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Injecting Alone is More Common among Men, Frequent Injectors and Polysubstance Users in a Sample of People Who Inject Drugs

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ABSTRACT

Background: Injecting alone increases the risk of a fatal overdose. We examined the extent of such behavior in a sample of people who inject drugs (PWID) and the typical characteristics of those injecting alone at least once during the past four weeks. **Design:** A cross-sectional study. PWID recruited from the street and from low-threshold services in seven Norwegian cities in September 2017 ($n=359$). Associations between characteristics and injecting alone were examined using logistic regression analysis. The independent variables were gender (female/male), age, having received overdose-prevention education (no/yes), and, in the past four weeks; homelessness/shelter use (no/yes), in opioid substitution treatment (no/yes), injecting \geq four days a week (no/yes), and substances injected (opioids only/opioids and other/other only/central stimulants (CS) only/CS and other/CS and opioids/CS, opioids and other). The adjusted odds ratios (aOR) and 95% Confidence Intervals (CI) were reported. **Findings:** Of the 359 PWID, 84.4% reported having injected alone. Males were more likely than females to inject alone (aOR=1.88 95% CI 1.00-3.54). Furthermore, those injecting frequently (aOR=1.99 95% CI 1.02-3.86) and those injecting multiple substances (CS, opioids and other) (aOR=2.94 95% CI 1.01-8.58) were more likely to inject alone compared to those injecting less frequently and opioids only. Although not statistically significant, the effect sizes in the logistic regression models suggest that polysubstance use may be driven by CS use. **Conclusion:** Injecting alone was common in our sample of PWID, and male gender, frequent injecting and polysubstance injecting were associated with this behavior.

KEYWORDS



People who inject drugs;
people who use drugs;
injecting drug use;
injecting alone;
overdose;
drug-induced deaths;
fatal overdose;
overdose

Introduction

Injecting alone is an important contributory factor in accidental overdose deaths. A Canadian study found that two-thirds of those who died from an overdose had used drugs alone before they died (Belzak & Halverson, 2018). Preventing solitary injecting might therefore be an important public health intervention in order to reduce overdose deaths. Such interventions are needed as these deaths are a major public health concern in many western countries. In 2019, the US overdose death rate was 21.6 deaths per 100,000 population (Centers for Disease Control & Prevention, 2020). Canada has experienced a 50 per cent increase since 2016 and the rate was 16 deaths per 100,000 population in 2019 (Government of Canada, 2021). In Australia, the rate was 7.4 per 100,000 population (Australian Institute of Health and Welfare, 2021). In Europe, the rate varies across countries, but in 2018 the highest rates were reported in Sweden (8.15 per 100,000 population), and Scotland (29.5 deaths per 100,000 population) (European Monitoring Centre for Drugs and Drug Addiction, 2020). Given this global concern, more knowledge is needed to understand how to prevent these deaths and specifically how to prevent solitary injecting.

In addition to solitary injecting, there are many well-documented factors that, alone or in combination, increase or contribute to the risk of a fatal overdose. The main contributory factor is opioid injecting (Degenhardt et al., 2011; Mathers et al., 2013), and the risk is even greater when such use is combined with other psychoactive substances (Johnson et al., 2015; Pavarin, 2013; Walton et al., 2016). Other well-known characteristics associated with increased risk of a fatal overdose are male gender, age, homelessness, prison release or discharge from drug treatment, opioid and polysubstance use (Bartu et al., 2004; Beijer et al., 2007; Binswanger et al., 2007; Darke et al., 2011; Davoli et al., 2007; Gossop et al., 2002; Morrison, 2009; Nambiar et al., 2015; O'Driscoll et al., 2001; Ravndal & Amundsen, 2010; Stoové et al., 2009). When these factors are combined with solitary injecting, the risk of a fatal overdose is further increased.

It is therefore necessary to increase awareness around the overdose risk associated with injecting alone among people who inject drugs (PWID). Education of PWID has been found to increase such awareness (Strang et al., 2008). However, education alone might not be sufficient for reducing this particular injecting behavior. One study found that

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those injecting alone tended to inject less frequently and avoided settings associated with drug use and public injection settings (Hagan et al., 2007). Furthermore, males and older and more experienced PWID are more likely to inject alone than females and younger and less experienced PWID (Barber et al., 1992; Hagan et al., 2007; Loxley et al., 1991). This may indicate that there are subgroups that are more prone to injecting alone than others. To prevent solitary injecting and to reduce the occasions where PWID inject alone there is a need for more knowledge in terms of the typical user characteristics of those injecting alone.

In this study, we therefore examined injecting behaviors during the past four weeks in a sample of street- and low-threshold-service-recruited PWID. Specifically, we examined if they had injected alone at least once in the four weeks prior to inclusion. We also estimated the putative associations between baseline characteristics and solitary injecting.

Method

Design

This was a cross-sectional survey in September 2017 of 359 people aged older than 18 years who reported injecting illegal substances in the preceding four weeks.

Setting

Norway is a sparsely populated Nordic country with a population of 5.3 million (Statistics Norway, 2019a). The recruitment cities are among the largest in Norway. Oslo, the capital, is the largest city (approximate population (in thousands): 680), followed by Bergen (280), Trondheim (200) and Stavanger (140). The other recruitment cities, Sandnes (80), Tromsø (75) and Kristiansand (110), are also among the twelve largest in Norway. (Statistics Norway, 2019b).

The country has an annual average of 271 fatal overdoses (Gjersing, 2021), and the number of PWID is estimated to be between 7400 and 10 500 (Norwegian Institute of Public Health, 2018). Prescription opioids such as morphine, codeine and oxycodone are the most frequent causes of overdose death, followed by heroin and methadone (Gjersing, 2021). Deaths from synthetic opioids (e.g. fentanyl, buprenorphine and pethidine) have increased in recent years, and these are the intoxicants in 15% of the deaths.

In Norway, naloxone nasal spray distribution began in June 2014; All those receiving the nasal spray for the first time receive a 15-minute overdose-prevention lesson (Madah-Amiri et al., 2019). Take-home naloxone programmes (THN) were introduced in the 1990s as a potential method to prevent overdoses (Strang et al., 1996). These programmes aim to train bystanders to administer the antidote during an overdose (Strang et al., 1996). Collectively, THN programmes have been found to be effective in reducing overdose mortality with low rates of adverse events (Bird et al., 2016, 2017; Clark et al., 2014; McDonald & Strang, 2016; Walley et al., 2013).

Participants

Participants were recruited from seven Norwegian cities (Oslo ($n=88$), Bergen ($n=77$), Trondheim ($n=64$), Stavanger ($n=33$), Sandnes ($n=17$), Tromsø ($n=37$) and Kristiansand ($n=43$)). This was a convenience sample. Participants were either street-recruited or recruited from a wide range of low-threshold (harm-reduction) facilities, such as needle-exchange services, daytime cafes tailored toward PWID and others with problematic substance use, daytime shelters, housing facilities for substance users, street health clinics, and work facilities that provided temporary employment on a day-to-day basis, health clinics that also dispensed methadone and buprenorphine and an injection room. Researchers and trained research assistants from the Norwegian Institute of Public Health recruited and interviewed the participants. Each interview took approximately 20 min to complete and was conducted so as to preserve privacy. The respondents received about 20 Euro/24 USD (200 NOK) for participation.

Study instruments

At inclusion, an interviewer-administered questionnaire was completed. It included the following variables; age, gender, living situation during the past four weeks (including homelessness and shelter use), in opioid substitution treatment (OST) during the past four weeks, frequency of injecting and type of substances injected during the past four weeks. It also comprised a question regarding overdose-prevention education. All those receiving a naloxone nasal spray for the first time receive a 15-minute overdose-prevention lesson. We therefore asked if the participants had ever been trained to use naloxone nasal spray and labeled this as overdose-prevention education in the analyses. The Norwegian THN programme has been available since 2014. The questionnaire is described in more detail elsewhere (Gjersing & Bretteville-Jensen, 2018).

Statistical analyses

Statistical analyses were conducted using Stata version 16.0. Differences in baseline characteristics between those injecting alone in the past four weeks compared to those not injecting alone were examined using Pearson's chi-squared for categorical variables and two-sample t-test for continuous variables.

Prior to the statistical analysis, we aggregated the type of substances injected into one variable with the categories: opioids only/opioids and other/other only/central stimulants (CS) only/CS and other/CS and opioids/CS, opioids and other. The opioid category comprises morphine, methadone and heroin, while the CS category comprises amphetamine/methamphetamine and cocaine. The other category comprises prescription drugs (such as benzodiazepines and methylphenidate), buprenorphine (subutex or suboxone) and other substances not specified by the respondents. Overall, 17 individuals replied that they had

injected suboxone (naloxone/buprenorphine) in the past four weeks. However, all of these individuals also responded that they had injected other substances such as CS, heroin, methadone, morphine or prescription drugs in the past four weeks. We do not have any information as to why they had injected this substance: if they thought they were responding to subutex, if they were just experimenting or injected it for other reasons.

Univariable and multivariable logistic regression analyses were used to examine the association between baseline characteristics and injecting alone at least once during the four weeks prior to inclusion. Not injecting alone was the reference category. The independent variables were gender (female/male), age, homelessness/shelter use in the past four weeks (no/yes), being in OST during the past four weeks (no/yes), injecting more than four days a week during the past four weeks (no/yes), type of substances injected in the past four weeks (opioids only/opioids and other/other only/central stimulants (CS) only/CS and other/CS and opioids/CS, opioids and other), and having received overdose-prevention education in the past (no/yes). The overdose-prevention education is a 15-minute training session given as part of the THN programme when an individual is given their first naloxone nasal spray kit. The THN programme was available from June 2014 and the respondents may therefore have received this education between June 2014 and inclusion (September 2017).

Except for OST, the independent variables were included based upon previous studies that have found these characteristics to be associated with injecting alone (Barber et al., 1992; Dwyer et al., 1994; Hagan et al., 2007; Horan & Van Hout, 2019; Loxley et al., 1991). OST was included as we hypothesized that OST patients might receive information regarding the risks associated with injecting alone as part of their treatment. The odds ratio (OR), adjusted OR (aOR) and 95% Confidence Interval (CI) were reported.

Funding

The Norwegian Institute of Public Health and the Norwegian Directorate of Health funded this study.

Ethics

The Norwegian Medical Ethics committee approved this study in June 2013 (2013/599/REK sør-øst A).

Results

Description of the sample

The majority (84.4%) of the sample of 359 PWID reported having injected alone at least once during the four weeks prior to inclusion. Table 1 shows that males (76.2%) and those injecting on four days or more per week (71.6%) were disproportionately represented among those injecting alone compared to those not injecting alone.

Associations between baseline characteristics and injecting alone

Males were 88% more likely to inject alone compared to females (OR=1.93, 95% CI=1.05-3.52) (Table 2). Those injecting on four days or more were more than twice as likely to inject alone compared to those injecting less frequently (OR=2.03 95% CI=1.14-3.65). Furthermore, those who reported having injected all the substances (CS, opioids and other substances) were nearly three times as likely to inject alone compared to those injecting opioids only (OR=2.86 95% CI=1.06-7.74). All these associations remained statistically significant in the adjusted model.

Furthermore, although not statistically significant, the effect size for injecting both CS and opioids during the four weeks prior to inclusion (OR=2.79 95% CI=0.90-8.63) is

Table 1. Baseline characteristics in a sample of street and low threshold service recruited 359 PWID included September 2017.

	Total 100% (n=359)	Not injected alone past 4 weeks 100% (n=56)	Injected alone at least once past 4 weeks 100% (n=303)	p-value ^b
Male	74.1%	62.5% (35)	76.2% (231)	0.031
Mean age (sd)	42.5 (10.0)	40.9 (10.0)	42.7 (10.0)	0.220
Homeless/shelter user ^a	19.2% (69)	19.6% (11)	19.1% (58)	0.930
Currently in OST ^a	53.8% (193)	51.8% (29)	54.1% (164)	0.750
Overdose prevention education ^c	55.2% (198)	60.7% (34)	54.1% (164)	
Injecting more than 4 days a week ^a	69.1% (248)	55.4% (31)	71.6% (217)	0.016
Substances injected ^a				0.140
Opioids only	10.3% (37)	16.1% (9)	9.2% (28)	
Opioids and other substances	7.8% (28)	14.3% (8)	6.6% (20)	
Other substances only	2.8% (10)	3.6% (2)	2.6% (8)	
CS only	20.1% (72)	23.2% (13)	19.5% (59)	
CS and other	15.3% (55)	14.3% (8)	15.5% (47)	
CS and opioids	16.2% (58)	10.7% (6)	17.2% (52)	
CS, opioids, and other	27.6% (99)	17.9% (10)	29.4% (89)	

^aIn the four weeks prior to inclusion.

^bPearson's chi-squared for categorical variables and two-sample t-test test for continuous variables.

^cThe naloxone distribution programme included a 15 min overdose prevention training session when given the first naloxone nasal spray kit. The programme was available from June 2014 and the respondents may therefore have received this education programme from this time and up until inclusion. Note: 2 missing currently in OST, 7 missing overdose prevention education. The missing are included into the no-category.

Table 2. The associations between baseline characteristics and injecting alone at least once during the four weeks prior to inclusion in a sample of street- and low-threshold-service-recruited PWID ($n=359$), estimated using multivariable logistic regression analysis. The reference category is to not have injected alone in the past four weeks prior to inclusion.

	Injecting alone OR (95% CI)	Injecting alone AOR (95% CI)
Gender		
Female	1.00	1.00
Male	1.93 [1.05,3.52]*	1.88 [1.00,3.54]*
Mean age (sd)	1.02 [0.99,1.05]	1.03 [0.99,1.06]
Homeless/shelter user ^a		
No	1.00	1.00
Yes	0.97 [0.47,1.99]	0.89 [0.40,1.97]
Currently in OST ^a		
No	1.00	1.00
Yes	1.10 [0.62,1.94]	1.06 [0.58,1.94]
Overdose prevention education ^b		
No*	1.00	1.00
Yes	0.76 [0.43,1.37]	0.82 [0.43,1.55]
Injecting 4 days a week or more ^a		
No	1.00	1.00
Yes	2.03 [1.14,3.65]	1.99 [1.02,3.86]*
Injecting ^a		
Opioids only	1.00	1.00
Opioids and other	0.80 [0.26,2.44]	0.91 [0.29,2.90]
Other only	1.29 [0.23,7.19]	1.44 [0.24,8.81]
CS only	1.46 [0.56,3.82]	1.60 [0.58,4.38]
CS and other	1.89 [0.65,5.46]	2.15 [0.70,6.66]
CS and opioids	2.79 [0.90,8.63]	2.78 [0.87,8.84]
CS, opioids, and other	2.86 [1.06,7.74]*	2.94 [1.01,8.58]*

^aIn the four weeks prior to inclusion.

^bThe naloxone distribution programme included a 15 min overdose prevention training session when given the first naloxone nasal spray kit. The programme was available from June 2014 and the respondents may therefore have received this education programme from this time and up until inclusion.

* $p < 0.05$.

similar to the effect size for injecting all the substances, and it remained the same in the adjusted model (aOR=2.78 95% CI=0.87-8.84). Furthermore, the effect size for injecting CS and other substances was OR=1.89 (95% CI=0.65-5.46) which is in the same direction as for the other variables where CS is used in combination with other substances. Although not statistically significant, meaning that the findings need to be interpreted with caution, this may indicate that polysubstance use is mainly driven by CS use, rather than opioid or other substance use.

Discussion

In line with previous studies (Barber et al., 1992; Bonar & Rosenberg, 2011; Hagan et al., 2007; Horan & Van Hout, 2019; McCrae et al., 2020; van Beek & Gilmour, 2000), injecting alone was common in our sample of street- and low-threshold-service-recruited PWID. The majority of the 359 participants had injected alone at least once during the four weeks prior to inclusion. Males were more likely than females to inject alone, and those injecting four days a week or more were more likely to inject alone than those injecting less frequently. Furthermore, those injecting multiple substances were more likely to inject alone compared to those injecting opioids only. Interestingly, although not statistically significant, it appears as if polysubstance use may be mainly driven by CS use, rather than opioid or other substance use.

If injecting alone is as common among PWID as our findings and the six previous studies cited immediately above suggest, it is likely to play an important role in the high number of overdose deaths in many countries. This is

further supported by a Canadian study that found that the majority of opioid-related deaths occurred when the individual was alone (Belzak & Halverson, 2018). This could also be one of the explanatory factors for the continuously high number of drug-induced deaths in Norway (Gjersing, 2021). Since 2014, numerous interventions to prevent overdose deaths have been implemented, such as naloxone nasal spray distribution, distribution of heroin smoking equipment, and overdose-prevention education (Madah-Amiri et al., 2019). Despite these interventions, the annual number of drug-induced deaths has remained stable (Gjersing, 2021). It may be that it is too early to see the effect of these interventions, or the number might have been even higher without them. On the other hand, other factors could be in play. Our findings suggest that injecting alone might be one of these other factors.

Interestingly, we found that polysubstance injecting was associated with a higher likelihood of solitary injecting, rather than injecting opioids only. This may indicate that those injecting opioids only are more likely to take precautions when injecting, than those using multiple substances. Furthermore, the multiple substance use appears to be driven mainly by CS injecting. Although not statistically significant, CS injecting in combination with opioids and/or other substances appeared to increase the likelihood of injecting alone. There may be many reasons for this, but CS and other substance use has been associated with a lower mortality risk than opioid use (Stockings et al., 2019). It is therefore not unlikely that interventions to reduce occasions where PWID inject alone mainly target those injecting opioids only, rather than those using multiple substances.

However, those using multiple substances may inject opioids occasionally. These occasional opioid users might even be at a higher overdose risk due to a lack of tolerance, and the risk might be even higher if they combine such use with other substances (Johnson et al., 2015; Pavarin, 2013; Walton et al., 2016). It would have been of interest to know if those using multiple substances injected alone regardless of the type of substances they injected or if they took particular care when injecting opioids. Unfortunately, our data did not comprise such information. Future studies would benefit from including such questions into their questionnaire.

It is also possible that the adverse consequences of CS use may be an additional reason for the associations between polysubstance injecting, mainly driven by CS use, and injecting alone. CS use, especially frequent use, is associated with a range of adverse psychological consequences such as psychosis, paranoia, and aggression (Darke et al., 2008; Degenhardt et al., 2017; Degenhardt & Topp, 2003). Being psychotic, paranoid and/or aggressive will naturally make a person less inclined to inject in the company of others. Consequently, the adverse consequences associated with CS use may increase the likelihood of PWID injecting alone even if they are aware of the risks associated with solitary injecting. However, CS use has been associated with a lower mortality risk than opioid use (Stockings et al., 2019), and if the individual never combines CS use with opioid use, injecting alone might not be a problem. However, a previous study from the same setting using the same study design found that most of their participants used multiple substances, albeit with various frequency of use (Gjersing & Bretteville-Jensen, 2018). It is therefore not unlikely that those experiencing adverse consequences of CS use also inject alone if they occasionally use opioids.

In addition to polysubstance injecting, frequent injecting also increased the likelihood of solitary injecting. It is likely to be more difficult to find a partner or observer for each injecting if the frequency is high. This suggests a need for easy access to safe injection facilities (SIF), but also highlights the challenges associated with frequent use. Even with easy access to SIF, it might be difficult for those injecting frequently to always visit these facilities or ensure they inject in the company of others. Future interventions need to address the issue of how to reduce occasions where PWID inject alone among those injecting frequently.

The association between frequent and solitary injecting contrasts with the finding from a large US multi-centre study, where those injecting alone tended to inject less frequently and avoided settings associated with drug use and public injection settings (Hagan et al., 2007). We did not have access to information regarding primary injection setting, but our sample was smaller and recruited from settings associated with drug use and public injection. It is therefore less likely that we had access to PWID who avoided such settings. Furthermore, the US study was conducted more than ten years prior to the current study, and it is possible that the different findings are due to temporal differences. Finally, it may be that the Norwegian context differs from the US. Possibly, although this is only speculation, it is

easier to avoid solitary injecting in the US compared to Norway, given that this is a much smaller country with tiny cities compared to the cities included in the US study (Hagan et al., 2007). It is therefore possible that the findings would not have differed under more similar contexts in respect of time, setting and sample. However, this is unknowable without conducting such a study.

In addition to polysubstance and frequent injecting, males were more likely than females to inject alone. This is in line with previous studies (Barber et al., 1992; Dwyer et al., 1994; Hagan et al., 2007; Loxley et al., 1991). There may be many reasons for this association. One study suggests that males prefer injecting alone to avoid the pressure to perform, to be tough and to test boundaries when they are in the company of others (Richert & Svensson, 2008). Another study indicated that males who inject take less responsibility for their own health (Trulsson, 2002). This study suggests that males are more likely to rely on others such as a mother or a girlfriend to take care of their health needs. A third possibility is that males who inject have a smaller social network than females who inject and consequently have fewer opportunities to inject in the company of others. Regardless of the reasons, males' higher likelihood of injecting alone should be addressed in future overdose-prevention work.

Limitations and strengths

The cross-sectional nature of the study limits its ability to establish a causal relationship. Furthermore, self-reported interview data are open to recall bias, under- and over-reporting and imprecise estimation of illegal activities such as illegal substance use. In addition, the convenience sample may not be representative of all PWID throughout Norway or in other countries. However, the participants' characteristics were relatively similar to a larger sample ($n = 884$) included from the same Norwegian cities in 2013 (Gjersing & Bretteville-Jensen, 2018). Furthermore, recruiting from or outside various low-threshold services may have led to an overrepresentation from some of the low-threshold services, since we do not have specific details on how many were recruited from each service. One of the study strengths is that it is likely to include participants that may not be available for inclusion in treatment or prison-based studies. The respondents received compensation for participation, which also likely increased consent among perhaps a more generalizable sample than if they had not received payment.

Conclusion

This study has shown that injecting alone was common among our sample of street- and low-threshold-service-recruited PWID. Males were more likely than females to inject alone and those injecting frequently and injecting multiple substances were also more likely to inject alone compared to those injecting less

frequently and injecting opioids only. Finally, there are indications that polysubstance use is mainly driven by CS use, rather than opioid or other substance use, but this needs to be examined in a larger sample. These findings may indicate that interventions to reduce occasions where PWID inject alone have reached those who inject opioids, but not those who inject multiple substances including CS.

Declaration of interest

The authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the article.

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References

- Australian Institute of Health and Welfare. (2021). *Alcohol, tobacco & other drugs in Australia*. Australian Government. <https://www.aihw.gov.au/reports/alcohol/alcohol-tobacco-other-drugs-australia/contents/data-by-region/drug-induced-deaths>
- Barber, J. G., Crisp, B. R., Ross, M. W., Wodak, A., Miller, M. E., & Gold, J. (1992). Research note: The social behaviour of injecting drug users. *The British Journal of Social Work*, 22(4), 455–462.
- Bartu, A., Freeman, N. C., Gawthorne, G. S., Codde, J. P., & Holman, C. D. A. J. (2004). Mortality in a cohort of opiate and amphetamine users in Perth. *Addiction*, 99(1), 53–60. <https://doi.org/10.1111/j.1360-0443.2004.00602.x>
- Beijer, U., Andréasson, A., Ågren, G., & Fugelstad, A. (2007). Mortality, mental disorders and addiction: A 5-year follow-up of 82 homeless men in Stockholm. *Nordic Journal of Psychiatry*, 61(5), 363–368.
- Belzak, L., & Halverson, J. (2018). Evidence synthesis—The opioid crisis in Canada: A national perspective. *Health Promotion and Chronic Disease Prevention in Canada*, 38(6), 224–233. <https://doi.org/10.24095/hpcdp.38.6.02>
- Binswanger, I. A., Stern, M. F., Deyo, R. A., Heagerty, P. J., Cheadle, A., Elmore, J. G., & Koepsell, T. D. (2007). Release from prison—A high risk of death for former inmates. *New England Journal of Medicine*, 356(2), 157–165. <https://doi.org/10.1056/NEJMsa064115>
- Bird, S. M., McAuley, A., Munro, A., Hutchinson, S. J., & Taylor, A. (2017). Prison-based prescriptions aid Scotland's National Naloxone Programme. *Lancet (London, England)*, 389(10073), 1005–1006. [https://doi.org/10.1016/S0140-6736\(17\)30656-6](https://doi.org/10.1016/S0140-6736(17)30656-6)
- Bird, S. M., McAuley, A., Perry, S., & Hunter, C. (2016). Effectiveness of Scotland's national naloxone programme for reducing opioid-related deaths: A before (2006–10) versus after (2011–13) comparison. *Addiction*, 111(5), 883–891. <https://doi.org/10.1111/add.13265>
- Bonar, E. E., & Rosenberg, H. (2011). Using the health belief model to predict injecting drug users' intentions to employ harm reduction strategies. *Addictive Behaviors*, 36(11), 1038–1044.
- CDCP (Centers for Disease Control and Prevention). (2020). *Drug overdose deaths*. U.S. Department of Health & Human Services. <https://www.cdc.gov/drugoverdose/deaths/index.html>
- Clark, A. K., Wilder, C. M., & Winstanley, E. L. (2014). A systematic review of community opioid overdose prevention and naloxone distribution programs. *Journal of Addiction Medicine*, 8(3), 153–163. <https://doi.org/10.1097/adm.0000000000000034>
- Darke, S., Kaye, S., McKetin, R., & Dufou, J. (2008). Major physical and psychological harms of methamphetamine use. *Drug and Alcohol Review*, 27(3), 253–262.
- Darke, S., Mills, K. L., Ross, J., & Teesson, M. (2011). Rates and correlates of mortality amongst heroin users: Findings from the Australian Treatment Outcome Study (ATOS), 2001–2009. *Drug and Alcohol Dependence*, 115(3), 190–195. <https://doi.org/10.1016/j.drugalcdep.2010.10.021>
- Davoli, M., Bargagli, A. M., Perucci, C. A., Schifano, P., Belleudi, V., Hickman, M., Salamina, G., Diecidue, R., Vigna - Taglianti, F., & Faggiano, F. (2007). Risk of fatal overdose during and after specialist drug treatment: The VEdeTTE study, a national multi-site prospective cohort study. *Addiction (Abingdon, England)*, 102(12), 1954–1959. <https://doi.org/10.1111/j.1360-0443.2007.02025.x>
- Degenhardt, L., Bucello, C., Mathers, B., Briegleb, C., Ali, H., Hickman, M., & McLaren, J. (2011). Mortality among regular or dependent users of heroin and other opioids: A systematic review and meta-analysis of cohort studies. *Addiction (Abingdon, England)*, 106(1), 32–51. <https://doi.org/10.1111/j.1360-0443.2010.03140.x>
- Degenhardt, L., Sara, G., McKetin, R., Roxburgh, A., Dobbins, T., Farrell, M., Burns, L., & Hall, W. D. (2017). Crystalline methamphetamine use and methamphetamine-related harms in Australia. *Drug and Alcohol Review*, 36(2), 160–170.
- Degenhardt, L., & Topp, L. (2003). Crystal meth use among polydrug users in Sydney's dance party subculture: Characteristics, use patterns and associated harms. *International Journal of Drug Policy*, 14(1), 17–24. [https://doi.org/10.1016/S0955-3959\(02\)00200-1](https://doi.org/10.1016/S0955-3959(02)00200-1)
- Dwyer, R., Richardson, D., Ross, M. W., Wodak, A., Miller, M., & Gold, J. (1994). A comparison of HIV risk between women and men who inject drugs. *AIDS Education and Prevention*, 6(5), 379–389.
- European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). (2020). *European drug report 2020: Trends and developments*. https://www.emcdda.europa.eu/edr2020_en
- Gjersing, L. R., & Bretteville-Jensen, A. L. (2018). Patterns of substance use and mortality risk in a cohort of 'hard-to-reach' polysubstance users. *Addiction*, 113(4), 729–739. <https://doi.org/10.1111/add.14053>
- Gjersing, L. (2021). *Drug-induced deaths in Norway 2020 (in Norwegian)*. Norwegian Institute of Public Health. <https://www.fhi.no/nettpub/narkotikainorge/konsekvenser-av-narkotikabruk/narkotikautlost-dodsfall-2020/#:~:text=Det%20totale%20antallet%20narkotikautl%C3%B8ste%20d%C3%B8dsfall,h%C3%B8yeste%20antallet%20d%C3%B8dsfall%20siden%202001>
- Gossop, M., Stewart, D., Treacy, S., & Marsden, J. (2002). A prospective study of mortality among drug misusers during a 4-year period after seeking treatment. *Addiction (Abingdon, England)*, 97(1), 39–47.
- Government of Canada. (2021). *Opioid- and stimulant-related harms in Canada*. <https://health-infobase.canada.ca/substance-related-harms/opioids-stimulants/graphs>
- Hagan, H., Campbell, J. V., Thiede, H., Strathdee, S. A., Ouellet, L., Latka, M., Hudson, S., & Garfein, R. S. (2007). Injecting alone among young adult IDUs in five US cities: Evidence of low rates of injection risk behavior. *Drug and Alcohol Dependence*, 91, S48–S55. <https://doi.org/10.1016/j.drugalcdep.2007.02.002>
- Horan, A., & Van Hout, M. C. (2019). Mapping service user needs to inform location of a supervised injecting room. *Heroin Addiction and Related Clinical Problems*, 22(2)
- Johnson, C., Dong, H., Ahamad, K., Hayashi, K., Milloy, M., Kerr, T., & Wood, E. (2015). Impact of binge alcohol on mortality among people who inject drugs. *Addictive Behaviors Reports*, 2, 28–32.
- Loxley, W., Marsh, A., & Lo, S. K. (1991). Age and injecting drug use in Perth, Western Australia: The Australian national AIDS and injecting drug use study. *Aids Care*, 3(4), 363–372. <https://doi.org/10.1080/09540129108251592>
- Madah-Amiri, D., Gjersing, L., & Clausen, T. (2019). Naloxone distribution and possession following a large-scale naloxone programme. *Addiction (Abingdon, England)*, 114(1), 92–100.
- Mathers, B. M., Degenhardt, L., Bucello, C., Lemon, J., Wiessing, L., & Hickman, M. (2013). Mortality among people who inject drugs: A systematic review and meta-analysis. *Bulletin of the World Health Organization*, 91(2), 102–123.

- McCrae, K., Hayashi, K., Bardwell, G., Nosova, E., Milloy, M., Wood, E., & Ti, L. (2020). The effect of injecting alone on the use of drug checking services among people who inject drugs. *The International Journal on Drug Policy*, 79, 102756.
- McDonald, R., & Strang, J. (2016). Are take-home naloxone programmes effective? Systematic review utilizing application of the Bradford Hill criteria. *Addiction*, 111, 1177–1187 <https://doi.org/10.1111/add.13326>
- Morrison, D. S. (2009). Homelessness as an independent risk factor for mortality: Results from a retrospective cohort study. *International Journal of Epidemiology*, 38(3), 877–883. <https://doi.org/10.1093/ije/dyp160>
- Nambiar, D., Agius, P. A., Stoové, M., Hickman, M., & Dietze, P. (2015). Mortality in the Melbourne injecting drug user cohort study (MIX). *Harm Reduction Journal*, 12(1), 55.
- Norwegian Institute of Public Health. (2018). *Problematic illegal substance use*. <https://www.fhi.no/nettpub/narkotikainorge/bruk-av-narkotika/problembbruk-av-narkotika/?term=&h=1>
- O'Driscoll, P. T., McGough, J., Hagan, H., Thiede, H., Critchlow, C., & Alexander, E. R. (2001). Predictors of accidental fatal drug overdose among a cohort of injection drug users. *American Journal of Public Health*, 91(6), 984–987.
- Pavarin, R. M. (2013). Mortality risk for cocaine abusers in relation to heroin use: A follow-up study. *Substance Use & Misuse*, 48(9), 702–710.
- Ravndal, E., & Amundsen, E. J. (2010). Mortality among drug users after discharge from inpatient treatment: An 8-year prospective study. *Drug and Alcohol Dependence*, 108(1-2), 65–69.
- Richert, T., & Svensson, B. (2008). Med livet som insats: Injektionsmissbruk, risktagande och överdoser. *Nordisk Alkohol & Narkotikatidsskrift*, 25, 355–376
- Statistics Norway. (2019a). *Population and population changes (In Norwegian)*. <https://www.ssb.no/en/befolkning/statistikker/folkemengde>
- Statistics Norway. (2019b). *County information (In Norwegian)*. <https://www.ssb.no/kommunefakta>
- Stockings, E., Tran, L. T., Santo, T., Peacock, A., Larney, S., Santomauro, D., Farrell, M., & Degenhardt, L. (2019). Mortality among people with regular or problematic use of amphetamines: A systematic review and meta-analysis. *Addiction (Abingdon, England)*, 114(10), 1738–1750. <https://doi.org/10.1111/add.14706>
- Stoové, M. A., Dietze, P. M., & Jolley, D. (2009). Overdose deaths following previous non-fatal heroin overdose: Record linkage of ambulance attendance and death registry data. *Drug and Alcohol Review*, 28(4), 347–352.
- Strang, J., Darke, S., Hall, W., Farrell, M., & Ali, R. (1996). Heroin overdose: The case for take-home naloxone. *BMJ (Clinical Research ed.)*, 312(7044), 1435–1436.
- Strang, J., Manning, V., Mayet, S., Best, D., Titherington, E., Santana, L., Offor, E., & Semmler, C. (2008). Overdose training and take-home naloxone for opiate users: prospective cohort study of impact on knowledge and attitudes and subsequent management of overdoses. *Addiction (Abingdon, England)*, 103(10), 1648–1657. <https://doi.org/10.1111/j.1360-0443.2008.02314.x>
- Trulsson, K. (2002). Kjønnsperspektiv på misbruk. *Rus & Avhengighet*, 9(2), 33–35. https://www.idunn.no/file/ci/2912939/Kjoennet_perspektiv_virker.pdf
- van Beek, I., & Gilmour, S. (2000). Preference to have used a medically supervised injecting centre among injecting drug users in Kings Cross. *Australian and New Zealand Journal of Public Health*, 24(5), 540–542. <https://doi.org/10.1111/j.1467-842X.2000.tb00507.x>
- Walley, A. Y., Xuan, Z., Hackman, H. H., Quinn, E., Doe-Simkins, M., Sorensen-Alawad, A., Ruiz, S., & Ozonoff, A. (2013). Opioid overdose rates and implementation of overdose education and nasal naloxone distribution in Massachusetts: Interrupted time series analysis. *BMJ (Clinical Research ed.)*, 346, f174 <https://doi.org/10.1136/bmj.f174>
- Walton, G. R., Hayashi, K., Bach, P., Dong, H., Kerr, T., Ahamad, K., Milloy, M. J., Montaner, J., & Wood, E. (2016). The impact of benzodiazepine use on mortality among polysubstance users in Vancouver. *Public Health Reports (Washington, D.C. : 1974)*, 131(3), 491–499.