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Prevalence and Correlates of 12-Month Prescription Drug Misuse in Alberta

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Objective: We examined the prevalence and correlates of prescription drug misuse (PDM) in a population-based sample of adults from Alberta.

Methods: Data were collected from 3511 adults in Alberta aged 18 years and older in 2002 using a computer-aided telephone survey; the survey response rate was 57.4%.

Results: The prevalence of 12-month PDM in Alberta was 8.2% in 2002. Opiates were the most frequently misused drug class, followed by sedatives, stimulants, and tranquilizers. Current disability was particularly associated with PDM. Odds of PDM were also elevated among adult students and adults with a high school diploma relative to adults with a post-secondary degree. Past-year problem gambling, illicit drug use, and alcohol use and dependence were each associated with PDM, while past-year binge drinking and daily smoking were not.

Conclusions: Findings suggest PDM was an important public health concern in Alberta in 2002. Estimates suggest prescription use and misuse have increased substantially in Canada since that time. There is an urgent need for an ongoing assessment of this evolving problem so that effective prevention and therapeutic strategies can be developed.

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Clinical Implications

- In 2002, 8200 adults per 100 000 living in Alberta misused 1 or more prescription drugs in the preceding 12 months. Estimates suggest PDM has increased since that time.
- Disabled status was the strongest overall predictor of past-year PDM.
- Problem gambling in the preceding 12 months was the strongest addiction-related predictor of PDM, followed by 12-month cocaine or crack use and 12-month alcohol dependence.

Limitations

- The study design was cross-sectional.
- Data on prescription drug use and motives for misuse were not collected.
- The sample size precluded a detailed analyses of prescription misuse by drug class.

Key Words: *prescription drug misuse, problem gambling, illicit drug use, alcohol dependence, smoking, population-based adults, Canada*

Increases in the production and use of psychoactive pharmaceutical drugs in North America have led to concerns about PDM and its consequences including injury, dependence, mood changes, fatal and nonfatal overdoses, cardiac arrhythmias, and respiratory depression.¹⁻⁵ Research suggests the most abused pharmaceutical preparations are those most potent and most available in the licit market.⁶⁻¹⁰ In the United States, PDM has risen steadily since the mid-1990s to become the second most abused category of psychoactive drugs after cannabis.^{9,11,12} People at greatest risk may be those who engage in other addictive behaviours. Researchers have just begun to describe the co-occurrence of PDM and other substance use problems, while potential associations between PDM and problem gambling remain virtually unknown.^{2,12-14}

Canada is the world's top per capita consumer of several high-potency opioids (for example, hydromorphone) and among the heaviest consumers of prescription medications in the world.⁹ Nevertheless to date, little epidemiologic information is available about the misuse of psychoactive prescription drugs in this country despite calls for a systematic assessment of this evolving problem.¹⁵ Findings released from the Canadian Alcohol and Drug Use Monitoring Survey indicate that of the 28.4% of Canadians who used a psychoactive pharmaceutical drug in 2008, only 2% did so to get high.¹⁶ There are additional reasons prescription drugs may be misused, including therapeutic effects (for example, to relieve pain or to sleep), to counteract the effects of other drugs, or to experiment; all of which may also be of clinical significance given they fall outside medically sanctioned use and may endanger public health. In our study, PDM was defined by prescription status (that is, medically sanctioned, compared with unsanctioned, use). Specifically, PDM was defined as use in larger amounts than prescribed, for a longer period than prescribed, or use without a physician's prescription. This definition casts a wider net, documenting the prevalence of PDM in the population as a whole, irrespective of motive. The goals of our study were to describe the prevalence of 12-month PDM in a population-based Canadian sample and to examine the extent to which sociodemographic variables and other addictive behaviours were associated with this problem.

Method

Sample

A computer-aided telephone interview was administered to a random, representative sample of adults ($n = 3511$). Adults

residing in private dwellings in Alberta were the target population. People living in group quarters (for example, rooming houses) and First Nations communities were excluded. Data were collected over a 2-month period in 2002. To participate, a respondent had to be a resident of the number called, be aged 18 years or older, and have the next birthday in the household. Households were selected using telephone numbers generated using random digit dialing. This process resulted in 6119 eligible screened numbers (that is, numbers that were not out of service, business, or fax numbers) from which 3511 respondents completed the full survey, 2553 refused, and 55 did not complete the survey in full, resulting in a response rate of 57.4%. Calls were made across a range of times to reduce the possibility of selection bias by employment status (9 AM to 9 PM on weekdays, 10 AM to 4 PM on Saturdays, and 2 PM to 8 PM on Sundays). Each household was contacted a maximum of 5 times. Sampling was stratified by region, with one-third drawn from Edmonton, Calgary, and the rest of the province. The mean interview length was 15 minutes. Our study received approval from the University of Alberta's Human Research Ethics Board and written informed consent was obtained from all participants. Data were weighted to correct for slight differences in the age and gender profile of respondents by region, compared with the Alberta 2001 census. All analyses were conducted on weighted data. Table 1 provides a description of the sample.

Measures

Prescription Drug Misuse

Four questions assessed PDM. Respondents were asked whether they had misused prescription opioids, sedatives, tranquilizers, or amphetamines in the 12 months preceding the interview, based on the following definition: use in larger amounts than prescribed, for a longer period than prescribed, or use without a physician's prescription. Respondents who indicated that they had misused prescriptions in a specific drug class were asked to list the prescriptions they had misused in the past year.

Illicit Drug Use and Dependence

Additional items assessed use of cannabis, illicit amphetamines, hallucinogens, solvents, cocaine or crack, and heroin in the preceding 12 months. The 7-item CIDI-SF was used to assess drug dependence.^{17,18} Respondents met criteria for dependence if they scored positively on 4 or more items. Respondents with no past-year drug use were coded noncases. Scores ranged from 0 to 7 (mean 0.18, SD 0.81). The internal consistency of scores was good ($\alpha = 0.85$).

Alcohol Use and Dependence

Three alcohol variables were examined: 12-month alcohol use (yes or no), frequent binge drinking (yes or no), and alcohol dependence. Consistent with other studies, frequent binge drinkers were defined as those who reported 5 or more drinks on one occasion once a month or more in the preceding year.¹⁹⁻²¹ The 7-item CIDI-SF for alcohol was used to assess alcohol dependence.^{17,21} Respondents met criteria for dependence if

Abbreviations used in this article

CIDI-SF	Composite International Diagnostic Interview—Short Form
NESARC	National Epidemiologic Survey on Alcohol and Related Conditions
PGSI	Problem Gambling Severity Index
PDM	prescription drug misuse
VIF	variance inflation factors

Table 1 Description of the sample and unadjusted prevalence of 12-month PDM by sociodemographic characteristics

Characteristic	Total unweighted n (weighted %)	Past-year PDM n (weighted %)
Total sample	3511 (100)	291 (8.2)
Sex		
Male	1603 (49.4)	133 (8.2)
Female	1908 (50.6)	158 (8.2)
Age, years		
18–24	459 (13.5)	70 (14.8)
25–34	698 (19.7)	59 (8.3)
35–44	873 (24.0)	70 (7.9)
45–54	660 (18.4)	43 (6.4)
≥55	801 (24.4)	46 (5.8)
Marital status		
Married or cohabiting	2074 (59.7)	106 (12.6)
Not currently married	582 (16.4)	43 (7.0)
Never married	854 (23.9)	142 (6.7)
Education		
Some high school	474 (14.1)	35 (7.2)
High school diploma	729 (20.9)	86 (11.6)
Some university or college	686 (19.4)	67 (9.8)
University or college degree	1617 (45.7)	102 (6.1)
Employment		
Employed full- or part-time	2610 (73.8)	183 (7.5)
Student	253 (6.9)	38 (15.2)
Homemaker	251 (6.7)	19 (7.7)
Retired	477 (14.6)	26 (5.9)
Unemployed	105 (3.1)	11 (11.1)
Disabled	62 (1.6)	13 (21.4)
Income, \$		
<20 000	425 (13.9)	47 (11.0)
20 000–39 999	788 (25.4)	66 (7.8)
40 000–59 999	693 (22.7)	58 (8.2)
60 000–79 999	455 (14.6)	41 (8.8)
80 000–99 999	262 (8.3)	22 (8.1)
≥100 000	453 (15.0)	37 (8.0)
Region		
Edmonton	1171 (28.7)	117 (9.7)
Calgary	1172 (32.5)	93 (7.7)
Rest of province	1168 (38.8)	81 (7.4)

they scored positively on 4 or more items, and those with no past-year use were coded noncases. Scores ranged from 0 to 7 (mean 0.54, SD 1.12). Internal consistency of scores was acceptable ($\alpha = 0.68$).

Smoking

Respondents were asked how frequently they smoked cigarettes in the past 30 days. Respondents who selected every day were coded daily smokers and those who selected almost every day, some days, or half days were coded nondaily smokers. Respondents who selected not at all were coded nonsmokers.

Problem Gambling

Problem gambling was assessed using the PGSI; a 9-item subset of the Canadian Problem Gambling Index that measures problem gambling in population-based samples.²² Problem gambling was defined by scores of 3 or more on the PGSI, and at-risk gambling by scores of 1 to 2. Respondents reporting no gambling in the past year were coded noncases. In our study, PGSI scores ranged from 0 to 27 (mean 0.43, SD 2.12) and internal consistency was excellent ($\alpha = 0.90$).

Demographic Covariates

Sex and age were assessed across 5 categories, marital status across 3 categories, education across 4 categories, employment and income across 6 categories, and region across 3 categories.

Data Analyses

The point prevalence of PDM was measured by calculating the proportion of the total sample who reported past-year PDM at a single point in 2002. All measures of prevalence were calculated using the total sample in keeping with the standard definition of prevalence in the epidemiologic literature^{23,24} and to ensure an accurate measure of disease burden in Alberta for the specified time point.

The degree to which 2 sets of variables (sociodemographics and addictive behaviours) were correlated with PDM was examined using logistic regression, with a dichotomous measure of PDM as the outcome and 95% confidence intervals. First, a hierarchical logistic regression model was estimated for sociodemographic variables. Significant variables were retained, as were 3 nonsignificant variables (age, sex, and region) for comparison with other studies. Next, addictive behaviours were entered simultaneously as one block, with the exception of alcohol variables. Alcohol predictors were then entered in separate blocks to accommodate the hierarchical relation between them (that is, to binge drink, alcohol must be consumed, and binge drinking typically occurs before a person becomes alcohol dependent). Multicollinearity between independent variables was examined using VIFs. All potential interactions were tested using log-likelihood statistics. Missing data were handled using listwise deletion. All analyses were run using SPSS software, version 17.0 (SPSS Inc, Chicago IL).²⁵

Results

Prevalence

The unadjusted 12-month prevalence of PDM was 8.6%. To reduce misclassification error, PDM cases were asked to list prescriptions misused. Thirteen cases reported misuse of over-the-counter drugs exclusively (for example, Nytol and caffeine pills) and were recoded noncases. The corrected prevalence of PDM was 8.2% overall; and 4.9%, 2.6%, 1.3%, and 0.8% for opiates, sedatives, amphetamines, and tranquilizers, respectively. Among PDMs, 86.3% misused prescriptions across 1 drug class, 10.9% across 2 drug classes, and 2.8% across 3 or more drug classes. Table 1 presents the prevalence of PDM by sociodemographic subgroup and Table 2 by subgroups reporting various forms of addictive behaviour. Although 16.2% of PDMs met criteria for drug dependence, it could not be discerned whether these people were illicit or prescription drug dependent from the data collected. Almost one-half of respondents who met criteria for drug dependence (48.9%) reported PDM in the past year, compared with 7.0% of respondents who were not drug dependent.

Correlates of Prescription Drug Misuse

Table 3 presents odds of 12-month PDM by sociodemographic subgroup using adjusted odds ratios and 95% confidence intervals. No 2-way interactions were significant. The odds of PDM were statistically similar across regions of Alberta, men and women, and a range of household income brackets. PDM odds were greater among young adults in models adjusted for sociodemographic characteristics. However, other addictive behaviours were also more prevalent among young adults, compared with adults aged 25 years and older (illicit drug use: 34.3%, compared with 9.3%; alcohol dependence: 10.6%, compared with 2.0%; and problem gambling: 6.6%, compared with 4.3%). Young adults were at no greater risk for PDM than older adults once other addictive behaviours were controlled in the model. This was also true for never-married respondents. In contrast, even in fully controlled models, respondents who reported their occupational status as disabled had 4 times greater odds of PDM than respondents employed full- or part-time. The odds of PDM also remained elevated for respondents with a high school diploma, relative to those with a post-secondary degree, and there was a trend toward significantly higher odds among respondents with some post-secondary training that may prove significant in larger samples. Interestingly, student status itself was a significant predictor of PDM in fully controlled models. Models controlling for sociodemographics alone underestimated the strength of this association. Adults who recorded their primary occupation as student had almost 2 times greater odds of PDM than adults employed full- or part-time; 70% of these students were young adults (mean 24 years, SD 7.8, range 18 to 55 years).

Table 4 presents the odds of PDM by subgroups reporting various addictive behaviours. There was no evidence of multicollinearity across these variables (VIF 1.05 to 1.72) and no 2-way interactions were significant. All forms of addictive behaviour were positively associated with PDM in models

Table 2 Unadjusted prevalence of 12-month PDM among respondents meeting criteria for 12-month addictive behaviours

12-month addictive behaviour	Total unweighted <i>n</i> (weighted %)	PDM prevalence <i>n</i> (weighted %)
Alcohol		
Alcohol use	2923 (83.2)	267 (9.0)
≥Monthly binge drinking	506 (14.4)	73 (14.5)
Alcohol dependent	108 (3.2)	33 (31.2)
Drugs		
Any illicit drug use ^a	451 (12.6)	98 (21.7)
Cannabis use	436 (12.1)	91 (20.7)
Cocaine or crack use	59 (1.7)	25 (40.0)
Hallucinogen use	65 (1.9)	23 (34.8)
Illicit amphetamines	9 (0.2)	4 (42.9)
Solvents	18 (0.5)	10 (55.6)
Heroin	3 (0.1)	3 (100.0)
Drug dependent	94 (2.7)	45 (48.9)
Smoking		
Nondaily smoker	198 (5.8)	26 (11.9)
Daily smoker	758 (21.7)	85 (10.8)
Gambling		
At-risk gambling	220 (6.2)	27 (12.0)
Problem gambling	167 (4.7)	36 (21.5)

^aPast-year use of cannabis, cocaine or crack, hallucinogens, illicit amphetamines, solvents, or heroin

adjusted for sociodemographics. There were striking reductions in the magnitude and significance of these associations once confounding between PDM and other addictive behaviours was controlled. In a fully controlled model, smoking was no longer associated with PDM suggesting this relation was based on associations between smoking and other addictive problems rather than PDM itself. In contrast, even in fully controlled models, problem gamblers had almost 3 times greater odds of PDM than nonproblem gamblers. Comparatively, the odds of PDM among problem gamblers was higher than any other addictive correlate measured in our study. Categories of drugs most frequently misused by problem gamblers matched that of the general population, but prevalence was considerably higher in each drug class (12.8% opiates, 8.5% sedatives, 5.5% stimulants, and 1.8% tranquilizers), odds of PDM were also higher among people using illicit drugs. Associations between PDM and cocaine use were stronger than cannabis or hallucinogen use (Table 4). Respondents who engaged in both PDM and illicit drug use in the past year ($n = 98$) were more likely to misuse prescriptions across multiple drug categories than respondents who misused prescription drugs alone (24.2% compared with 8.4% [$\chi^2 = 13.37$, $df = 1$, $P < 0.001$]).

Overestimation of the association between binge drinking and PDM in models controlling for sociodemographics may have been due in part to moderately sized correlations between binge drinking and illicit drug use ($\phi = 0.35$, $P < 0.001$). Alcohol

Table 3 AORs of 12-month PDM by sociodemographic characteristics^a

Characteristic	AOR ^b (95% CI)	AOR ^c (95% CI)
Sex		
Male	1.09 (0.84–1.41)	0.91 (0.69–1.21)
Female	1.0 (Reference)	1.0 (Reference)
Age, years		
18–24	1.81 (1.01–3.29) ^a	1.12 (0.59–2.14)
25–34	1.37 (0.80–2.35)	1.08 (0.61–1.91)
35–44	1.36 (0.82–2.27)	1.21 (0.71–2.07)
45–54	1.06 (0.62–1.82)	1.00 (0.57–1.76)
≥55	1.0 (Reference)	1.0 (Reference)
Marital Status		
Married or cohabiting	1.0 (Reference)	1.0 (Reference)
Not currently married	1.05 (0.71–1.54)	0.94 (0.63–1.40)
Never married	1.40 (1.01–1.97) ^a	1.02 (0.70–1.48)
Education		
Some high school	1.13 (0.74–1.73)	0.93 (0.59–1.46)
High school diploma	1.84 (1.34–2.53) ^a	1.70 (1.22–2.38) ^a
Some university or college	1.40 (1.01–1.98) ^a	1.26 (0.88–1.81)
University or college degree	1.0 (Reference)	1.0 (Reference)
Employment		
Employed full- or part-time	1.0 (Reference)	1.0 (Reference)
Student	1.35 (0.85–2.13)	1.86 (1.14–3.05) ^a
Homemaker	1.17 (0.69–2.03)	1.36 (0.78–2.35)
Retired	1.03 (0.58–1.86)	1.26 (0.69–2.31)
Unemployed	1.39 (0.74–2.60)	1.50 (0.77–2.92)
Disabled	3.99 (2.01–7.94) ^a	4.01 (1.96–8.23) ^a
Region		
Edmonton	1.32 (0.97–1.77)	1.27 (0.93–1.74)
Calgary	1.05 (0.77–1.42)	0.98 (0.71–1.36)
Rest of province	1.0 (Reference)	1.0 (Reference)
^a Significant ORs		
^b Adjusted for sex, age, marital status, education, employment, and region		
^c Adjusted for past-year alcohol use, alcohol dependence, smoking, problem gambling, past-year cannabis use, cocaine or crack use, and hallucinogen use		

use and alcohol dependence remained important predictors of PDM in fully controlled models. The odds of PDM for alcohol use without dependence was 1.74, while the odds for alcohol use with dependence was estimated at $1.74 \times 2.20 = 3.94$. The misuse of 2 or more classes of drugs was common among respondents with alcohol dependence who misused prescription drugs. Almost one-half (45.7%) of respondents with alcohol dependence misused prescriptions across 2 classes, compared with 9.2% of respondents who misused prescription drugs but did not have alcohol dependence ($\chi^2 = 34.85$, $df = 1$, $P < 0.001$).

Overall, the prevalence of PDM among respondents meeting criteria for 1 or more of problem gambling, alcohol dependence, or illicit drug use was more than 3 times that of respondents without these addictive problems (18.8%, compared with

6.0%). Conversely, 43.7% of all respondents who misused prescription drugs met criteria for alcohol dependence, problem gambling, and (or) had used illicit drugs in the past year. One-third of all respondents who misused prescription drugs had used illicit drugs in the past year, 12.4% were problem gamblers, and 12.0% were alcohol dependent.

Discussion

Our study examined the prevalence and correlates of PDM within a population-based sample of adults. Results indicate that in 2002, 8.2% or 8200 adults per 100 000 in Alberta had misused 1 or more prescription opiates, sedatives, amphetamines, or tranquilizers in the preceding 12 months. The overall prevalence of past-year opioid, sedative or tranquilizer, and stimulant misuse was 4.9%, 3.2%, and 0.8%, respectively. Among PDMs, 16.2% of respondents met criteria for illicit and (or) prescription drug dependence, compared with less than 1% of non-PDM respondents. Subpopulations at particular risk for PDM included disabled adults, adults with a high school diploma who had not pursued post-secondary studies, and adult students. Although the odds of PDM were particularly high among disabled adults, this finding was not surprising given they may use psychoactive prescriptions more frequently than the general population (for example, to control pain).²⁶ Disabled adults are also more likely to have underlying comorbidities such as depression that further increase the potential for PDM.^{27,28} Targeted interventions aimed at reducing PDM among disabled adults should not hinder the necessary medical management of pain in this subpopulation. While high school graduates were 70% more likely to misuse prescriptions than university graduates, high school dropouts displayed no greater odds for this problem. It may be that adults who have not completed high school are less likely to visit a doctor, request or receive medications, or less likely to report PDM than high school graduates. Given the monotonic associations between education and PDM documented in US studies^{29,30} further research is needed in Canada before more definitive conclusions can be made.

Confounding by other addictive behaviours masked higher odds of PDM among adult students. This association appears due in part to unique factors underlying the etiology of PDM among students, rather than factors typically shared by this subgroup, given these were controlled in the model (for example, young age or illicit drug use). There is evidence that US college students misuse prescriptions to relieve stress and improve concentration while studying, particularly in highly competitive academic environments.^{31–33} Further research is needed to examine motives for PDM among Canadian students.

Contrary to previous studies, age, marital status, and sex were not significant predictors of PDM.^{12,14,30,33,34} While young adults and never-married respondents displayed greater odds of PDM in initial models, these associations were no longer significant after other addictive behaviours were controlled, suggesting young adults and never-married respondents may have a higher

propensity for addictive behaviours correlated with PDM, but no greater odds of PDM itself. As well, men had no greater odds of PDM than women. Using a definition of PDM matching our study, data derived from the 2001–2002 US NESARC study found lifetime PDM was more common among men across all categories of psychoactive prescription drugs.¹³ Data from the 2003 US National Survey on Drug Use and Health found 12 month nonmedical opioid use (that is, without a prescription or for the feeling it caused) was also more common among men, while women were equally likely to misuse sedatives, tranquilizers, or stimulants.³⁵ Further research is needed to gain a better understanding of PDM by sex in Canada, including experiences that contribute to this problem across the life course. Clinical studies suggest affective stress and a history of sexual or physical abuse are risk factors for prescription opioid misuse in women, while criminal behaviour and associating with substance abusers are risk factors for men.^{36–38} A population-based assessment of factors that precede PDM in Canada would make a significant contribution to our understanding of this problem.

Our study was among the first to examine associations between problem gambling and PDM in a population-based sample. The odds of PDM among problem gamblers was almost 3 times greater than nonproblem gamblers. Almost one-quarter of problem gamblers who misused prescriptions did so over 2 or more drug categories, increasing the likelihood for adverse consequences. Problem gamblers may be misusing prescriptions to cope with gambling losses, deal with gambling urges, to stay awake while gambling, or they may engage in both PDM and gambling to escape other life stressors. Further research is needed to shed more light on motives for PDM among problem gamblers.

While the NESARC study found lifetime smoking and lifetime PDM were associated in models adjusted for sociodemographics,¹³ our study found additional control for other addictive behaviours negates this relation for 12-month behaviour. Findings suggest any association between smoking and PDM was a product of strong relations between smoking and other addictive behaviours rather than PDM itself. Future studies that separate PDM by motive (for example, to relieve pain or to get high) are needed to understand this relation in a more detailed way.

Despite the significant risk to increased morbidity and mortality, studies suggest the substance most frequently used in combination with prescription drugs is alcohol.³⁹ Our study found alcohol use was a risk factor for PDM, but this association was stronger for alcohol dependence than alcohol use alone. PDM among alcohol-dependent respondents frequently involved misuse across multiple prescription drug categories, increasing the risk for adverse consequences. Binge drinking, in contrast, did not increase the odds of PDM in fully controlled models. Similar to young adults and unmarried respondents, binge drinkers appeared to have a propensity for at-risk addictive behaviours

Table 4 AORs of 12-month PDM by comorbid addictive behaviour

12-month addictive behaviour	AOR ^a (95% CI)	AOR ^b (95% CI)
Alcohol use		
No	1.0 (Reference)	1.0 (Reference)
Yes	2.22 (1.42–3.47) ^c	1.81 (1.15–2.86) ^c
≥Monthly binge drinking		
No	1.0 (Reference)	1.0 (Reference)
Yes	1.79 (1.30–2.47) ^c	0.89 (0.60–1.32)
Alcohol dependence		
No	1.0 (Reference)	1.0 (Reference)
Yes	4.29 (2.72–6.77) ^c	2.19 (1.28–3.74) ^c
Cannabis use		
No	1.0 (Reference)	1.0 (Reference)
Yes	3.15 (2.30–4.32) ^c	2.02 (1.39–2.94) ^c
Cocaine or crack use		
No	1.0 (Reference)	1.0 (Reference)
Yes	5.67 (3.20–10.05) ^c	2.71 (1.42–5.16) ^c
Hallucinogen use		
No	1.0 (Reference)	1.0 (Reference)
Yes	4.47 (2.53–7.91) ^c	1.91 (1.01–3.63) ^c
Smoking		
None	1.0 (Reference)	1.0 (Reference)
Nondaily smoker	1.55 (0.98–2.47)	1.04 (0.63–1.72)
Daily smoker	1.43 (1.06–1.91) ^c	0.95 (0.69–1.32)
Gambling		
Nonproblem gambler	1.0 (Reference)	1.0 (Reference)
At-risk gambler	1.55 (0.99–2.41)	1.53 (0.96–2.43)
Problem gambler	3.24 (2.15–4.88) ^c	2.92 (1.88–4.53) ^c
^a Adjusted for sex, age, marital status, education, employment, and region		
^b Adjusted for past-year alcohol use, alcohol dependence, smoking, problem gambling, past-year cannabis use, cocaine or crack use, and hallucinogen use		
^c Significant ORs		

highly correlated with PDM (for example, illicit drug use) rather than a specific proclivity for PDM itself.

Consistent with previous studies, illicit drug use was highly associated with PDM.^{33,35,40} Almost one-quarter of respondents who used illicit drugs in the past year had also misused prescriptions in that time period. Associations between PDM and cocaine or crack use were stronger than cannabis or hallucinogen use.

More generally, many people who engage in addictive behaviours do so in complex ways that amplify the likelihood of PDM beyond the single odds ratios presented here. For example, single odds ratios do not take into account that most

adults who use cannabis also use alcohol, amplifying the true odds of PDM among most cannabis users to $2.02 \times 1.81 = 3.66$. Similarly, cocaine or crack use in the past year without cannabis and alcohol use in the past year is rare, amplifying the odds of PDM for most cocaine or crack users to $2.71 \times 2.02 \times 1.81 = 9.91$.

Our study had several limitations. Information about prescription drug use, motives for misuse, prescription drug dependence, and correlates of PDM in previous studies (for example, depression, anxiety, and physical illness) were not collected. Second, although research suggests sociodemographic factors may be uniquely associated with the specific drug class misused,⁴¹ the sample size could not accommodate analyses by drug category. Third, the cross-sectional design precludes inferences about causation and temporal sequence. Finally, there may be response bias, owing to the relatively low response rate, use of self-report measures, and the use of telephone interviewing.

Conclusions

PDM was an important public health concern in Alberta in 2002. At that time, Canada reported the fourth highest per capita consumption of prescription narcotics in the world.⁴² In 2009, Canada became the third highest per capita user, with estimates for prescription opiate misuse growing 24.3% between 2002 and 2005 alone.^{43,44} There is an urgent need for an ongoing assessment of this evolving problem. Despite its limited geographic locale, our work extends current knowledge about PDM in Canada and provides epidemiologic information that can be used to compare and complement future research in this area.

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References

- Barker MJ, Greenwood KM, Jackson M. The cognitive effects of long-term benzodiazepine use: a meta-analysis. *CNS Drugs*. 2004;18:37–48.
- Becker WC, Sullivan LE, Tetrault JM, et al. Non-medical use, abuse and dependence on prescription opioids among US adults: psychiatric, medical and substance use correlates. *Drug Alcohol Depend*. 2008;94(1–3):38–47.
- Gallardo-Carpentier A, Aileru AA, Carpentier RG. Arrhythmogenic and antiarrhythmic actions of substances of abuse: effects on triggered activity. *J Electrocardiol*. 1997;30:137–142.
- Murray MJ, DeRuyter ML, Harrison BA. Opioids and benzodiazepines. *Crit Care Clin*. 1995;11:849–873.
- Swanson JM, Volkow ND. Pharmacokinetic and pharmacodynamic properties of stimulants: implications for the design of new treatments for ADHD. *Behav Brain Res*. 2002;130(1–2):73–78.
- Cicero TJ, Inciardi JA, Muñoz A. Trends in abuse of oxycontin and other opioid analgesics in the United States: 2002–2004. *J Pain*. 2005;6(10):662–672.
- Dasgupta N, Kramer ED, Zalman M, et al. Association between non-medical and prescriptive usage of opioids. *Drug Alcohol Depend*. 2006;82(2):135–142.
- Grudzinskas C, Balster RL, Gorodetzky CW, et al. Impact of formulation on the abuse liability, safety and regulation of medications: the expert panel report. *Drug Alcohol Depend*. 2006;83(Suppl 1):S77–S82.
- International Narcotics Control Board. Report of the International Narcotics Control Board for 2008. Vienna (AT): United Nations; 2009.
- Zacny J, Bigelow G, Compton P, et al. College on problems of drug dependence taskforce on prescription opioid non-medical use and abuse: position statement. *Drug Alcohol Depend*. 2003;69(3):215–232.
- Compton WM, Volkow ND. Major increases in opioid analgesic abuse in the United States: concerns and strategies. *Drug Alcohol Depend*. 2006;81(2):103–107.
- McCabe SE, Cranford JA, West BT. Trends in prescription drug abuse and dependence, co-occurrence with other substance use disorders, and treatment utilization: results from two national surveys. *Addict Behav*. 2008;33(10):1297–1305.
- Huang B, Dawson DA, Stinson FS, et al. Prevalence, correlates, and comorbidity of nonmedical prescription drug use and drug use disorders in the United States: results of the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry*. 2006;67(7):1062.
- McCabe SE, Cranford JA, Boyd CJ. The relationship between past-year drinking behaviors and nonmedical use of prescription drugs: prevalence of co-occurrence in a national sample. *Drug Alcohol Depend*. 2006;84(3):281–288.
- Fischer B, Rehm J, Goldman B, et al. Non-medical use of prescription opioids and public health in Canada: an urgent call for research and interventions development. *Can J Public Health*. 2008;99(3):182–184.
- Health Canada. Canadian Alcohol and Drug Use Monitoring Survey: summary of results for 2008. Ottawa (ON): Health Canada; 2009.
- Kessler RC, Andrews G, Mroczek D, et al. The World Health Organization Composite International Diagnostic Interview Short-Form (CIDI-SF). *Int J Methods Psychiatr Res*. 1998;7:171–185.
- Wittchen HU. Reliability and validity studies of the WHO Composite International Diagnostic Interview (CIDI): a critical review. *J Psychiatr Res*. 1994;28:57–94.
- Boyle SH, Mortensen L, Grønbaek M, et al. Hostility, drinking pattern and mortality. *Addiction*. 2008;103(1):54–59.
- Malyutina S, Bobak M, Kurilovitch S, et al. Relation between heavy and binge drinking and all-cause and cardiovascular mortality in Novosibirsk, Russia: a prospective cohort study. *Lancet*. 2002;360(9344):1448.
- Merrick EL, Horgan CM, Hodgkin D, et al. Unhealthy drinking patterns in older adults: prevalence and associated characteristics. *J Am Geriatr Soc*. 2008;56(2):214–223.
- Ferris J, Wynne H. The Canadian Problem Gambling Index: final report. Ottawa (ON): Canadian Centre on Substance Abuse; 2001.
- Aschengrau A, Seage GR. Essentials of epidemiology in public health. Sudbury (MA): Jones and Bartlett; 2008.
- Oleckno WA. Essential epidemiology: principles and applications. Long Grove (IL): Waveland Press Inc; 2002.
- Kleinbaum DG, Klein M. Logistic regression: a self-learning text. New York (NY): Springer; 2010.
- National Institute of Drug Abuse. Prescription drugs: abuse and addiction. Bethesda (MD): National Institutes of Health; 2005.
- Edlund MJ, Martin BC, Devries A, et al. Trends in use of opioids for chronic noncancer pain among individuals with mental health and substance use disorders: the TROUP Study. *Clin J Pain*. 2010;26(1):1–8.
- Horowitz A, Reinhardt JP, Boerner K, et al. The influence of health, social support quality and rehabilitation on depression among disabled elders. *Aging Ment Health*. 2003;7:342–350.
- Cohen IM, McCormick AV. The misuse of prescription drugs by post-secondary students. Abbotsford (BC): BC Centre for Social Responsibility; 2008.
- Johnston L, O'Malley P, Bachman J, et al. Monitoring the future national survey results on drug use, 1975–2003: college students and adults ages. NIH Publication 04–5508. 2004;(2):19–45.
- Teter CJ, McCabe SE, LaGrange K, et al. Illicit use of specific prescription stimulants among college students: prevalence, motives, and routes of administration. *Pharmacotherapy*. 2006;26(10):1051–1510.

32. McCabe SE, Teter CJ, Boyd CJ. Illicit use of prescription pain medication among college students. *Drug Alcohol Depend.* 2005;77:37–47.
33. McCabe SE, Teter CJ, Boyd CJ, et al. Nonmedical use of prescription opioids among US college students: prevalence and correlates from a national survey. *Addict Behav.* 2005;30(4):789–805.
34. McCabe SE, Boyd CJ, Teter CJ. Subtypes of nonmedical prescription drug misuse. *Drug Alcohol Depend.* 2009;102(1–3):63–70.
35. Tetrault JM, Desai RA, Becker WC, et al. Gender and non-medical use of prescription opioids: results from a national US survey. *Addiction.* 2009;103:258–268.
36. Jamison RN, Butler SF, Budman SH, et al. Gender differences in risk factors for aberrant prescription opioid use. *J Pain.* 2010;11(4):312–320.
37. Webster LR, Dove B. *Avoiding opioid abuse while managing pain: a guide for practitioners.* North Branch (MN): Sunrise River Press; 2007.
38. Webster LR, Webster RM. Predicting aberrant behaviors in opioid-treated patients: preliminary validation of the Opioid Risk Tool. *Pain Med.* 2005;6:432–442.
39. Brunton L, Lazo J, Parker K. *Goodman & Gilman's, the pharmacological basis of therapeutics.* 11th ed. New York (NY): McGraw-Hill Professional; 2006.
40. Matzger H, Weisner C. Nonmedical use of prescription drugs among a longitudinal sample of dependent and problem drinkers. *Drug Alcohol Depend.* 2007;86(2–3):222–229.
41. Simoni-Wastila L, Strickler G. Risk factors associated with problem use of prescription drugs. *Am J Public Health.* 2004;94(2):266–268.
42. International Narcotics Control Board. *Narcotic drugs: estimated world requirements for 2004—statistics for 2002.* New York (NY): United Nations; 2004.
43. International Narcotics Control Board. *Narcotic drugs: estimated world requirements for 2009—statistics for 2007.* New York (NY): United Nations; 2008.
44. Popova S, Patra J, Mohapatra S, et al. How many people in Canada use prescription opioids non-medically in general and street drug-using populations? *Can J Public Health.* 2009;100(2):104–108.

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Résumé : Prévalence et corrélats du mésusage de 12 mois des médicaments sur ordonnance en Alberta

Objectif : Nous avons examiné la prévalence et les corrélats du mésusage des médicaments sur ordonnance (MMO) dans un échantillon d'adultes de la population de l'Alberta.

Méthodes : Les données ont été recueillies auprès de 3511 adultes de l'Alberta âgés de 18 ans et plus en 2002, au moyen d'un sondage téléphonique assisté par ordinateur. Le taux de réponse a été de 57,4 %.

Résultats : La prévalence de 12 mois du MMO en Alberta était de 8,2 % en 2002. Les opiacés étaient la classe de médicaments la plus fréquemment mal utilisée, suivis des sédatifs, stimulants, et tranquillisants. L'incapacité en cours était particulièrement associée au MMO. Les probabilités de MMO étaient aussi élevées chez les adultes étudiants et chez les adultes détenant un diplôme d'études secondaires, relativement aux adultes titulaires d'un diplôme d'études postsecondaires. Les problèmes de jeu, l'utilisation de drogues illicites, et la consommation et la dépendance à l'alcool dans l'année précédente étaient tous associés au MMO, alors que la consommation excessive d'alcool et l'usage quotidien du tabac ne l'étaient pas.

Conclusions : Les résultats suggèrent que le MMO était un important problème de santé publique en Alberta, en 2002. Les estimations suggèrent que l'usage et le mésusage des ordonnances ont augmenté substantiellement au Canada depuis ce temps. Il y a un besoin pressant d'une évaluation continue de ce problème croissant de sorte que des stratégies préventives et thérapeutiques efficaces puissent être élaborées.