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Diagnosed alcohol dependence and criminal sentencing among British Columbian Aboriginal offenders

Emily S. Rempel*, Julian M. Somers, John R. Calvert, Lawrence C. McCandless

Faculty of Health Sciences, Simon Fraser University, 8888 University Drive, Burnaby, BC, Canada V5A 1S6

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ABSTRACT

Introduction: Alcohol use is commonly reported as a short-term criminal risk factor; however there is minimal research on the effects of alcohol dependence on crime. Canadian Aboriginal offenders exhibit both disproportionate crime and alcohol disorder prevalence. This study aims to examine the impact of diagnosed alcohol dependence on Aboriginal ethnicity and criminal sentencing in British Columbia.
Methods: We used an administrative linkage database of social, health and justice system variables to develop a retrospective cohort of 70,035 offenders sentenced through courts in British Columbia from 2001–2010. We used a coefficient difference mediation analysis to evaluate the mediating effect of alcohol dependence on the association between self-reported Aboriginal status and sentencing rate.
Results: Aboriginal offenders had 1.92 (95% C.I.: 1.79,2.06) times higher odds of alcohol dependence than Caucasian offenders. Adjustment for health, social and demographic factors resulted in a 27% (95% Confidence Interval (CI): 15%, 33%) reduction in the association of Aboriginal ethnicity on sentencing. Adjustment for alcohol dependence resulted in only a further reduction of 2% (95% CI: −12%, 15%). Although alcohol dependence was associated both with Aboriginal ethnicity and sentencing, it did not have a significant mediating impact on sentencing rate.
Conclusion: Alcohol dependence was not a mediator for the relationship between sentencing rate and Aboriginal ethnicity. However, due to the proportion of offenders diagnosed with alcohol dependence, these results support alcohol misuse as an important public health policy target in this population.

1. Introduction

The relationship between alcohol use and crime is well documented at both the individual and population level (Martin, 2001; McLelland and Teplin, 2001; Palk et al., 2007; Lundholm et al., 2013; Dietze et al., 2013). However, the impact of alcohol dependence on crime is poorly understood. Alcohol consumption is associated with decreased risk perception and increased aggression, resulting in a higher likelihood of criminal behaviour (Martin, 2001; Vaughn et al., 2012). In an examination of United States police–citizen interactions, 34% of interactions involved alcohol (McLelland and Teplin, 2001). These effects are, however, temporary and the impact of alcohol dependence is not commonly examined as a primary outcome for associations with crime. Despite this, substance use disorders, primarily alcohol dependence, represent the greatest proportion of mental disorders among offenders (Wormith and McKeague, 1996; van der Put et al., 2014). Nearly a third of all mental health diagnoses were related to alcohol and drug use among a sample of probationers and parolees from Ontario, Canada (Wormith and McKeague, 1996). As well, alcohol use is often co-morbid with other mental health disorders particularly drug dependence (Somers et al., 2008; Dietze et al., 2013). Of even greater concern, problematic alcohol use is consistently reported as a major issue contributing to criminal behaviour among Indigenous offenders worldwide (Weatherburn and Snowball, 2008; Yessine and Bonta, 2009; Wood and Hays, 2014).

Aboriginal Canadians, including First Nations, Métis and Inuit, are overrepresented in Canada's justice system (Roberts and Melchers, 2003; Kendall, 2013). Although crime rates have decreased over the past three decades, rates among Aboriginal offenders have decreased at a slower rate than other offenders (Roberts and Melchers, 2003; Perreault, 2009). This represents a persistent racial disparity in crime rates in Canada (Roberts and Melchers, 2003; Yessine and Bonta, 2009). This mirrors trends among Black offenders in the United States, Indigenous offenders in Australia and New Zealand, as well as other populations at social, economic and health disadvantage (Weatherburn, 2008; Weatherburn and Snowball, 2008; Brame et al., 2014).

* Corresponding author. Tel.: +1 778 782 4821; fax: +1 778 782 5927.
E-mail address: emily_rempel@sfu.ca (E.S. Rempel).

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From a population health perspective, excess crime rates cause substantial harm to overall wellbeing. Offender populations typically experience many negative health outcomes including higher mortality and greater burdens of chronic disease (Binswanger et al., 2007; Herbert et al., 2012; Kendall, 2013). As well offenders tend to engage in riskier behaviours like increased substance and alcohol use once released from custody (Vaughn et al., 2012). Increased alcohol use, in particular, is a major concern among Aboriginal populations in Canada. Alcohol consumption is self-reported as the greatest health concern among First Nations communities (Neubold, 1998). Both crime and alcohol dependence in Aboriginal communities are a complex result of historical and modern traumas as well as social and physical environment (Adelson, 2005; Evans-Campbell, 2008; Ehlers et al., 2013). This has contributed to an average five-year disparity in life expectancy between Aboriginal and non-Aboriginal Canadians (Statistics Canada, 2014).

Despite the clear relationship between alcohol use and crime (McLelland and Teplin, 2001; Martin, 2001; Palk et al., 2007; Lundholm et al., 2013; Dietze et al., 2013), few researchers have examined this association among Canadian Aboriginal populations. Persistent stereotypes like the 'drunken Indian' reinforce public perception of alcohol use as a major contributor to crime in Aboriginal populations (Holmes and Antell, 2001; Feldstein et al., 2006; Razack, 2013). However, there is little empirical evidence on the prevalence rates of alcohol dependence among Aboriginal offenders and whether this causes crime. Aboriginal Canadians provide an important study population for the alcohol dependence and crime relationship, both in an investigative sense as well as a potential target for policy interventions.

Although evidence is scarce about Indigenous offenders, crime and alcohol dependence have been examined in other populations. There are three predominant explanations for the relationship (Parker and Auerhahn, 1998; Mulvey et al., 2006). The first two theories propose that either alcohol dependence causes crime over the life-course or that crime causes alcohol dependence due to the criminal environment (Kerner et al., 1997; Fergusson and Horwood, 2000). Both theories support a causal relationship beyond the temporary effects of alcohol. However a causative model does not fully explain the association. As many offenders do not have alcohol dependence and most people with alcohol dependence do not commit crimes, other factors must impact this association.

A final explanation, and our primary focus, is shared risk factors. Both criminal behaviour and alcohol use disorders peak at similar ages and are associated with social disadvantage. Much of this relationship is potentially spurious (Mulvey et al., 2006; Yessine and Bonta, 2009; Skeem et al., 2011). Adequate adjustment for social, health and genetic factors would remove the statistical association between alcohol disorders and crime. For Aboriginal offenders, this means high prevalence of criminal and alcohol use risk factors could explain these population co-occurring problems.

There is limited current evidence that tests the shared risk model. Weatherburn (2008) found among Indigenous Australian offenders, alcohol abuse compared to other demographic and social variables had the strongest correlation with arrest. In a New Zealand birth cohort, the alcohol disorder and crime association persisted after adjustment for other variables, although this relationship was restricted to assault in the later study (Fergusson and Horwood, 2000; Boden et al., 2013). Conversely, Ha°kansson and Berglund (2012) found that binge drinking was negatively associated with reoffending among prisoners with substance use disorders after adjusting for other factors like gender and age. Considering these conflicting results, further research is needed on how alcohol dependence contributes to crime. This includes examining how alcohol dependence may predict sentencing, as well as how ethnicity and sentencing are associated with alcohol dependence.

Our objective was to describe and examine the impact of diagnosed alcohol dependence on the relationship between Aboriginal ethnicity and crime in British Columbia (BC), Canada. Specifically whether alcohol dependence explains the association between Aboriginal ethnicity and sentencing, after accounting for other risk factors. Although drug dependence and alcohol dependence are often co-morbid among offenders (Somers et al., 2008; Dietze et al., 2013), we focused on alcohol dependence due to the unique social and political history of alcohol use among Aboriginal peoples. This was the first study to evaluate this relationship among Aboriginal offenders in Canada.

We examined a large cohort of offenders from BC using government-sourced administrative data (Somers et al., 2011; Rezansoff et al., 2013; McCandless et al., 2014). First, we contrasted sociodemographic and alcohol dependence characteristics of BC's Aboriginal and non-Aboriginal offender populations in a descriptive analysis. Second, we examined risk factors for alcohol dependence among offenders, including Aboriginal status, using regression analyses. Third, we examined whether diagnosed alcohol dependence accounted for the higher Aboriginal sentencing rate compared to other BC offenders using mediation analyses. Our hypothesis was that diagnosed alcohol dependence would be a partial mediator of the relationship between Aboriginal ethnicity and criminal sentencing.

2. Methods

2.1. Sample and data sources

We developed a retrospective longitudinal offender cohort using the Inter-Ministry Database (IMDb), an administrative linkage database of social, health and justice system data from all individuals sentenced between 1997 and the present through courts in BC, Canada (Somers et al., 2011; Rezansoff et al., 2013; McCandless et al., 2014). Cohort inclusion criteria were having at least one sentence from April 1, 2001 to one month prior to April 1, 2010, reporting ethnicity, and being over 15 years of age. 11 individuals were removed for having unreported gender. Individuals were followed until their date of death or study end on April 1, 2010. The final sample included 70,035 individuals. Analyses were completed using SASv9.3 and R (R Development Core Team, 2004). Ethical approval for this study was provided by the Simon Fraser University Research Ethics Board.

2.2. Variables and measures

2.2.1. Criminal justice variables. Criminal justice variables were obtained from the BC Ministry of Justice. Sentencing rate was the total number of sentences including initial offense in the dataset divided by years of follow-up time. Sentencing indicates a convicted offense and represents an estimate of frequency of offending. Other variables included initial offense sentence type (custody versus community) and crime type (violent, non-violent or drug and alcohol related). A custody sentence is served within a justice system facility, while a community sentence is served outside of these facilities.

2.2.2. Health variables. All health data were sourced from the Provincial Medical Service Plan (MSP) Database while hospitalization records were extracted from the BC Discharge Abstract Database. The MSP database lists all BC physician interactions both in the community and within justice system facilities. Alcohol dependence was a binary variable and defined as an individual having at least one ICD-9 coded MSP record for alcohol dependence. Baseline health variables included mental disorder, alcohol dependence and drug dependence. Diagnosis was determined as

Table 1
Demographic, social assistance, health and criminal justice characteristics by ethnicity of 70035 offenders sentenced through British Columbian courts from 2001 to 2010.

	Ethnicity			
	Aboriginal[a]	Caucasian	Other[b]	*P*-value
Population size (*n*)	11001	47616	11418	
Demographic variables				
% Female	27.11	17.49	12.74	<0.001
Age in years				
% Under 25	41.27	29.58	30.08	
% 25–40	37.50	37.03	41.29	
% Over 40	21.23	33.39	28.62	<0.001
Education				
% Grade 9 or less	20.20	9.76	9.88	
% Above grade 9	74.62	82.94	74.28	
% Unknown/none	5.18	7.29	15.84	<0.001
Social assistance variables[c]				
% Crisis grant	18.31	14.20	5.54	<0.001
% Disability grant	6.04	6.59	2.77	<0.001
Mean income assistance months (SD)	4.64 (7.91)	3.91 (7.51)	1.74 (5.37)	<0.001
Health variables prior to cohort entry[c,d]				
% Mental disorder	24.20	32.62	20.75	<0.001
% Drug dependence	9.67	11.96	5.36	<0.001
% Alcohol dependence	8.46	5.88	3.59	<0.001
% Hospitalised	23.83	20.34	12.52	<0.001
Health variables in follow-up[d]				
% Mental disorder	31.63	38.83	26.52	<0.001
% Drug dependence[e]	15.66	17.02	7.51	<0.001
% Alcohol dependence	13.04	8.61	5.18	<0.001
Criminal justice system variables				
Initial offense category				
% Violent	38.20	30.11	31.57	
% Non-violent	50.56	53.88	45.88	
% Drug and alcohol related	11.24	16.01	22.54	<0.001
Initial sentence				
% Probation or other	85.46	87.41	86.72	
% Custody	14.54	12.59	13.28	<0.001
Mean sentencing rate per year (SD)	1.46 (2.83)	1.12 (2.34)	0.98 (2.13)	<0.001
Mean follow-up in years (SD)	4.25 (2.54)	4.40 (2.49)	4.21 (2.49)	<0.001

[a] Includes individuals who self-identify as Aboriginal, Inuit, First Nations or Métis.
[b] Other ethnicity includes individuals who self-identify as Black, Hispanic, East Indian or Asian.
[c] Within two years preceding cohort entry.
[d] Based on MSP service plan records using ICD-9 codes.

having at least one MSP record for each health characteristic (based on ICD-9 classifications of disease) two years prior to cohort entry. Health variables over follow-up were defined in the same way as the baseline variables. Hospitalization included individuals who had as at least one hospitalization two years prior to cohort entry. Mortality data were obtained from the BC Vital Statistics Agency.

2.2.3. Demographic variables. Demographic variables, including self-reported gender, age in years and education status, were obtained from Ministry of Justice data at initial sentence in the dataset. Aboriginal status was self-reported ethnicity recorded at initial sentence. Individuals were divided into three groups: Aboriginal (First Nations, Métis, Inuit and other unspecified Aboriginal), Caucasian, and Other Ethnicity (Black, Hispanic and Asian). Social assistance variables, from BC Ministry of Social Development records, at baseline (two years prior to cohort entry) included crisis grant (at least one transaction for financial assistance related to a crisis grant), disability grant (at least one transaction for financial assistance related to a disability) and months of income assistance.

2.3. Statistical analysis

2.3.1. Cohort description. We stratified all variables by ethnicity and reported differences across ethnic groups in a descriptive analysis. Categorical variables were reported as a percentage and continuous variables as a mean with standard deviation. Differences were compared using a chi-squared test for categorical variables and ANOVA for continuous variables where statistical significance was $\alpha < 0.05$. Health variables were reported both two years prior to cohort entry and over follow-up.

2.3.2. Alcohol dependence model. We developed a model for alcohol dependence diagnosis over follow-up among offenders. All variables were examined in univariate and multivariate logistic regression models with the outcome alcohol dependence, where one indicates alcohol dependence. Variable inclusion in the multivariate model required statistical significance in univariate analysis and/or expert knowledge that the covariate was associated with alcohol dependence. In addition, we compared model effectiveness by examining the Aikake Information Criterion (AIC). Statistical significance was set at $\alpha < 0.05$.

2.3.3. Mediation analysis. The mediating effect of alcohol dependence on the relationship between ethnicity and sentencing rate was examined using a coefficient difference mediation analysis (MacKinnon et al., 2007). Due to the count nature of the sentencing data, Poisson-based models were developed for the outcome variable sentencing rate. Sentencing rate models revealed overdispersion of the data (highκ dispersion parameters); therefore negative binomial regression was used in lieu of Poisson regression (Elhai et al., 2008).

Four models were developed for the mediation analysis. Model 1 was univariate analyses of sentencing rate regressed on ethnicity. Model 2 was a multivariate analysis of sentencing rate regressed on ethnicity and alcohol dependence alone. Model 3 was a multivariate analysis of sentencing rate regressed on ethnicity and adjusted for

Table 2
Odds Ratio (OR) for the association between participant characteristics and alcohol dependence for 70035 offenders sentenced through British Columbian courts from 2001 to 2010.

	Univariate RR (95% CI)	Multivariate RR[a] (95% CI)
Ethnicity		
Caucasian	1.00	1.00
Aboriginal[b]	1.59 (1.49,1.70)	1.92 (1.79,2.06)
Other[c]	0.58 (0.53,0.63)	0.78 (0.71,0.85)
Baseline mental disorder[d,e]	2.47 (2.34,2.60)	1.73 (1.62,1.84)
Baseline drug dependence[d,e]	3.69 (3.46,3.92)	2.53 (2.36,2.72)
Hospitalized[e]	2.44 (2.31,2.58)	1.60 (1.50,1.70)
Female	1.29 (1.21,1.38)	0.86 (0.80,0.93)
Age		
Under 25	0.75 (0.70,0.80)	0.79 (0.74,0.85)
25–40	1.00	1.00
Over 40	1.14 (1.07,1.21)	1.25 (1.17,1.33)
Education		
Grade 9 or less	1.00	1.00
Grade 9 or above	0.83 (0.77,0.90)	0.98 (0.91,1.07)
Unknown/none	0.41 (0.36,0.47)	0.70 (0.60,0.81)
Crisis grant[e]	2.24 (2.10,2.38)	0.97 (0.89,1.07)
Disability grant[e]	1.92 (1.75,2.10)	0.90 (0.81,1.01)
Months on income assistance[e]	1.05 (1.05,1.05)	1.02 (1.01,1.02)
Initial offense		
Non-violent	1.00	1.00
Violent	0.95 (0.90,1.01)	0.98 (0.92,1.05)
Drug and alcohol related	0.90 (0.83,0.97)	1.05 (0.86,1.13)
Initial sentence custody (vs. Probation)	0.83 (0.76,0.90)	0.85 (0.78,0.93)
Years of follow-up	1.24 (1.23,1.25)	1.25 (1.24,1.27)
Sentencing rate	0.97 (0.96,0.98)	1.03 (1.02,1.04)

[a] Adjusted for all variables.
[b] Includes individuals who self-identify as Aboriginal, Inuit, First Nations or Métis.
[c] Other ethnicity includes individuals who self-identify as Black, Hispanic, East Indian or Asian.
[d] Based on MSP service plan records using ICD-9 codes.
[e] Within two years preceding cohort entry.

demographic, baseline health variables, social and justice system variables not including alcohol dependence. Model 4 was identical to Model 3 but additionally included alcohol dependence over follow-up in the multivariable model. Model selection processes were the same as the alcohol dependence model, except that confounding variables were required to be associated with sentencing and ethnicity.

The percent change in the coefficient for Aboriginal status was calculated between models 1 and 3 and models 3 and 4. We used the following formula:

$$\frac{RR_{Model1} - RR_{Model2}}{RR_{Model1} - 1} \times 100,$$

where RR is the rate ratio. 95% confidence intervals for the percent change in coefficients were developed using the Bootstrap method.

3. Results

3.1. Participant characteristics

Table 1 compares the cohort characteristics; all differences across groups were significant at $\alpha < 0.001$. A greater proportion of the Aboriginal group was female, under 25 and less educated compared to other groups. As well, the Aboriginal group had the highest sentencing rate (1.46 sentences per year on average), and the highest proportion of offenders with alcohol dependence at baseline (8.46%). The Aboriginal group had a lower proportion of offenders with a mental disorder at baseline (24.20%) compared to Caucasian offenders (32.62%), but a higher proportion than the Other ethnicity group (20.75%). Over follow-up, these relationships persisted. All groups showed an increase in the proportion of mental disorder diagnoses and substance use disorders after cohort entry.

3.2. Alcohol dependence model

Table 2 shows a strong association between Aboriginal ethnicity and alcohol dependence diagnosis in the multivariate model, compared to Caucasian offenders (Odds Ratio (OR) = 1.92, 95% CI: 1.79,2.06), whereas the association in the univariate model was weaker (OR = 1.59, 95% CI: 1.49,1.70). A higher sentencing rate was associated with alcohol dependence diagnosis (OR = 1.03, 95% CI 1.02,1.04). The strongest characteristics in multivariate analysis associated with higher odds of alcohol dependence included having a baseline mental disorder (OR = 1.73, 95% CI: 1.62,1.84) and having a baseline drug dependence diagnosis (OR = 2.53, 95% CI: 2.36,2.72). As well offenders over the age of 40, compared to individuals between 25 and 40, had higher odds of alcohol dependence (OR = 1.25, 94% CI: 1.17,1.33).

Table 3
Coefficient difference mediation analysis results. Rate Ratios (RR) for the association between Aboriginal status and sentencing rate for 70035 offenders sentenced through British Columbian courts from 2001 to 2010.

	Model 1[a] RR (95% CI)	Model 2[b] RR (95% CI)	Model 3[c] RR (95% CI)	Model 4[d] RR (95% CI)	Percent reduction (%)—Model 3 versus Model 1 (95% CI)[e]	Percent reduction (%)—Model 4 versus Model 3 (95% CI)[e]
Ethnicity						
Caucasian	1.00	1.00	1.00	1.00	–	–
Aboriginal[f]	1.36 (1.33,1.39)	1.35 (1.32,1.38)	1.26 (1.23,1.29)	1.25 (1.23,1.28)	27 (15,33)	2 (−12,15)
Other[g]	0.78 (0.76,0.80)	0.78 (0.76,0.80)	0.84 (0.82,0.85)	0.84 (0.82,0.86)	26 (16,40)	1 (−20,18)
Follow-up alcohol dependence[h]	1.17 (1.14,1.20)	1.13 (1.10,1.16)	–	1.09 (1.06,1.12)	–	–
Baseline drug dependence[h]	1.56 (1.52,1.60)	–	1.44 (1.41,1.48)	1.43 (1.39,1.47)	–	–

[a] Unadjusted model.
[b] Adjusted for follow-up alcohol dependence only.
[c] Adjusted for sentencing risk factors including initial sentence and offense type; age, gender, and education status at time of cohort entry; and hospitalization, mental disorder, drug dependence, crisis grant, disability grant and months on income assistance two years prior to cohort entry.
[d] Adjusted for all sentencing risk factors, including follow-up alcohol dependence diagnosis.
[e] Percent reduction in association between Aboriginal status and sentencing rate.
[f] Includes individuals who self-identify as Aboriginal, Inuit, First Nations or Métis.
[g] Includes individuals who self-identify as Black, Hispanic, East Indian or Asian.
[h] Based on MSP service plan records using ICD-9 codes.

3.3. Mediation analysis

In univariate analyses (see Table 3) Aboriginal ethnicity compared to Caucasian ethnicity, was associated with a higher rate of criminal sentencing (Rate Ratio = 1.36, 95% CI: 1.33,1.39). The Other (RR = 0.78, 95% CI: 0.76,0.80) group exhibited a lower sentencing rate than the Caucasian group. All variables were significant in univariate analyses, and therefore included in subsequent models. Model 2 showed Aboriginal ethnicity was associated with a 35% increase (RR = 1.35, 95% CI: 1.32,1.38) in sentencing rate when adjusted for alcohol dependence alone. Model 3 resulted in a reduction of the association between Aboriginal ethnicity and sentencing rate of 27% (95% CI: 15%,33%) ($RR_{unadjusted} = 1.36$ versus $RR_{adjusted} = 1.26$). This reduction illustrates confounding in the Aboriginal status and criminal sentencing association due to social, health and demographic variables. Model 4 is identical to Model 3 except that it also controls for alcohol dependence. After addition of alcohol dependence in the model, the effect of Aboriginal ethnicity on sentencing rate compared to Caucasian ethnicity decreased by a mere 2% (95% CI: −12%,15%).

4. Discussion

4.1. Cohort characteristics

The descriptive analysis results are consistent with previous research. Aboriginal offender populations tend to have higher sentencing rates and a greater percentage of offenders who are young and female than other ethnic groups (Perreault, 2009; Kendall, 2013). The Aboriginal group has the highest sentencing rate as well as the greatest proportion of offenders whose initial offense was violent. In 2006 Aboriginal peoples represented 4.8% of the BC population, a much lower proportion compared to the offender sample (BC Stats, 2006). This suggests the group is both offending more and being sentenced with more severe crimes. The Aboriginal group also has a higher proportion of individuals with lower socioeconomic status e.g. greater use of social assistance and lower education. This partially explains the higher rate of sentencing, as age and socioeconomic status are commonly associated with criminal behaviour (Yessine and Bonta, 2009; Skeem et al., 2011). These characteristics, particularly the twofold higher proportion of Aboriginal offenders with only a grade 9 education, align with the shared risk explanation.

The Aboriginal group had a higher proportion of individuals diagnosed with alcohol dependence both prior to group entry and over follow-up. Aboriginal offenders, although exhibiting lower socioeconomic strata, have an 8% lower percentage of mental disorders than the Caucasian group. Although this difference is statistically significant, it could represent diagnostic bias. Aboriginal offenders could have a higher likelihood of alcohol dependence diagnosis versus another mental disorder, due to an underlying expectation that Aboriginal peoples experience issues with alcohol misuse (Razack, 2013). This would artificially inflate the differences between non-Aboriginal and Aboriginal offenders. Although, there is a potential ethnic inequity in the proportion of alcohol dependence among offenders, further research should test whether these variations are genuine.

4.2. Alcohol dependence and ethnicity

The logistic regression analysis (Table 2) of alcohol dependence shows a strong association between Aboriginal status and alcohol dependence. Aboriginal offenders have 92% higher odds of alcohol dependence than Caucasian offenders (OR = 1.92, 95% CI: 1.79,2.06). This suggests alcohol dependence is a major health issue for this group. In Table 2, the univariate rate ratio was closer to the null than the multivariate rate ratio. As alcohol dependence was more common among older offenders and the Aboriginal group was younger than the other ethnic groups, age likely biased the relationship between Aboriginal status and alcohol dependence towards the null.

In addition to the higher odds in follow-up, nearly one in ten Aboriginal offenders (8.46%) had a diagnosis of alcohol dependence prior to cohort entry. These results suggest a strong public health need to counteract alcohol dependence inequities among Aboriginal offenders. Under a shared risk model, preventing alcohol dependence could also decrease criminal behaviour. Particularly targeting risk factors like education could be mutually beneficial for public health and justice systems.

4.3. Alcohol dependence as a partial mediator

Our hypothesis that alcohol dependence would statistically account for the relationship between Aboriginal status and sentencing rate was not supported by the mediation analysis. Adjustment with alcohol dependence results in merely a 2% (95% CI: −12%,15%) reduction for Aboriginal offenders, which is not statistically significant. Gutierrez et al. (2013) found similar results in their analysis of risk assessment instruments, alcohol and drug use was less likely to predict recidivism for Canadian Aboriginal offenders compared to other offenders. Among New Zealand juvenile offenders, Fergusson and Horwood (2000) found most of the association between alcohol abuse and crime was due to confounding factors, e.g., shared risk factors. They attribute the remaining statistical association to causative effects. This contradicts the results of our analysis, but these differences are likely due to differing measures of alcohol abuse, statistical methods and populations.

Another potential explanation for our results is the co-morbidity of alcohol dependence with drug dependence. We adjusted for drug dependence in both Model 3 and Model 4. As these disorders are often highly correlated, the limited association between alcohol dependence and crime could be explained by including drug dependence in the model. As seen in Table 3, drug dependence was strongly associated with sentencing. However, as both drug and alcohol dependence remained significantly associated with sentencing in Model 4, including a combined variable would not likely change the Aboriginal status rate ratio.

Overall, our results support the shared risk explanation of alcohol dependence and crime. Alcohol dependence did not account for the differences in sentencing rate among offenders. In Model 2 alcohol dependence was associated with sentencing rate, however it did not mediate the differences in sentencing rate between ethnicities. This result also counteracts assumptions that alcohol disorders impact offending differently for Aboriginal offenders compared to other ethnic groups. Other factors like age or socioeconomic status likely contribute to the increase in both crime and alcohol dependence in the Aboriginal population. After adjusting for sentencing risk factors, Aboriginal status was still associated with a higher sentencing rate and odds of alcohol dependence diagnosis. This suggests that other variables, not available in the administrative data, likely influence both alcohol dependence and sentencing. These other risk factors could include societal issues like racism and historical traumas like residential schooling (Adelson, 2005; Evans-Campbell, 2008; Ehlers et al., 2013). The increase in the proportion of alcohol dependence over time in all groups and the statistical association of alcohol dependence with sentencing rate suggests there are several intervening explanations at work (Ensor and Godfrey, 1993; Kerner et al., 1997). It is unlikely that shared risk factors alone account for the prevalence of alcohol dependence

among offenders. All three explanations for the crime and alcohol dependence relationship are plausible.

4.4. Strengths and limitations

There are several limitations that bear consideration when interpreting the results of our study. Administrative databases have predetermined definitions of variables like ethnicity. Although 'Aboriginal' is a commonly used ethnic category, it does not recognize variation among Canadian Indigenous peoples (Adelson, 2005; Kumar et al., 2012). Research suggests administrative identification of Indigenous status overestimates the true Indigenous population (Wood and Hays, 2014). A similar result in our analysis would produce an even weaker mediating effect.

Another potential limitation is measurement error of alcohol dependence. We measured alcohol dependence as a binary variable using MSP records. We anticipate some degree of both under and over reporting. There could be significant misdiagnosis or undiagnosis in the dataset as many individuals with drug or alcohol dependence are unlikely to seek help. However, offenders may represent a group more likely to be diagnosed due to access to treatment programs (Ilgen et al., 2011). The length of follow-up varied for each offender. This may limit comparability in alcohol dependence diagnosis between follow-up and baseline time periods. As well, offenders who serve custody sentences may have a different likelihood of being diagnosed with alcohol dependence, although all offenders have access to medical services (British Columbia Ministry of Public Safety and Solicitor General, 2010).

Sentencing bias could exaggerate the rate of sentencing among Aboriginal individuals. Aboriginal offenders could be subject to harsher police response or a greater likelihood of police contact resulting in a court appointment (Kendall, 2013). Sentencing, however, represents a criminal justice interaction relatively far along the justice system pathway and should be minimally affected by bias. Several influences on the relationship between alcohol disorders, crime and Aboriginal status were beyond the scope of this analysis including fetal alcohol spectrum disorders. We did not account for the zero-truncated nature of the sentencing data. Negative binomial regression is based on counts including zero, as such the confidence intervals for our effect estimates are less conservative.

A major strength of this analysis is use of administrative longitudinal data. Offenders were examined over time, allowing for multiple interactions with the health care and justice system. This resulted in a large sample size with substantive accumulation of pre and post-entry information that eliminates both recall and response bias. The data are highly unique, as we have information from multiple sources about the entire population of offenders in BC. We can therefore make reliable population level inferences.

The range of demographic information on BC offenders allowed us to analyse a subject rarely discussed in population research, namely predictors of sentencing and alcohol dependence among Indigenous groups. Particularly including Métis offenders is an urgently needed step towards recognizing the diversity of Aboriginal groups within BC. In addition, our study is potentially generalizable to other Indigenous offenders across Canada. Although we caution interpreting our results as evidence against or for causation of alcohol disorders on offending, this analysis is a first step in understanding the current impact of alcohol disorders on Aboriginal offenders in BC. To the authors' knowledge, this is the first study to examine associations between alcohol dependence and criminal behaviour among BC Aboriginal peoples. As well, there is limited knowledge on this subject for Indigenous peoples worldwide, who tend to experience similar poorer health and elevated criminal behaviour (Weatherburn and Snowball, 2008).

5. Conclusions

This study examined whether diagnosed alcohol dependence statistically accounted for the disproportionately higher rate of Aboriginal offending compared to other ethnic groups in BC. Although Aboriginal offenders experienced a higher burden of alcohol dependence, it did not mediate sentencing rate. This supports a shared risk model, where other factors like age and socioeconomic status contribute to higher rates of alcohol disorders and crime. These results suggest further need for programming and policy that prevents alcohol dependence and crime in these populations. The short-term impact of alcohol on human behaviour is well understood, but the impact of alcohol dependence on crime is more complicated than a causative model. Further research should consider the complex nature of the association between alcohol dependence and crime to inform effective policy and public health programs.

Contributions

ESR, LCM, JMS and JRC developed the study. ESR and LCM developed the statistical analysis. ESR undertook the statistical analysis and wrote the manuscript. The manuscript was approved and revised by all authors.

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Conflict of interest statement

No conflict declared.

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