TITLE

The relationship between alcohol use and injecting drug use: impacts on health, crime and wellbeing

Authors

Paul Dietze[1,2], Rebecca Jenkinson[1], Campbell Aitken[1], Mark Stoové[1,2], Damien Jolley[1,2], Matthew Hickman[3], Thomas Kerr[4]

[1] Centre for Population Health, Burnet Institute, 85 Commercial Rd, Melbourne, Victoria, Australia, 3004

[2] School of Public Health and Preventive Medicine, Monash University, 99 Commercial Rd, Melbourne Victoria, Australia, 3004

[3] School of Social & Community Medicine, University of Bristol, Canynge Hall, Bristol, BS8 2PS, United Kingdom

[4] Urban Health Research Initiative, British Columbia Centre for Excellence in HIV/AIDS, Vancouver, BC, V6Z 1Y6, Canada

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Correspondence: Professor Paul Dietze PhD

Centre for Population Health, Macfarlane Burnet Institute for Medical and Public Health

85 Commercial Rd Melbourne VIC 3004 AUSTRALIA

Tel: +613 9282 2134 Fax: +613 9282 2138

email: pauld@burnet.edu.au

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Abstract

Background and objectives:

People who inject drugs (PWID) are at risk of a variety of adverse outcomes. Previous research suggests that alcohol, when consumed with opioids, is a risk factor for overdose, but there has been less investigation of the effects of alcohol consumption on other health, criminogenic or life satisfaction outcomes. In this paper we explore the effects of alcohol on outcomes for PWID across a variety of life domains.

Methods:

Baseline data were drawn from the Melbourne Injecting Drug User cohort study , which is a cohort of 688 PWID. Drinking scores were generated from the AUDIT-C (0, 1-7, 8+) and associations between them and health (recent heroin overdose, Emergency Department use), criminogenic (violent and nonviolent crime) and life satisfaction (personal wellbeing) outcomes were examined using logistic and linear regression.

Results:

While around 36% of the cohort reported past-month abstinence from alcohol, 44% scored between 1 and 7 and 20% above 7 on the AUDIT-C. A score above 7 was associated with perpetration of violent crime and lower personal wellbeing ratings than a score of 0, after adjusting for potential confounders. There was no association between alcohol and other outcomes examined, after adjustment for confounders.

Conclusion:

Cohort participants who drink heavily were more likely to report engaging in violent crime and poorer life satisfaction. The relationship between alcohol and the offending behaviours of the cohort was consistent with the effects of alcohol on violent offending in the broader community.

1 Introduction

People who inject drugs (PWID) are at risk of a variety of adverse health and criminogenic outcomes, such as overdose and arrest (Dietze et al., 2005; Kerr et al., 2005; Kinner et al., 2009; Stoove et al., 2009; Teesson et al., 2008). Age- and sex-standardised rates of mortality from overdose or other drug related causes are high (Degenhardt et al., 2011), and involvement with the legal system is frequently noted among samples of PWID (Kinner et al., 2009). They also report significantly lower levels of overall life satisfaction than the general community (Dietze et al., 2010). It is therefore not surprising that studies have also found that PWID are frequent users of health services (Darke et al., 2007; Kerr et al., 2005). For example, 60% of participants in a cohort of PWID in Vancouver accessed an Emergency Department and 78% accessed primary care services over a two-year period (Kerr et al., 2005).

A large body of research has examined exposures associated with these adverse outcomes among PWID. For example, the use of central nervous system depressants such as benzodiazepines and alcohol has been shown to be a risk factor for non-fatal overdose (Dietze et al., 2005) and drug (i.e., frequent crystal methamphetamine injection) and chronic disease-related (i.e., HIV) exposures have been shown to be significant predictors of service utilisation (Kerr et al., 2005). However, few researchers have examined alcohol consumption as a key explanatory variable for adverse outcomes in PWID (other than overdose). For example, most studies of service utilisation in PWID (e.g., Darke et al., 2007; Kerr et al., 2005) did not include alcohol consumption as an explanatory variable in analysis. Similarly, past studies of overall personal wellbeing of PWID failed to consider the potential impact of alcohol consumption (Dietze et al., 2010). The omission of alcohol consumption exposures in these studies is somewhat surprising given the well-established link between problematic alcohol consumption patterns and acute and chronic health harms in general populations (Babor et al., 2010), and given that alcohol use is known to increase risk for adverse outcomes among PWID.

Various studies have shown associations between alcohol consumption and the perpetration of aggressive and violent behaviour in the general population (Chermack and Blow, 2002; Graham and Homel, 2008; Graham and Wells, 2001; Marshall et al., 2008). Possibly as a result of the disinhibitory effects of alcohol, alcohol is seen as having a causative role in violent or aggressive behaviour (Parker and Auerhahn, 1998; Room and Rossow, 2001). This proposition is supported by evidence that increasing alcohol consumption is associated with increased severity of aggression (Graham and Wells, 2001). In the literature on injecting drug use, the role of alcohol consumption in violent

behaviour has been demonstrated in numerous studies (e.g., Marshall et al., 2008; Torok et al., 2008); however, the measurement of alcohol consumption in these studies is not consistent. For example, Torok et al. (2008) use the Alcohol Use Disorders Identification Test (AUDIT) scores to measure consumption in their sample, treating them as a continuous measure of alcohol consumption, in spite of the fact the AUDIT is a screening measure of alcohol disorders, comprising measures of consumption and harm, not consumption alone. In contrast, Marshall et al. (2008) developed a binary measure of alcohol consumption in which a 'yes' indicated that the participant consumed at least four (Canadian standard) drinks per day in the previous six months, allowing for only a restricted measurement of alcohol consumption. Nevertheless, with these measurement caveats in mind, alcohol has been consistently associated with violent victimisation and perpetration in studies of PWID.

In summary, previous research suggests a causative role for alcohol in aggressive incidents and that this would be expected to be manifested in PWID. However, in relation to other life domains such as health and wellbeing, alcohol is rarely included as an explanatory variable in analyses involving PWID. Heavy drinking does not always impact on these life domains for the wider population (e.g., alcohol dependence per se is not associated with increased visits to general practitioners - Proudfoot and Teesson, 2009), but it is unknown whether alcohol consumption or heavy drinking would impact on these domains for PWID after adjusting for potential confounders, in particular intensity of illicit drug use. If alcohol consumption or heavy drinking is linked to a kind of generalised deviance and poorer health among PWID, then particular drinking patterns would be independently associated with decreases in measures across all these life domains. If, on the other hand, alcohol use is associated with violent behaviours alone, then one would expect that alcohol consumption or heavy drinking would only impact on measures these behaviours alone.

In order to examine these issues this study has been specifically designed to explore the effects of alcohol consumption, and heavy drinking in particular, on health, criminogenic and life satisfaction outcomes for PWID.

2 Methods

2.1 Sample and interviews
A sample of 688 PWID was recruited and interviewed as part of the Melbourne Injecting Drug User Cohort Study (MIX). MIX involves interviewing eligible participants (18-40 years of age, injecting in the month prior to interview) annually using a structured questionnaire that canvasses participant demographics, patterns of lifetime and recent (past month) alcohol and other drug acquisition and

use, and the health and social consequences of drug use. Interviews take place in different locations across Melbourne, usually in and around six main drug markets in the greater metropolitan area (St Kilda, Footscray, Dandenong, City of Yarra, City of Melbourne, Frankston). Trained interviewers administer the questionnaire with the aid of personal digital assistants (PDAs) running Questionnaire Development System software (Nova Research Company, Maryland, USA). At the end of each interview, participants are reimbursed AUD$30 for their time and out-of-pocket expenses. Data for this paper were obtained from baseline interviews conducted with participants between April 2008 and January 2010. The study was approved by the Human Research Ethics Committees of the Victorian Department of Human Services (now the Victorian Department of Health) and Monash University.

2.2 Outcome variables

We examined a variety of health, criminogenic and life satisfaction outcomes reported by participants including: recent (past six months) heroin overdose, past month hospital emergency department attendance, past month perpetration of violent crime, fraud or drug dealing, and overall life satisfaction as measured by the Personal Wellbeing Index (PWI) (Cummins, 2003; Dietze et al., 2010).

2.3 Predictor variable

Drinking status was derived from a variant of the AUDIT consumption questions (AUDIT-C) (Bush et al., 1998), modified to include only a past month rather than past year timeframe (to ensure compatibility with the other drug use questions used in the questionnaire). Drinking status cutpoints of abstinent, moderate and high risk in the past month were calculated on the basis of AUDIT-C scores of 0, 1-7 and 8+ respectively.

2.4 Potential confounders

Potential confounders of all of the above outcomes were generated for inclusion in analysis in the socio-demographic and drug use domains.

Socio-demographic correlates: Age (<20, 20-24, 25-29, 30+), gender (male, female), education (<year 10, year 10-1, year 12+ - including post-high-school courses), employment (unemployed, employed/other) and indigenous (indigenous/non-indigenous) status, living circumstances (with spouse/partner, alone or with spouse/partner and with children, with parents/other relatives, with friends/housemates, alone, other), recruitment site (St Kilda, Footscray, Dandenong, City of Yarra/CBD, Frankston), country of birth (Australia/other), accommodation type (owner-occupied,

private rental, public housing, unstable – including homeless, boarding house and temporary accommodation), ever failed a year at school (y/n), ever been expelled from school (y/n), incarceration history (never, once, twice, 3+ times).

Drug use correlates: Additional drug use variables included: length of injecting career (years), current pharmacotherapy (methadone or buprenorphine, y/n), past month use of main drugs (heroin and methamphetamine, heroin only, methamphetamine only, neither heroin nor methamphetamine), frequency of heroin use in the week before interview (none, <7times, 7-13 times, >13 times), frequency of methamphetamine use in the week before interview (none, 1-2 times per week, >2 times past week), past-month use of benzodiazepines (y/n), self-reported hepatitis C (HCV) status (y/n) and most recent purchase of heroin/speed used in public (e.g., park, street) location (y/n).

2.5 Analysis strategy

Data were downloaded from PDAs and transferred into a Stata 11 database for analysis.

Simple descriptive statistics were generated for each of the outcomes. We then examined the bivariate relationships between drinking status and each of the outcome variables using logistic regression.

Our multivariable analysis followed the counfounding model building protocol used in several recent papers focused on relationships between a primary explanatory variable and a given outcome of interest (e.g., Milloy et al., 2009). Here, we began with a full model for each outcome that included the drinking status variable and all the potential confounders listed above. We then ran reduced models with each potential confounder removed in turn. The relative change of the coefficient for the drinking status variable was then examined in each of these models. The omitted potential confounder that resulted in the smallest change in the coefficient for the drinking status variable was then removed from further analysis. This procedure was repeated until the smallest change in the drinking status coefficient was greater than 10%. The final models include the relationship between drinking status and each of the six outcomes, after adjusting for relevant potential confounders. We report only the adjusted relationship between drinking status and each of the six outcomes in this paper. Tests of multicollinearity between potential confounders showed variance inflation factors within accepted limits.

3 Results

The distribution of drinking scores across the sample is shown in Table 1 along with a selection of other drug use and demographic characteristics. The sample was comprised largely of unemployed

males who reported frequent heroin use in the past week. Just over a third of the sample reported no drinking in the month prior to interview, with 44% classified as having moderate drinking status and 20% as high-risk. Overall, the sample characteristics were similar to samples of PWID recruited in Melbourne (e.g., Dietze et al., 2005) and Australia more broadly (e.g., Dietze et al., 2010).

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3.1 Drinking and health and social outcomes

Table 2 shows the distributions of AUDIT-C scores across the outcome variables along with the results of the bivariate and multivariable analyses. This Table shows that the drinking status variable was significantly associated with all of the outcomes in bivariate analyses, apart from reported fraud and dealing. Higher drinking levels were associated with elevated rates of recent heroin overdose, recent perpetration of violent crime, recent hospital emergency department attendance and reduced ratings of overall life satisfaction. After adjusting for all of the potential confounders considered in the modelling process, drinking status remained significantly associated with reported violent offending and PWI ratings only. Participants reporting high-risk drinking status were around five times more likely to report past-month perpetration of violent crime than participants who were abstinent. A dose-response pattern emerged in relation to PWI ratings: participants in the moderate drinking group gave PWI ratings 4.03 points lower than those reporting abstinence and participants in the high-risk drinking group gave PWI ratings 5.06 points lower than those reporting abstinence. There was no evidence of any association between drinking status and reports of past-month fraud or drug dealing.

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4 Discussion

In this study we examined how moderate and heavy drinking patterns and recent abstinence related to various health, criminogenic and quality of life outcomes in a sample of PWID. Our results showed that PWID whose past month drinking pattern was defined as moderate (between 1-7 on our version of the AUDIT-C) did not differ markedly in health outcomes from those who reported abstinence in

the previous month. However, a significant effect for moderate drinking was found for measures of personal wellbeing. In contrast, heavy drinking (scoring above 7 on our version of the AUDIT-C) resulted in almost universally poorer outcomes in bivariate analyses, but this effect was not evident when potential confounding was considered in multivariable models. The only exceptions here were in relation to violent crime and PWI ratings. Although there was a trend in this direction for past month heroin overdose and emergency department attendance, these relationships were not statistically significant.

We expected that heavy drinking would be associated with overdose given previous research on alcohol consumption as a risk factor for overdose (Darke and Zador, 1996; Dietze et al., 2005). The absence of any effects of heavy drinking on health indicators (overdose and emergency department attendance), after adjustment potential confounders, including variables related to intensity of drug use, suggests that heavy drinking is less important than other variables that are part of the web of association for poor health in this population. Nevertheless, high levels of drinking were associated with poorer life satisfaction ratings (as measured through the PWI), even after adjusting for drug use and other sociodemographic variables that have been shown to affect ratings of life satisfaction in PWID (Dietze et al., 2010).

The relationship between alcohol consumption and violent crime perpetration mirrors that found in previous research with PWID and people who use illicit drugs more broadly (Chermack and Blow, 2002; Marshall et al., 2008; Parker and Auerhahn, 1998; Torok et al., 2008). However, our study suggests that only higher levels of consumption are related to the perpetration of violent crime. Importantly, these drinking levels were unrelated to other nonviolent offending behaviours such as fraud or drug dealing. This suggests that alcohol does not impact on any form of generalised deviant behaviour, at least that which might be captured by the measures chosen in this study. Overall, notwithstanding the cross-sectional nature of this study, these results are consistent with a possible causal role for heavy drinking in the perpetration of violence among PWID, as has been shown in other populations (Room and Rossow, 2001).

It is well known that PWID whose hepatitis C virus (HCV) status is either perceived or confirmed positive are less likely to consume alcohol, and that interventions to reduce consumption have benefits in terms of liver function amongst this group (Drumright et al., 2011), as disease progression is more marked among those who consume alcohol (John-Baptiste et al., 2010). It would also appear that some forms of alcohol consumption counselling framed in relation to HCV can lead to increased abstinence (Drumright et al., 2011). Our findings, albeit from a cross-sectional analysis, suggest that

a possible additional benefit of this increased abstinence may be reduced violent offending and increased life satisfaction. Given the high prevalence of HCV among Australian PWID (Crofts et al., 1999; Crofts et al., 1997), HCV status should be explored as an intervention point to reduce alcohol consumption among Australian PWID. These interventions could be framed along the lines of brief or other interventions that have been shown to be successful in other populations, and may include abstinence or reduced/controlled drinking as intervention goals (Babor et al., 2010). Such interventions may not only improve HCV-related outcomes, but may be a mechanism of possible reduction in the perpetration of violence by, and increased life satisfaction among, PWID.

Several limitations associated with this study should be mentioned. First, our sample was not randomly selected, and therefore may not be representative of PWID in Melbourne or other parts of Australia. Second, we relied on self-report, and our data may be limited by various forms of response bias, including those related to recall and social desirability. For example, sensitive behaviours, including intense drug use, may have been underestimated. However, we know of no reason why these response biases would be differentially distributed among those who did and did not drink alcohol. Third, the analysis reported here is cross-sectional, derived from baseline data alone. As such, we cannot infer any causal relationships. Future analyses using prospective data will better illuminate the potential role of alcohol consumption as a cause of the outcomes examined. Finally, we were not able to include HIV status as a potential confounder as less than 1% of participants believed that they were HIV positive, in accord with most samples of Australian PWID (Crofts et al., 1999).

In summary, while previous research has examined the association between alcohol use and health and social outcomes for PWID, to our knowledge none has examined the relationship across a variety of outcomes in a single study, and past studies have been limited by measurement issues specific to alcohol use. In this paper more than a third of our sample was abstinent from alcohol but around one-fifth reported high-risk drinking. In multivariate analyses, high-risk drinking was independently associated with perpetration of violent crime and poorer ratings of life satisfaction after adjustment for other potential confounders, including intensity of drug use. These findings suggest that heavy alcohol consumption can exacerbate some negative social outcomes among PWID; these effects appear similar to effects found in other groups in the wider community. The findings highlight the importance of considering heavy drinking in the context of drug dependence treatment and other harm reduction strategies, as they suggest that reductions in heavy drinking may reduce violent offending and improve life satisfaction. Moreover, the high prevalence of HCV, and the evidence suggesting HCV positivity and associated alcohol consumption counselling can lead

to reduced drinking, means that HCV testing and management provides a clear point of intervention that needs to be further explored.

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Table 1: Selected drug use and demographic characteristics of the sample

Drug use Variables	%	Demographic Variables	%
AUDIT-C score (n=688)		**Incarceration history (n=684)**	
Abstinent (0)	36	Never been in prison	40
Moderate (1-7)	44	Incarcerated once	31
High-risk (8+)	20	Incarcerated two or more times	29
Current Pharmacotherapy (n=688)		**Sex (n=688)**	
Yes	35	Female	33
No	65	Male	67
Main drugs (n=665)		**Age (n=688)**	
Heroin and methamphetamine	31	<20	5
Heroin only	55	20-24	23
Methamphetamine only	9	25-29	53
Neither heroin nor methamphetamine	5	30+	19
Recent benzodiazepine use (n=688)		**Aboriginal/Torres Strait Islander status (n=688)**	
Yes	54	Yes	6
No	46	No	94
Self-reported HCV status (n=688)		**Country of birth (n=688)**	
Yes	45	Australia	80
No	55	Other	20
Recent public drug use (n=688)		**Employment status (n=687)**	
Yes	54	Not employed	86
No	47	Employed	14
Methamphetamine use Frequency past week (n=688)		**Education (n=688)**	
None	77	Did not complete year 10	34
1-2 times	15	Completed year 10-11	46
>twice	9	Completed high school or higher	20
Heroin use Frequency past week (n=688)		**Current accommodation type (n=684)**	
None	25	Owner-occupied	23
<7 times	45	Private rental	28
7-13 times	14	Public housing	30
>13 times	16	No stable accommodation	19

Table 2: Distribution of AUDIT-C cutoffs across main outcomes, univariate and adjusted regression results

	AUDIT-C cutoff	% with outcome	Univariate OR (95% CI)	Adjusted OR (95% CI)	Beta Coefficient (95%CI)	Adjusted Beta coefficient (95%CI)
Recent heroin overdose (n=68/272)*, 25%	abstinent	19	Ref	Ref		
	1-7	26	1.29 (0.90-1.84)	1.62 (0.74-3.59)		
	8+	32	1.68 (1.08-2.60)	1.84 (0.75-4.53)		
Past-month ED attendance (n=93/683), 14%	abstinent	10	Ref	Ref		
	1-7	14	1.41 (0.83-2.39)	1.36 (0.74-2.50)		
	8+	20	2.23 (1.23-4.03)	1.86 (0.93-3.72)		
Past-month violent crime (n=51/682), 8%	abstinent	3	Ref	Ref		
	1-7	7	1.90 (0.85-4.26)	1.45 (0.59-3.53)		
	8+	16	5.17 (2.31-11.59)	5.03 (2.05-12.35)		
Past-month fraud (n=14/682), 2%	abstinent	2	Ref	Ref		
	1-7	2	1.03 (0.28-3.89)	0.39 (.08-2.06)		
	8+	4	2.37 (0.62-8.96)	1.06 (0.21-5.42)		
Past-month dealing (n=192/679), 28%	abstinent	28	Ref	Ref		
	1-7	29	1.05 (0.73-1.54)	0.98 (0.62-1.56)		
	8+	27	0.96 (0.59-1.54)	0.65 (0.35-1.21)		
PWI score Mean/	abstinent	58			Const – 57.67	Const – 62.44
	1-7	54			-4.01 (-7.22- -0.80)	-4.03 (-7.29- -0.77)
	8+	51			-6.52 (-10.53- -2.51)	-5.06 (-9.29- -0.83)

*those who reported ever having a heroin overdose, n = 272