This is the authors' final, peer reviewed manuscript published in Science of the total environment DOI: 10.1016/j.scitotenv.2013.12.098 (2014) ISSN 0048-9697 trykt; 1879-1026 elektronisk, with the title:

Self-reports of consumption of amphetamines, cocaine and heroin in a survey among marginalized drug users.

http://www.sciencedirect.com/science/article/pii/S0048969713015817

Self-reports of consumption of amphetamines, cocaine and heroin in a survey among marginalized drug users

Ellen J. Amundsen[a,]
eja@sirus.no

Malcolm J. Reid[b]
Malcolm.Reid@niva.no

[a]Norwegian Institute for Alcohol and Drug Research, P.O. Box 565 Sentrum, NO-0105 Oslo, Norway
[b]Norwegian Institute for Water Research, Gaustadalleen 21, NO-0349 Oslo, Norway
Corresponding author. Tel.: + 47 40 62 10 29.

Abstract

Background and aim Scientific literature offers few measurements of the quantities consumed by individual drug users. Such measurements are used for calculating the total drug consumption by the quantity–frequency method, and are extremely important for the comparison with waste water derived consumption estimates. The aim of this study was to measure quantities of amphetamines, cocaine and heroin consumed by marginalized drug users, using a multi-city questionnaire survey design. Variation by gender, age, frequency of use, main drug used and city was explored.

Results The self-reported quantity used on the last day of use was for amphetamines on average 800 mg, for cocaine 1014 mg and for heroin 682 mg. The self-reported usual dose was on average 297 mg, 487 mg and 297 mg respectively, while the median value was 250 mg for all three drugs. Overall, gender and age group were less important than frequency of use and the main drug used for establishing differences regarding the outcome variables. There were some differences regarding cities. No measure of purity was carried out at the interview sites, so the calculation of pure quantities was based on aggregate results from analyses of seizures by police and customs.

Conclusions The self-reported quantities of drugs consumed in three cities in Norway was equal to or somewhat higher among marginalized users than earlier assumed, where assumptions were based on limited literature and anecdotal information.

Keywords: Amphetamines; Cocaine; Heroin; Quantity; Dose; Self-reported

1 Introduction

The methods for monitoring drug use and estimating the quantities of drugs consumed and market sizes have been supplemented with the new method of measuring illegal drugs in waste water (Frost and Griffiths, 2008; Reid et al., 2011).

Estimation of the size of drug markets has so far been carried out either using information from the production side or from the demand side (Bramley-Harker, 2001). The demand side approach employs data on the number of users, their frequency of use, and the quantities consumed, often called the quantity/frequency (QF) method. In a study by Reid et al. (2012) the waste water and QF method for estimating cocaine consumption were compared for the city of Oslo, Norway. No significant differences were found regarding results from the QF approach and the waste water approach. It was surprising, however, that the figure from the QF approach was the highest. The QF approach tends to underestimate alcohol consumption for a country, as compared to sales and production data. Underestimation may vary from 30% to 70% (Babor et al., 2010). At the moment, a major weakness in using the QF method to estimate the consumption of illegal drugs is the scarcity of information about quantities consumed (Reid et al., 2012; Mckeganey et al., 2009). To be able to improve the comparisons of methods for consumption estimation, more studies measuring quantities of use for different user populations should be carried out.

Comparisons of methods estimating consumption will also depend on the purity of the drug. This is very seldom controlled at the street level in surveys (Evrard et al., 2010). Figures on purity may vary over time, place and with the level in the sales system. Cutting the drug, i.e. mixing it with another matter to obtain a larger profit, may vary by drug dealer organization or route of transport. Cutting also happens at the last sale or user level to get an enhanced effect. Figures regarding drug purity are usually derived from seizures by the police or customs.

The aim of this study was to measure the quantities of amphetamines, cocaine and heroin consumed among marginalized drug users, using a multi-city questionnaire survey design. Variation by gender, age, frequency of use, main drug use and city was explored. Illustrations of the quantity of pure drugs consumed are also given.

2 Material and methods

For this study, eligible persons were those 18 years and over who had used amphetamines, cocaine, heroin, or other opioids during the last 12 months in three cities: Arendal, with 42,000 inhabitants (interviews conducted in 2010); Tromsø,

with 71,000 inhabitants (interviews conducted in 2011–2012); and Oslo, with 625 ,000 inhabitants (interviews conducted in 2012). "Amphetamines" were specified in the questionnaire to include amphetamine and methamphetamine, while "cocaine" also included crack. "Heroin" included the specific substance only, while "other opioids" included all other natural, semi-synthetic and synthetic types of opiates and opioids, both prescribed and not prescribed. The questionnaire included a long list of substances and corresponding brand names for clarification. Respondents were recruited by contact established via local social workers and administrative staff working in services for marginalized drug users¸ both non-governmental and public. Posters announced the aim of the survey and periods of interviewing at the different services. Most interviews were conducted in calm areas or separate café rooms, low threshold services or hostels/shelters, while some were conducted in the streets just outside such premises. No random mechanism for choosing cites to interview was employed, but in each city, researchers visited several sites aimed at marginalized users in different situations. Interviews were conducted by the project leader and social science or social work students who received 5 h of training. The interviews lasted from 20 to 30 min, and compensation of NOK 200 ($35) was given after the interview.

The questionnaire included questions mainly about the types of drugs used and their frequency of use and quantity. In addition, some demographic and background information was requested, such as gender, age group, continent of birth, education level and type of dwelling. In Arendal and Tromsø an additional question regarding "mainly weekend use" vs. "use any other day of the week" was included.

An anonymous dataset was preferred and this was developed in collaboration with the Norwegian Social Science Data Services (NSD), which is the partner of the Norwegian Data Inspectorate for implementation of the statutory data privacy requirements in the research community. The project was approved by The National Committee for Research Ethics in the Social Sciences and the Humanities.

The inclusion criterion for the study was use of amphetamines, cocaine/crack, heroin or opioids in the last 12-months. In this analysis, only those who had taken such drugs during the last 30-days were included. This was done to reduce the recall bias regarding quantities consumed.

Injecting drugs, as opposed to other methods of administration, is very common among marginalized drug users in Norway. Both amphetamine and methamphetamine are sold as powders on the black market and are often injected. The opioids include a wide range of substances: opium, heroin (the brown type is

dominating), methadone (mainly as a fluid), Subutex and a long range of drugs such as Dolcontin, OxyContin and Temgesic (tablets). Heroin is mainly injected and tablets are also often crushed and injected. Information on quantities of opioids other than heroin was not complete due to the wide range of such drugs. Results are therefore only shown for amphetamines, cocaine and heroin.

The significance of the differences in the outcome variables by gender, age, the drug most frequently used, the frequency of the actual drug use over the last 30 days, and city was tested using a linear regression, both unadjusted (simple) and adjusted (multiple). A five per cent level was used for all significant tests. The usual formula for confidence intervals of normally distributed variables was applied with 95% levels (mean ± 1.96 * standard error of mean).

A few reported very high quantities and doses. It was not possible to distinguish between true and biased values or errors. To avoid high values that might make averages artificially high, these values were reduced to a maximum 3000 mg for a day's use (24 h) and maximum 1000 mg for a dose. Five values were reduced for amphetamines, 13 for cocaine and four for heroin.

3 Theory/calculation

Drug consumption and drug use patterns can a priori vary between cities and geographical areas. Therefore three cities of varying size, geographically spread in Norway, were chosen. The low number of cities implies, together with the lack of a random selection mechanism, that the results cannot be generalized to the national level.

Marginalized drug users taking amphetamines, cocaine/crack or heroin are seldom dedicated users of only one of these substances. Poly drug use is common, including also other substances like cannabis, opioids, alcohol, ecstasy etc. Many prefer a specific substance, however, and then develop a tolerance for or gain habits of a high level of use of that substance. Therefore the variables "main substance used" and "frequency of use" were a priori important for the quantity consumed. Gender and age may also be associated with quantities used.

The intake of amphetamines, cocaine and heroin will vary over the week, month and year. For marginalized users, periods of abstinence will occur, either due to periods in prison or in treatment or as a personal choice. It is therefore not a simple task to create a set of questions which produce unbiased estimates of quantities consumed per day, per week, per month or per year. This study first asked about lifetime consumption for each of the main substances, then about how many of

the last 12 months the respondents took them, then how often each substance was taken during the months of consumption (once a month; monthly, but not more than 2–3 times per month; 1–3 times per week; daily or almost daily (4–7 times per week)). The study then asked whether the substance was taken during the last 30-days, and finally, over how many days it was taken during the last 30 days.

The quantity outcome questions for amphetamines were:

1. The last time (24 h) you took amphetamines, how much did you take altogether?

2. Usually, how big is your single dose of amphetamines?

Both answers were reported in grams. The questions were similar for cocaine (including crack) and heroin.

Aggregate information published by the central police laboratories regarding the purity of seized substances in 2011, both from customs and police, has been employed to estimate the purity of the drug consumed (Kripos, 2011). Table 1 shows the variation in purity in seizures by police and customs as well as the average purity. The variation in purity is substantial, regardless of whether the seizure was of street doses or larger border crossing quantities. This finding matches the general perception of law enforcement agencies in Norway that suggests that most of the cutting is carried out outside Norwegian borders. Since the variations in large and small quantities are similar, the total mean of purity may thus well be close to the true value for small quantities sold. Purity at the consumption level (small doses) has to be the preferred information, however not available.

Table 1 Purity in seizures of drugs. 2011. Per cent.

Type of drug	Variation in all seizures	Variation in 7–8 largest seizures	Average
Amphetamines	1–90	8–65	44
Cocaine	..	20–75	33
Heroin	< 1–70	< 1–6	15

4 Results

The total number of respondents was 413, of which 339 (82-%) had used amphetamines, cocaine/crack or heroin the last 30-days and were thus included in the subsample studied here. Of the 339 respondents, 23% were women, 24 % were less than 34-years of age and 44% were older than 45-years of age. Amphetamines were the drugs most commonly used over the last 30-days (83-%) while 71% had used

heroin and 17% cocaine. Forty percent reported that heroin was the drug most frequently used over the last 12 months, followed by 31% reporting amphetamines and 1% reporting cocaine. Others reported other opioids as their most commonly used drug the last 12-months. Among users of amphetamines, 38% reported more than 20-days of use over the last 30-days. Comparable figures for cocaine were 2% and 43% for heroin. In the two smaller cities 12% (n = 68) of the amphetamines users consumed it mainly at week-ends. Comparable figures were 0% (n = 7) for cocaine users and 6% (n = 34) for heroin users. Finally, 33 respondents (10-%) were from Arendal, 53 (16-%) from Tromsø and 253 (75-%) from Oslo.

The average self-reported quantities used during the last day of use and the usual dose of amphetamines, cocaine and heroin are shown in Table 2 for those who had used the drug in the last 30-days. Results are also shown for gender, age group, the actual drug most frequently used last year, frequency of use of the actual drug during the last 30-days, and city. The usual doses were higher than the commonly mentioned 200 or 250 mg, especially for cocaine. The median dose was 250 mg for all three substances, however. On average, the quantities consumed on the last day of use were 2.7 usual doses of amphetamines, 2.1 usual doses of cocaine and 2.3 usual doses of heroin. Injecting was the common method of administration for amphetamines (86-% among users last 30-days) and heroin (93-% among users last 30-days). Among cocaine users over the last 30-days, 31% had injected the drug.

Table 2 Self-reported quantity used last day of use and usual dose among users last 30 days. Amphetamines, cocaine, heroin. Gender, age, most frequently used drug last 12-months, frequency of use last 30-days, city. Average with confidence intervals (CI). Milligrams. Number of observations (n =).

	Amphetamines		Cocaine		Heroin	
	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)
All	800 (721–879) n = 277	297 (280–315) n = 277	1014 (757–1291) n = 53	487 (379–595) n = 45	682 (605–760) n = 236	297 (278–317) n = 239
Gender						
Males	812 (720–903) n = 213	311 (290–333) n = 211	1015 (722–1309) n = 43	476 (354–599) n = 36	674 (588–760) n = 177	306 (283–329) n = 179
Females	760 (602–919)	253 (230–	1010 (233–1787)	528 (245–	708 (533–883)	271 (236–

	Amphetamines		Cocaine		Heroin	
	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)
	n = 64	276) n = 66	n = 10	811) n = 9	n = 59	307) n = 60
Age						
18–34 years	800 (655–945) n = 79	297 (260–333) n = 78	1305 (716–1892) n = 14	490 (220–760) n = 10	778 (611–946) n = 59	291 (254–328) n = 59
35–44 years	867 (721–1013) n = 100	311 (281–342) n = 101	880 (450–1310) n = 25	457 (310–603) n = 23	604 (486–723) n = 84	280 (249–312) n = 86
45 years and over	731 (609–853) n = 98	282 (258–308) n = 98	964 (521–1407) n = 14	542 (283–801) n = 12	692 (563–821) n = 93	317 (284–349) n = 94
Most frequently used drug						
Yes	1088 (936–1239) n = 105	353 (321–387) n = 104	1700 (485–2914) n = 3	410 (0–859) n = 2	882 (756–1008) n = 131	318 (293–344) n = 131
No	583 (518–649) n = 172	256 (240–272) n = 173	880 (725–1034) n = 50	381 (320–441) n = 43	508 (437–579) n = 105	268 (242–293) n = 108
Frequency of use last 30-days						
1–3 days	490 (372–608) n = 45	262 (219–305) n = 44	647 (457–837) n = 36	409 (282–535) n = 29	480 (348–612) n = 49	299 (246–350) n = 50
4–9 days	604 (451–789) n = 42	242 (209–274) n = 42	1500 (0–3242) n = 5	500 (0–1175) n = 4	146 (297–534) n = 25	228 (182–275) n = 26
10–19 days	684 (543–825) n = 61	282 (252–312) n = 61	1290 (0–2750) n = 5	840 (396–1284) n = 5	464 (288–639) n = 20	230 (178–282) n = 20
20 days or more	1030 (896–	336 (307–	2357 (1483–	550 (233–	835 (723–946)	320 (296–

	Amphetamines		Cocaine		Heroin	
	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)	Quantity last day of use (CI)	Usual dose (CI)
	1165) n = 128	365) n = 128	3231) n = 7	867) n = 7	n = 141	343) n = 142
City						
Arendal	1159 (917–1400) n = 30	350 (293–407) n = 30	1213 (498–1927) n = 4	163 (80–245) n = 4	596 (329–863) n = 13	203 (139–267) n = 13
Tromsø	862 (677–1047) n = 49	280 (254–305) n = 49	1000 (394–1606) n = 3	225 (140–310) n = 2	456 (340–571) n = 29	210 (167–252) n = 32
Oslo	669 (590–750) n = 198	283 (263–304) n = 198	885 (717–1053) n = 46	420 (352–488) n = 39	743 (655–832) n = 197	319 (299–339) n = 194

In Table 3, both unadjusted and adjusted coefficients of the linear regression for the quantity consumed on the last day of use are shown, as well as the significance of the factors. Overall, gender and age group were less important than frequency of use and the main drug used for establishing differences regarding the outcome variable. There were some differences regarding cities. Table 4 shows the same results for the usual dose. The most frequently used drug and frequency of use were significant only for amphetamine use in the adjusted analyses.

Table 3 Self-reported quantities used last day of use among users last 30-days of amphetamines, cocaine and heroin. Regression coefficients on gender, age, the drug being the most frequently used last 12-months, frequency of its use last 30-days, city. Milligrams.

	Amphetamines (n = 277)		Cocaine (n = 53)		Heroin (n = 236)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Constant	[a]	450	[a]	1105	[a]	576
Gender						
Females	− 51	− 35	− 5	− 141	34	21
Males [b]	0	0	0	0	0	0
Age						
18–24 years [b]	0	0	0	0	0	0
35–44 years	67	37	− 424	− 400	− 174	− 208
45 years and over	− 69	− 106	− 339	− 236	− 86	− 71

	Amphetamines (n = 277)		Cocaine (n = 53)		Heroin (n = 236)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Most frequently used drug						
Yes	503*	375*	1045	661	363*	177
No [b]	0	0	0	0	0	0
Frequency of use						
0–19 days [b]	0	0	0	0	0	0
20 days or more	429*	387*	1547*	1547*	378*	223*
City						
Arendal	429*	377*	55	− 608	− 297	− 121
Tromsø	211*	120	− 595	− 364	− 370*	− 183
Oslo [b]	0	0	0	0	0	0

[a]Constant varies by variable.

[b]Reference category.

*Significant at 0.05 level.

Table 4 Usual dose among users last 30 days of amphetamines, cocaine and heroin. Regression coefficients on gender, age, the drug being the most frequently used last 12-months, frequency of its use last 30 days, city. Milligrams.

	Amphetamines (n = 277)		Cocaine (n = 53)		Heroin (n = 236)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Constant	[a]	259	[a]	544	[a]	314
Gender						
Females	− 59*	− 54*	51	12	− 35	− 30
Males [b]	0	0	0	0	0	0
Age						
18–24 years [b]	0	0	0	0	0	0
35–44 years	15	5	− 33	− 70	− 10	− 25
45 years and over	− 13	− 33	51	1	26	15
Most frequently used drug						
Yes	104*	92*	66	197	41*	5
No [b]	0	0	0	0	0	0
Frequency of use						
0–19 days [b]	0	0	0	0	0	0
20 days or more	72*	54*	75	80	55*	17
City						
Arendal	66*	41	− 378	− 463	− 112*	− 104*
Tromsø	5*	− 17	− 353	− 335	− 116*	− 104*
Oslo [b]	0	0	0	0	0	0

[a]Constant varies by variable.

[b]Reference category.

[c]Significant at 0.05 level.

For the estimation of the quantity of the pure drug consumed, the mean purity in 2011 (see Table 1) as reported from seizures by police and customs was applied, see Table 5. No confidence intervals are shown since they can be calculated from Table 2 using the given purity.

Table 5 Estimated pure quantity used last day of use and pure usual dose among users last 30-days. Amphetamines (purity 44-%), cocaine (purity 33-%), heroin (15-%). Most frequently used drug last 12 months, frequency of use last 30-days, city. Average. Milligrams.

	Amphetamines		Cocaine		Heroin	
	Quantity last day of use, pure (n = 277)	Usual dose, pure (n = 277)	Quantity last day of use, pure (n = 53)	Usual dose, pure (n = 45)	Quantity last day of use, pure (n = 236)	Usual dose, pure (n = 239)
All	352	131	335	161	102	45
Gender						
Males	357	137	335	157	101	46
Females	334	111	333	174[a]	106	41
Age						
18–34 years	352	131	431	162	117	44
35–44 years	381	137	290	151	91	42
45 years and over	322	124	318	179	104	48
Most frequently used drug						
Yes	479	155	561[a]	135[a]	132	48
No	257	113	290	126	76	40
Frequency of use last 30 days						
1–3 days	216	115	214	135	72	45
3–9 days	266	106	495[a]	165[a]	22	34
10–19 days	301	124	426[a]	277[a]	70	35
20 days or more	453	148	778[a]	182[a]	125	48
City						

	Amphetamines		Cocaine		Heroin	
	Quantity last day of use, pure (n = 277)	Usual dose, pure (n = 277)	Quantity last day of use, pure (n = 53)	Usual dose, pure (n = 45)	Quantity last day of use, pure (n = 236)	Usual dose, pure (n = 239)
Arendal	510	154	400[a]	54[a]	89	30
Tromsø	379	123	330	74	68	32
Oslo	294	125	292	139	111	48

[a]Less than ten respondents.

5 Discussion

Gender and age group were less important than frequency of use during the last 30-days and the main drug last used over 12-months for establishing differences in "consumption last day of use" and the "usual dose" of amphetamines, cocaine and heroin among marginalized drug users. Almost all users reported use any day of the week. There were some differences between the cities in the survey, pointing at local differences in the quantities consumed.

Use of amphetamines and heroin was more common than use of cocaine and crack in this survey. This is in accordance with other studies of hard drug use in Norway (Amundsen and Bretteville-Jensen, 2010). The age and gender distribution is also close to samples from other studies. The low number of cocaine users (see Table 2) reduced the value of the analysis for this substance, but the results are shown since there are few sources of such information.

There are few surveys among marginalized drug users to which to compare these results. In an evaluation of a heroin injection room in Oslo, the average injection dose of heroin was 230 mg and the average number of injections per day was reported to be 3.2, yielding a daily consumption of 736 mg of heroin (Olsen and Skretting, 2007). In our study the figure for Oslo was 743 mg, a very close estimate. The average purity of heroin declined between 2005–2006 and 2010–2011, however.

Studies have been carried out among cocaine users in the early 90s, but mainly among 'non-problematic' or 'non-deviant' users. In one such study from Amsterdam, the users reported an average dose of 444 mg in periods of their heaviest use (Cohen and Sas, 1994). This is close to the figure of 487 mg found in our survey. The purity was assumed to be higher, however. Based on the samples in 1991 bought from non-abstinent respondents in Amsterdam, the purity varied between 74 and 96% and the mean was 87% In our country the mean was 33% in 2011.

Self-reported behavior may be subject to biases and uncertainties. The reliability and validity of self-reported illegal drug use have been studied in different populations; among young people, in the general populations, among patients in drug treatment, mental health patients and in marginalized drug-using populations. This study was carried out in the last type of population, where there was no punishment for the reporting of drugs and no positive evaluation for not reporting taking them. In such situations, the reliability and validity of self-reports are respectable when compared to biomarkers (Darke, 1998; Napper et al., 2010; Nyamathi et al., 2001). Darke (1998) concluded that self-reports are sufficiently reliable and valid to provide descriptions of drug use, drug related problems and the natural history of drug use. Results are different among young people (mainly under-reporting), addicted persons waiting for treatment (reporting too high) and those reporting about drug use within or after treatment (under-reporting) (Magura and Kang, 1996).

In this survey there were no measurements of the weight of the drug, nor of its purity. This is a common situation (Evrard et al., 2010). Self-reports of the quantities consumed will thus rely on information from the dealers at the street level. Purity was based on scarce information from analyses carried out by the central police laboratory of all seizures by the police and customs (see Table 1). This is by no means satisfactory. Content and purity can, however, be measured by gas phase chromatography and mass spectrometry on site using tiny quantities. With a survey design which includes measurements of both content and purity, much better information can be established (Evrard et al., 2010; Brunt, Niesink, 2011). It may be a challenge, however, to obtain the agreement of the user to test their drugs. It is also difficult to establish whether the samples tested are representative of consumption of the drugs among all drug users or a segment of them.

The first comparison between waste water measures and surveys regarding the community use of cocaine found that the combined survey quantity/frequency (QF) estimate (117 (CI 70–165) kg/per year of pure cocaine) was not significantly different from the waste water estimate (76 (sensitivity interval 60–91) kg/per year of pure cocaine) (Reid et al., 2012). The knowledge of quantities in the QF approach was sparse, however; only data from Arendal was known, in addition to anecdotal knowledge and surveys from the beginning of the 90s. The quantity of cocaine found for use on the last day of use (reported 1014 g, 335 pure) in the three city survey was, however, somewhat higher than the quantities assumed for marginalized users by Reid et al. (2012). Thus the comparison of the combined survey method and the waste water method did not change when this new information was included. There

may be other errors in the combined survey approach, however, such as errors in consumption among recreational users and errors in the frequency distributions for all groups. But the waste water method may also have weaknesses, one of them being the "back calculation" from the metabolite or substance measured in the waste water to the quantity actually consumed (Reid et al., 2011).

Comparisons of consumption of amphetamines and heroin between the waste water and QF methods must take the quantity of doctor prescribed medications taken by the general population into account. Amphetamines, for example, are found in prescribed drugs to treat attention deficit hyperactivity disorder (ADHD). Regarding heroin comparisons, the main problem is that the drug quickly undergoes metabolism to other compounds which cannot be distinguished from agents in commonly prescribed medications (for example morphine). Also, in addition to the prescribed use of such drugs, there is an overflow to illegal consumption. Surveys among drug users should therefore include illegal (and legal) use of such drugs.

The variation in purity is one of the key difficulties with regard to the generalization of the results found here to those of other cities/areas, and also for the comparison of consumption estimates by waste water analysis. Changes in purity do not necessarily lead to changes in doses or quantities, however. The users' perception of the quality of a drug does not, for example, coincide with the purity or the type of cutting agent. Regarding cocaine, Evrard (2010) concluded that the composition was largely unknown to users and that the user's perceptions of cocaine quality were based partly on false beliefs and certain administrative methods. Therefore the quantity consumed was not necessarily increased or reduced according to their knowledge of purity. Otherwise the variation in consumption may vary with many factors: development of tolerance, prices and availability, economic possibilities, social norms and established practices, as well as factors related to the availability of harm reduction measures and treatment.

6 Conclusions

Measurements of the quantities consumed by individual drug users are essential for calculating the total drug consumption in a community by the quantity–frequency method, and are extremely important for the comparison with waste water derived consumption estimates. Self-reported quantities of drugs consumed were investigated in three cities in Norway and were found to be equal to or somewhat higher among marginalized users than previously assumed, when assumptions were based on limited literature and anecdotal information. Drug purity is however highlighted as one of the most critical difficulties in the investigation and estimation

of individual drug consumption. Variation in purity and in individual drug consumption should be subject to further research, as this work will be extremely useful to the triangulation and/or comparison of datasets generated by complementary methods in drug epidemiology.

Acknowledgment

Data collection was funded by The Research Council of Norway under the Program for Drug and Alcohol Research (RUSMIDDEL), NFR No. 185523/V50. We would like to thank our interviewers and all those who supplied information and helped us in Arendal, Tromsø and Oslo. Finally, we will thank all our interviewees for sharing their information with us.

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