

Illicit Drug Use and Social Integration: A Cross-Sectional Study

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HINF 381: Epidemiology, Population Health, and Public Health

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December 12th, 2023

V00837207

1 | INTRODUCTION

Between 2016 and 2023, 40,642 Canadians died of opioid overdose at an average rate of 22 deaths per day, (Government of Canada, 2023). As a Canadian and resident of Victoria, British Columbia, this topic is of great importance to me; as the years go by, I notice the increasing incidence of homelessness and opioid overdose in the city I live. While the nature of addiction is complex, some studies have found evidence of a temporal relationship between social isolation and addiction, with social isolation preceding addictive behavior (Buchanan, 2004; Silvia, 1990).

Social integration is defined as the sense of belonging that one has to a group of friends; low social integration occurs when individuals or groups become marginalized, isolated, or excluded from mainstream society. This can occur due to a variety of factors such as race, ethnicity, religion, socioeconomic status, or cultural differences. Low integration often leads to a lack of understanding and respect between groups and results in social fragmentation, conflict, and inequality. In the context of illicit drug use, research suggests that low social integration may be a causative factor on the road to drug addiction with some scientists even saying that “the opposite of addiction is not sobriety, but connection,” (Mate, 2008). A similar term, “social capital”, is used to describe an abundance of social integration and wellbeing for individuals and communities. Areas with high levels of social capital maintain protective effects against overdose death rates during national surges, and elevated social capital prior to addiction may even assist in natural recoveries, (Granfield, et al., 2001; Zoorob, et al., 2017). The specific mechanisms of social integration are well studied but not fully understood; the primary objective of this study is to observe the relationship between social integration and illicit drug use in the Canadian Community Health Survey (CCHS), 2015-2016, and weigh if the evidence supports further investigation.

2 | METHODOLOGY

Study Design

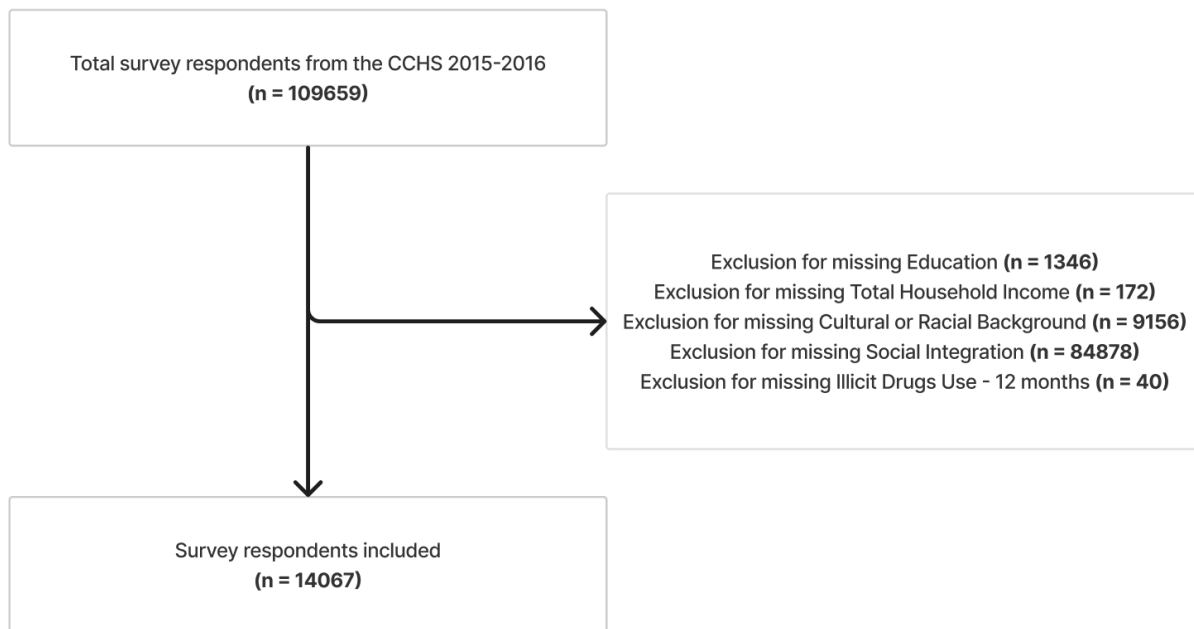
The 2015-2016 Canadian Community Health Survey (CCHS) public access microdata set was used for this cross-sectional study; no other data sources were considered. The CCHS includes a comprehensive range of variables, encompassing aspects of health and socio-demographic information and is conducted by Statistics Canada in all provinces and territories, (Government of Canada, 2017).

Study Population

The Canadian Community Health Survey (CCHS) encompasses about 98% of Canadians aged 12 years and older who reside in private homes across over 100 health regions in all provinces and territories. However, the survey does not include several groups: residents of Indian Reserves and Crown Lands, people living in institutions, active members of the Canadian Forces, youths aged 12 to 17 in foster care, and inhabitants of some isolated regions.

The entirety of the Canada-wide dataset was initially considered in this study ($n = 109,659$), but only results from Alberta, Prince Edward Island, and the Yukon Territories remained after necessary exclusions—likely due to intentional survey design limitations across the country. Exclusions were performed in the following order based on missing data or valid skips during survey responses: Education ($n = 1,346$); Total Household Income - all sources ($n = 172$); Cultural or Racial Background ($n = 9,156$); Social Integration ($n = 84,878$); Illicit Drugs Use - 12 months ($n = 40$), **Figure 1**. Afterward, the study included 14,067 Canadians. The excessive valid skips for Social Integration questions is of note and likely restricted the survey to Alberta, Prince Edward Island, and Yukon responses.

Figure 1. Selection of Study Population



Primary Outcome Variable

The primary outcome variable chosen for this study was Any illicit drug use - 12 months (DRMDVLAY). The 12 month focus was selected under the assumption that levels of social integration change over the course of a life span, and that 1 year window would adequately capture the relationship between social integration and illicit drug use if any existed. The DRMDVLAY variable was amalgamated from question responses to other variables:

- ADM_PRX: Health component completed by proxy (y/n)
- DRM_010: Have you ever smoked illicit drugs? (y/n)
 - Was this in the past 12 months? (y/n)
- DRM_020: Have you ever taken illicit drugs orally? (y/n)
 - Was this in the past 12 months? (y/n)
- DRM_030: Have you ever snorted or sniffed illicit drugs? (y/n)
 - Was this in the past 12 months? (y/n)
- DRM_045: Have you ever used a needle to inject or be injected with a drug not prescribed by a doctor? (y/n)
 - Was this in the past 12 months? (y/n)

Specifically, DRMDVLAY indicates whether the respondent has smoked illicit drugs, snorted or sniffed them, took them orally, or used a needle to inject or be injected with a drug not prescribed by a doctor in the past 12 months. Not stated responses were considered grounds for exclusion.

Primary Exposure Variable

The primary exposure variable chosen for this study was Social provisions scale - social integration (SPSDVINT). SPSPDVINT was chosen over Social Provisions overall scale (SPSPDVCON) because it isolated responses that focus on being part of a group, whereas SPSPDVCON included individual relationship

supports; some evidence in the literature review indicated that group belonging might more impactful than single trusting relationships, (Bartkowski, 2007). The SPSDVINT variable was also amalgamated from question responses to other variables:

- ADM_PRX: Health component completed by proxy (y/n)
- SPS_010: There are people who enjoy the same social activities I do (1,2,3,4)
 1. Strongly agree
 2. Agree
 3. Disagree
 4. Strongly disagree
- SPS_035: I feel part of a group of people who share my attitudes and beliefs (1,2,3,4)
 1. Strongly agree
 2. Agree
 3. Disagree
 4. Strongly disagree
- SPST010: Score calculation for SPS_010
- SPST035: Score calculation for SPS_035

Specifically, the SPSDVINT variable is used to measure the score of the respondent on the "Social Integration" sub-scale, with scores ranging from min (2) to max (8). A higher score reflects a higher level of perceived "Social Integration" which is defined as a sense of belonging to a group of friends.

Covariates

Similar to other ecological studies found in the literature review, the linear regression model was adjusted for potential confounders. Specifically, province of respondent, gender, age group (12-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80+), highest level of education attained, total household income, and cultural / racial background.

Analysis

We first conducted a thorough analysis of the selected variables using frequency distribution tables. Following this, we explored the associations between various socio-demographic predictors and Illicit Drug Use. This step involved calculating and reporting unadjusted odds ratios and their respective p-values. Subsequently, we analyzed the relationship between Social Integration (our primary exposure) and Illicit Drug Use (our outcome). Here, we reported odds ratios that were adjusted for other influencing factors, along with their p-values. Any p-value lower than 0.05 was considered a statistically significant association. All statistical analyses were performed using R Studio; the complete R code can be found in **Appendix A**.

3 | RESULTS

Data Analysis

This study observed 14,067 respondents with complete data out of the 109,659 surveyed population; **Table 1** shows the characteristics of this sample. The sample group originated from 3 provinces / territories of Canada, 82.9% of which came from Alberta. The slight majority of individuals, 30.7%, were between the ages of 20-39, with 40-59 being nearly tied at 30.4%. Amongst genders, the female demographic accounted for 53.7%, and 86% of respondents were caucasian. The majority of individuals achieved a post-secondary diploma or degree in their lifetime, 58.6%. Interestingly, the leading

demographic for total household income was above \$80,000 at 53.1%, with the second largest at only 14.4%. A collective 93% of sampled respondents had social integration ratings above “Medium” with only 2.4% below. Finally, 90.4% of sampled respondents reported no illicit drug use within the last 12 months.

The unadjusted associations between illicit drug use - 12 months and all other characteristics are displayed in **Table 2**. Interestingly, significant positive association ($p < 0.05$) was found with High (OR = 1.24, $p = 0.01$), Medium (OR = 1.76, $p = 0.003$), and Low (OR = 4.44, $p = 0.001$) levels of Social Integration. Among the provinces, illicit drug use was most strongly associated with the Yukon Territories (OR = 1.82, $p < 0.001$). Men were twice as likely than women to be associated with illicit drugs (OR = 2.01, $p < 0.001$), and ages 20-39 were by far the most positively associated among the groups (OR = 2.20, $p = 0.001$). A maximum education of Secondary School was positively associated with illicit drugs (OR = 1.47, $p = 0.058$), but not considered statistically significant. The \$20,000 to \$39,999 household income bracket was the only income bracket positively associated with illicit drugs (OR = 1.05, $p = 0.8$) but far from statistically significant, while \$80,000 or more was statistically less likely to be associated (OR = 0.53, $p = 0.003$). For racial background, non-white heritage was significantly less associated with illicit drugs than white demographics (OR = 0.21, $p < 0.001$).

Finally, **Table 3** shows the relationship between Social Integration and Illicit Drug Use - 12 months when adjusted for location, gender, age, education, income, and race. The only significant associations found were between Medium levels of Social Integration (OR = 1.65, 0.006) and Low levels of Social Integration (OR = 3.34, $p = 0.007$). Interestingly, the Very Low category was negatively associated with Illicit Drugs though not significantly (OR = 0.59, $p = 0.5$).

Table 1. Frequency Table: Study Observations by Variable

Province	Survey sample, n (%)	Weighted Population, n (%)	95% CI (Weighted Proportion)
Alberta	11663 (82.9)	3111199 (95.7)	95.5 - 96
Prince Edward Island	1675 (11.9)	116311 (3.6)	3.3 - 3.8
Yukon	729 (5.2)	22460 (0.7)	0.6 - 0.8
Age Group			
12-19	1415 (10.1)	321107 (9.9)	9.2 - 10.6
20-39	4325 (30.7)	1213848 (37.3)	36 - 38.7
40-59	4282 (30.4)	1084441 (33.4)	32 - 34.7
60-79	3450 (24.5)	561138 (17.3)	16.4 - 18.2
80+	595 (4.2)	69436 (2.1)	1.9 - 2.4
Gender			
Female	7553 (53.7)	1601897 (49.3)	47.9 - 50.6
Male	6514 (46.3)	1648073 (50.7)	49.4 - 52.1
Cultural or Racial Background			
White	12104 (86)	2547050 (78.4)	77.1 - 79.6
Non-white (Aboriginal or Other Visible Minority)	1963 (14)	702921 (21.6)	20.4 - 22.9
Highest Level Of Education			
Less than secondary school	2683 (19.1)	509052 (15.7)	14.8 - 16.6
Secondary school	3135 (22.3)	738190 (22.7)	21.6 - 23.8
Post-secondary	8249 (58.6)	2002728 (61.6)	60.3 - 62.9
Total Household Income			
No income or less than \$20,000	822 (5.8)	111972 (3.4)	3.1 - 3.8
\$20,000 to \$39,999	1895 (13.5)	299478 (9.2)	8.5 - 9.9
\$40,000 to \$59,999	2032 (14.4)	386102 (11.9)	11.1 - 12.7
\$60,000 to \$79,999	1843 (13.1)	398726 (12.3)	11.4 - 13.1
\$80,000 or more	7475 (53.1)	2053691 (63.2)	61.9 - 64.5
Social Integration			
Very High	5295 (37.6)	1236457 (38)	36.7 - 39.4
High	2830 (20.1)	665251 (20.5)	19.4 - 21.6
Slightly High	4960 (35.3)	1145570 (35.2)	33.9 - 36.5
Medium	648 (4.6)	132529 (4.1)	3.6 - 4.6
Slightly Low	255 (1.8)	57951 (1.8)	1.4 - 2.2
Low	55 (0.4)	8253 (0.3)	0.2 - 0.3
Very Low	24 (0.2)	3959 (0.1)	0.1 - 0.2
Any Illicit Drug Use – 12 months			
No	12715 (90.4)	2929078 (90.1)	89.3 - 90.9
Yes	1352 (9.6)	320892 (9.9)	9.1 - 10.7

Table 2. Unadjusted Odds Ratios between Illicit Drug Use - 12 months and All Characteristics

Characteristic	OR¹	95% CI¹	p-value
Social Integration			
Very High	—	—	
High	1.24	0.96, 1.61	0.10
Slightly High	1.05	0.83, 1.32	0.7
Medium	1.76	1.21, 2.57	0.003
Slightly Low	1.27	0.68, 2.35	0.5
Low	4.44	1.78, 11.1	0.001
Very Low	0.61	0.12, 3.18	0.6
Province			
Alberta	—	—	
Prince Edward Island	0.90	0.70, 1.17	0.4
Yukon	1.82	1.35, 2.45	<0.001
Gender			
Female	—	—	
Male	2.01	1.66, 2.44	<0.001
Age Group			
12-19	—	—	
20-39	2.20	1.35, 3.56	0.001
40-59	0.99	0.59, 1.63	>0.9
60-79	0.31	0.18, 0.54	<0.001
80+	0.01	0.00, 0.10	<0.001
Highest Level Of Education			
Less than secondary school	—	—	
Secondary school	1.47	0.99, 2.19	0.058
Post-secondary diploma or degree	0.94	0.64, 1.39	0.8

¹ OR = Odds Ratio, CI = Confidence Interval

Characteristic	OR ¹	95% CI ¹	p-value
Total Household Income			
No income or less than \$20,000	—	—	
\$20,000 to \$39,999	1.05	0.65, 1.69	0.8
\$40,000 to \$59,999	0.87	0.56, 1.36	0.5
\$60,000 to \$79,999	0.74	0.47, 1.16	0.2
\$80,000 or more	0.53	0.35, 0.80	0.003
Cultural or Racial Background			
White	—	—	
Non-white (Aboriginal or Other Visible Minority)	0.21	0.14, 0.30	<0.001
¹ OR = Odds Ratio, CI = Confidence Interval			

Table 3. Adjusted Odds Ratios between Illicit Drug Use - 12 months and Social Integration

Characteristic	OR ¹	95% CI ¹	p-value
Social Integration			
Very High	—	—	
High	1.19	0.92, 1.53	0.2
Slightly High	0.92	0.74, 1.13	0.4
Medium	1.65	1.16, 2.37	0.006
Slightly Low	1.18	0.69, 2.03	0.5
Low	3.45	1.40, 8.47	0.007
Very Low	0.59	0.15, 2.41	0.5
¹ OR = Odds Ratio, CI = Confidence Interval			

Literature Review

A public search was performed on Google Scholar with keywords “social capital drug” with 2,790,000 results. A previous search for “illicit drug use social integration” yielded too many results with few citations. Only entries on the first page with relevant titles, citations greater than 100, and published after the year 2000 were considered for review; 4 total, 6 rejected. If the scope of a paper was too narrow, such as examining friendships among only drug addicts instead of a wider population, it was also rejected. Full access to paid papers was provided by a public access academic paper database (Sci-Hub, 2011). The remaining literature was examined for incidence rates, odds ratios, absolute risk, relative risk, attributable risk, and other relevant statistics. The excluded papers and justification are as follows:

- (Granfield, R., et al., 2001) — narrow scope
- (May, C. K., 2008) — too few citations
- (Lovell, A. M., 2002) — narrow scope
- (Jonas, A. B., et al., 2012) — narrow scope
- (Reynoso-Vallejo, H, 2011) — too few citations
- (Pourramazani, N., et al., 2019) — too few citations

An ecological temporal trends study by Zoorob and Salemi (2017) investigated the relationship between social capital and age-adjusted drug overdose mortality in U.S counties from 1999 to 2014. They found that overdose fatalities were inversely related with high levels of social capital and gave statistically significant OR ratios; the highest quintile social capital had 87% lower rates of mortality relative to the lowest after adjusting for racial background, household income, education, and rural / urban status. They used the density of civic associations and non-profit organizations, the percentage of county adults who voted in elections, and the county’s response rate to the census as a ‘group measure’ of social capital, as per suggestion by another source, (Rupasingha, et al., 2006). What was interesting about this paper was this means of measuring social capital; our interpretation suggested that gathering places and social groups may be more influential than single relationships when it comes to illicit drug use. Furthermore, the paper provided a good starting place for the adjustment characteristics.

The second paper explored the relationship between adolescents' perceptions of neighborhood disorganization, social capital, and their alcohol and drug (AOD) use, AOD dependence, and access to AOD treatment, (Winstanley, et al., 2008). The study utilizes data from the 1999 and 2000 National Survey on Drug Use and Health (NSDUH), focusing on youth aged 12-17 years. High levels of social capital were negatively associated with AOD use (OR = 0.79, $p < 0.01$). Similar to the previous paper, these researchers focused on community group organizations and made similar socio-economic adjustments.

A cross-sectional study on social capital and AOD in Sweden was the third paper included for this literature review, (Aslund, C., et al., 2013). The researchers selected a population of 7757 students aged 13-18 and measured social capital and AOD from the results of a questionnaire survey across 57 schools. Social capital was measured differently in this study using instead questions about neighborhood social integration, trust, and safety. They found that individuals with low neighborhood social capital and low social trust had significantly increased adjusted OR ratios across alcohol (OR = 1.57, $p < 0.001$), smoking (OR = 3.12, $p < 0.001$), and illicit drugs (OR = 2.55, $p < 0.001$). The methods for measuring social capital in the study were unfortunately divergent from the previous two papers, but nonetheless supported their findings.

Religious institutions have long been associated with lower rates of addiction, but whether this

relationship can be attributed to the social networks provided by these organizations, or to trust in a higher power, has long been in question. The last paper included in the literature review conceptualized attendance to any gatherings as a form of social capital, religious or not, and used cross-sectional data on high school seniors to sample social integration, alcohol and drug use behavior, religious beliefs and attitudes, and secular forms of civic engagement, (Bartkowski, et al., 2007). Controlling for birth cohort, race, gender, family structure, mother's education, mother's employment status, region, and urban vs rural, they found that internalization of religious norms does not produce consistent protection against drug use (OR = 0.026, $p > 0.05$), nor does a general trust in God (OR = 0.045, $p > 0.05$), but religious network integration does (OR = 0.095, $p < 0.05$) across all substances. Specifically, a sense of trust in people in general was statistically significant (OR = 0.182, $p < 0.01$) while trust in God was not—I thank Galileo that I may write this without a charge of heresy. Importantly, this study isolated the relationship between social integration and illicit drug use and provided sound covariates for adjustment.

4 | DISCUSSION

Limitations

The study's primary objective was to examine the relationship between social integration and illicit drug use. In achieving this, we uncovered several key insights, albeit with inherent limitations and biases. Regarding internal and external validity, the cross-sectional design of the study only provides a snapshot of the relationship between social integration and illicit drug use within the Canadian population and is not able to establish causality. Although we observed associations, it remains unclear whether low social integration leads to increased drug use or if drug use results in diminished social integration, though other studies do support the causative temporal relationship, (Buchanan, 2004; Silvia, 1990).

This study's findings align partially with existing literature suggesting a link between social integration and drug use. However, some discrepancies were noted, particularly in the strength and direction of associations. This could be attributed to differences in population demographics, geographical locations, or measurement tools for social integration.

Potential Bias

In conducting this cross-sectional study, several inherent biases were identified, each contributing to potential limitations in the validity and generalizability of the findings. Understanding and acknowledging these biases is essential for a nuanced interpretation of the results and their implications.

Sampling bias is evident in the study, stemming from the use of the Canadian Community Health Survey (CCHS) data. This survey excludes key demographic groups such as residents of First Nations Reserves and Crown Lands, individuals in institutions, active Canadian Forces members, youths in foster care, and residents of certain isolated regions. This exclusion results in a sample that may not entirely reflect the broader Canadian population, potentially skewing the understanding of the relationship between social integration and illicit drug use across all societal segments.

Nonresponse bias is another significant concern, highlighted by the substantial number of valid skips observed for questions related to social integration. This suggests that a notable portion of respondents chose not to answer these critical questions. When nonresponse is tied to the variables under study, in this case social integration and illicit drug use, it can lead to biased results that may

not accurately represent the true nature of these relationships.

The study also faces information bias due to the reliance on self-reported data, particularly for sensitive topics like drug use and social integration. The accuracy of such data is often compromised by underreporting or overreporting, influenced by factors like social desirability and recall bias. This can lead to misrepresentation of the true extent or nature of the drug use and social integration within the surveyed population.

Despite efforts to adjust for known confounders, confounding bias remains a potential issue. While the study accounts for variables such as province, gender, age, education, income, and race, other critical factors like mental health status, family history, and nuanced socioeconomic elements might still exert an unrecognized influence on the outcomes related to social integration and drug use, though mental health was considered a mediating variable in this case between exposure and outcome. Survivorship bias may also be present, particularly considering the high incidence of opioid-related fatalities noted in the study period. If the dataset fails to account adequately for individuals who have succumbed to drug overdose, this could result in an underestimation of the actual prevalence of drug use within the population. The risk of ecological fallacy also arises when drawing conclusions about individual behaviors based on aggregated data. Since the study spans various provinces and territories, there's a risk of inaccuracies in inferring individual-level behaviors from regional-level trends.

In the Literature Review process, a form of selection bias may have occurred. The criteria for paper selection, based on citation count and publication year, could potentially exclude relevant studies that are either less cited or more recent, thereby limiting the breadth of perspectives and findings reviewed. Lastly, publication bias in the literature review phase is a concern. There tends to be a propensity for studies with significant findings to be published more frequently than those yielding null or insignificant results. This could skew the overall understanding of the topic as gleaned from the existing literature.

In summary, while this study provides valuable insights into the relationship between social integration and illicit drug use, it is important to consider these biases in the interpretation of the findings. These limitations highlight the need for further research that can mitigate these biases to gain a better understanding of this complex relationship.

5 | CONCLUSION

This study suggests a positive association between low social integration and illicit drug use with statistical significance. However, due to the cross-sectional nature of the study, it falls short of establishing a clear causal relationship. The observed relationships illustrate the complex factors between drug use and the necessity for multifaceted public health interventions, including social provisions.

Future steps should include case-control and cohort studies to better understand the temporal dynamics of social integration and drug use. Additionally, a more inclusive approach to sampling, encompassing a broader range of social and demographic groups, would provide a more comprehensive understanding of these relationships. Finally, improving the sensitivity and specificity of measurement tools for social integration and drug use would enhance the quality of data and the validity of findings.

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