/country-work/country-snapshots-interviews-with-national-counterparts/switzerland>. Accessed 4 Jan 2017