

Substance-Related and Behavioural Addiction Problems: Two Surveys of Canadian Adults

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## ABSTRACT

### Objectives

To describe absolute and relative prevalence of 10 self-attributed substance-related and behavioural addiction problems among Canadian adults; to describe perceived prevalence of these problems in the general population; and to examine whether estimates varied by survey mode.

### Methods

Sample 1 included 4,000 adults recruited from an online research panel; Sample 2 included 2,000 randomly selected adults who completed a computer-assisted telephone interview.

Respondents in both samples were asked (1) whether or not they had experienced a problem in the preceding year with each of four substances (alcohol, tobacco, marijuana, cocaine) and six behaviours (gambling, eating, shopping, sex, video gaming, work), (2) whether they had ever personally knew someone exhibiting a problem with each behaviour, and (3) perceived prevalence of problems in the general population.

### Results

About half of respondents reported experiencing any past-year addiction problems. Tobacco and alcohol were the most common substance-related problems, while the most common behavioural problems were related to eating and work. Respondents consistently overestimated perceived population prevalence relative to self-attributed problems; however, magnitude of overestimation was significantly greater among those who personally reported a problem with these behaviours. Online survey participants consistently reported higher self-attributed problem rates compared to CATI respondents, but rank-order correlations across self-, acquaintances-, and population-attributed prevalence estimates were very high in both samples.

### Conclusions

Both survey modes provided accurate relative prevalence estimates, but further research should explore determinants of higher prevalence rates among online participants and respondents' consistent tendency to overestimate perceived population prevalence.

### Substance-Related and Behavioural Addiction Problems: Two Surveys of Canadian Adults

Addictions have been characterized as chronic relapsing health conditions, and are marked by substantial adverse impacts on individuals and society (Sussman, Lisha, & Griffiths, 2011). These include, but are not limited to higher morbidity and mortality rates for the addicted person, health and financial damages for others, and increased economic and social costs for society as a whole (Effertz & Mann, in press; McGinnis & Foege, 1999; Single, Robson, Xie, & Rehm, 1998). Compared to other mental health problems, the prevalence of addictions is considerably higher, especially when behavioural addictions are taken into account (Sussman, et al., 2011).

Although conceptualization, criteria, and types of behavioural addictions have been highly debated (Mihordin, 2012; Mudry et al., 2011), prominent researchers have argued that that they are similar to substance-related addictions in that they generate short-term rewards that promote behavioural persistence, despite knowledge of adverse consequences (Grant, Potenza, Weinstein, & Gorelick, 2010). Behaviours associated with this liability include gambling, excessive Internet use, shopping, working, exercising, eating, video game playing, and sexual activity (Karim & Chaudhri, 2012). Loss of control over these behaviours can lead to neglect of role obligations and health protective behaviours, as well as interpersonal conflict.

Previous studies suggest that, similar to substance-related addictions, behavioural addictions can have adverse health consequences. For example, excessive Internet use is associated with poorer sleep and less frequent exercise (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007; Kim et al., 2010); problematic eating is associated with elevated risks of obesity (Dubois, Farmer, Girard, Peterson, & Tatone-Tokuda, 2007); workaholism is associated with psychological distress and physical complaints (Schou Andreassen, Ursin, & Eriksen, 2007; Shimazu, Schaufeli, & Taris, 2010); and pathological

gambling is related to substantially increased suicide risk (Hodgins, Mansley, & Thygesen, 2006; Potenza, Kosten, & Rounsaville, 2001).

The addiction field has a strong tradition of survey research describing prevalence rates for substance-related addictions. In contrast, population-based prevalence studies of behavioural addictions are less common. The most thoroughly studied behavioural addiction has been gambling (Afifi, Cox, Martens, Sareen, & Enns, 2010; Ashley, & Boehlke, 2012; Huang & Boyer, 2007; Rush, Bassani, Urbanoski, & Castel, 2008; Tse, Hong, Wang, & Cunningham-Williams, 2012; Villella et al, 2011), which is the only behavioural addiction that has been included in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM; American Psychiatric Association, 2000). Unfortunately, only sporadic prevalence data are available for other behavioural addictions (Sussman, Lisha, & Griffiths, 2011), and studies to date have generally focused on special populations and age groups (e.g., Burke, 1999; Chiu, & Woo, in press; Lejoyeux, Guillot, Chalvin, Petit, & Lequen, 2012; MacLaren & Best, 2010; Poli, & Agrimi, 2012; Turner et al., in press; Villella et al, 2011). Underlying this state of affairs is a general lack of short but comprehensive and reliable screening instruments validated and available for use in population health surveys.

The need for such instruments will increase in the future, in light of the increasing range of behaviours that potentially qualify as addictions – both as portrayed in popular media (e.g., Webb, 2012; Whitelocks, 2012), and in emerging changes in the taxonomy and nomenclature used to classify addictions (e.g., reclassifying pathological gambling as gambling disorder and co-locating it in the DSM chapter related to drug and alcohol use disorders; Petry, 2010). Proposed changes to the DSM system will also change how self-reported symptoms commonly assessed in population surveys are used to make inferences about the prevalence of addictions in different populations (e.g., adding a craving criterion; narrowing the range of signs to exclude involvement in illegal acts as an external criterion for

inferring addiction; O'Brien, 2011). When combined with changes in the diagnostic categories themselves (e.g., elimination of the abuse/dependence distinction in proposed changes to DSM-V; O'Brien, 2011), addiction epidemiologists and survey researchers will be challenged to revisit extant assessment tools and scoring algorithms in order to accommodate the evolving nature of psychiatric nosology in this area.

One approach to these changes is to view them simply as attempts to become more objectively accurate with respect to the classification of addictions. Indeed, there is already a growing body of research comparing prevalence estimates obtained using older diagnostic criteria to those obtained using the proposed new nomenclature (e.g., Hasin, Fenton, Beseler, Park, & Wall, 2012; Peer, Rennert, Lynch, Farrer, Gelertner, & Kranzler, 2013), and these studies do not problematize the implicit assumption that such comparisons are necessary efforts to triangulate different assessment tools to an (imperfectly measured) objective diagnostic condition. In contrast, others express concerns that upcoming changes in addiction-related diagnostic categories and symptoms signal a watershed moment in the state of scientific enquiry in this area, one that reflects fundamental problems in conceptualizing and measuring addictions (Room, 2011). From this perspective, changes in addiction nosology are questionable in relation to the evidence base (e.g., Edwards, 2012) as well as the tacit positivist assumptions underlying epidemiologic studies of addiction (Keane, Moore, & Fraser, 2011).

### The Present Study

We believe that shifting definitions in psychiatric diagnoses and changing views in popular media about what 'counts' as an addiction have important implications for inferences made by the general public about whether they, or people they know, are experiencing problems with a wide range of substances and behaviours. Thus, the overall objective of the present study was to determine whether a "lay epidemiology" approach to understanding

addictions could shed light on the scope and accuracy of problems that might qualify as addictions. Lay epidemiology proposes that "...fields of symptomatology, nosology, aetiology, and epidemiology have identifiable counterparts in the thoughts and activities of people outside the formal medical community" (Davison et al., 1991, p.6). From this perspective, systematic investigations inferences made by the lay public about health conditions can provide important insights into how the general population construes risks and how to craft intervention strategies (Lawlor et al., 2003). The present study adopted a lay-epidemiologic perspective to address four research questions. First, we described prevalence of *self-attributed* substance-related and behavioural addiction problems, without imposing particular symptoms and syndromes derived from any nosological systems underlying the standard screening and assessment tools typically used in population surveys. As part of this research question, we compared self-attributed addiction problem rates with those derived from comparable population surveys using items derived from diagnostic criteria. Second, we described *perceived* prevalence of problems with substances and behaviours in order to document public awareness and familiarity with a broad range of substance-related and behavioural addiction problems. Third, in light of growing evidence demonstrating that that population prevalence estimates can differ across *survey data collection modes* (e.g., random digit dialling versus online panel sampling and other data collection methods (see Breedveld & Hoekman, 2011; Datta, Walsh, & Terrell, 2002; Nagelhout et al., 2010), we attempted to replicate previous findings (Spijkerman et al., 2009) demonstrating higher prevalence of substance-related addiction problems among online panel respondents, compared to respondents recruited via random digit dialling. Finally, the use of three prevalence measures and two different survey modes allowed us to examine whether there is any evidence for *patterning* across addictive behaviours and data collection methods. Specifically, we assessed

the extent to which the rank ordering of prevalence estimates were consistent across measures and survey modes.

## METHODS

The study procedures and measures were approved by the University of Alberta Health Research Ethics Board.

### Samples and Procedures

#### Web sample

Online respondents were drawn from Ipsos Canadian Online Panel. Target quotas were set for age, gender and region based on 2006 Canadian Census data, and a random, representative sample of Panel members were sent invitations to take part in the survey. Each email invitation included a survey URL, embedded with a personal identification number. Respondents were able to complete the survey at their convenience, and were allowed to stop and return to the survey, if required. In order to maximize participation and minimize non-response bias, email reminders to complete the survey were sent approximately three days following the initial invitation, and an incentive was provided to all those who complete the survey. A total of 4000 online interviews were conducted between December 1, 2009 and December 21, 2009; the median interview time was 12 minutes.

#### Telephone sample

Between April 28<sup>th</sup> and May 11<sup>th</sup>, 2010, Ipsos Reid was contracted to conduct 2,000 telephone interviews with Albertans aged 18 and older. In order to ensure a random sample, all interviews were conducted via random digit dialing (RDD). RDD ensures that all interviewees are selected completely randomly, that is, all Alberta households had an equal chance of being contacted to complete the survey. Further, the “birthday method” of selecting respondents was used in order to ensure randomness within households (i.e., asking to speak to the person in the household aged 18 or older who most recently celebrated a birthday). A



total of 2000 telephone interviews were conducted between April 28, 2010 and May 11, 2010; the mean interview time was 12.03 minutes.

### Sample weights

Each dataset was independently weighted to ensure that regional, age and gender composition reflected that of the actual Alberta population aged 18 years or older according to 2006 Canadian Census data. Weights were converted to relative weights which summed to the sample sizes in each dataset. A set of 500 bootstrap weights were created (Yeo, Mantel, & Liu, 1999) and were used to calculate nonparametric estimates of standard errors. Detailed characteristics of the two samples are provided in Table 1.

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Table 1 about here  
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### Measures

#### Sociodemographics

Both the online and CATI samples were administered identical survey measures. As shown in Table 1, survey items assessed participants' gender, age, and educational level. Additional sociodemographic variables included marital status (with four response categories), employment (with seven response categories), and household income (with ten response categories).

#### Prevalence of self-attributed problems

To measure prevalence of self-attributed problems across the ten addictive behaviours, a single-question ("Thinking back over your life, have you ever personally had a problem with [addictive behaviour]?") was used, with three response options ("No" ; "Yes, but not in the past 12 months"; "Yes, in the past 12 months"). The 10 addiction problems measured were: alcohol, tobacco, marijuana, cocaine, gambling, eating, shopping, sex, video gaming,

and work (see Table 2). The focus of this study was past-year prevalence estimates, and so the ‘No’ and ‘Yes, but not in the past 12 months’ response options were combined. To avoid order effects, type of addictive behaviour was presented in a random sequence for each respondent in each sample. A definition was provided to respondents for each of the potentially problematic behaviours under consideration (see Table 2). The definitions were intended to broadly characterize “problems” with a broad range of substance-related and behavioural addictions without explicitly using the term “addiction” in order to avoid respondent reactivity.

### Perceived prevalence of addictions

To assess respondents’ perceptions of problems with the 10 behaviours among acquaintances and the general public, two additional single-item questions were asked: (1) “Have you ever known someone who has had a problem with [addictive behaviour]?” (answered “Yes” or “No”) ; and (2) “What percentage of Alberta adults (18 and older) do you think experienced a problem with [addictive behaviour] in the past 12 months?”.

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Table 2 about here

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### Analyses

Bootstrapped standard errors were calculated using Mplus version 7; all other statistical analyses were executed using SPSS 20.0 (SPSS, Chicago, IL, USA). Weighted frequencies were used to estimate population prevalence rates of self-reported problems with each behaviour. Chi-square tests were employed to evaluate relationships between survey mode and prevalence rates of self-reported addictive behaviours. When employing Chi-square tests, Cramer’s V was used to quantify effect size. To assess consistency of relative prevalence estimates across self, acquaintance, and general population measures, Spearman

rank-order correlation coefficients were calculated among these measures, within and across survey modes. Finally, we explored whether the magnitude of population estimates differed among respondents who did and did not report a past-year problem with each addictive behaviour by computing a difference score, wherein each of the 10 self-attributed prevalence rates obtained from each sample was subtracted from each respondent's estimate of general population prevalence. Mann-Whitney tests were conducted to compare the size of respondents' population estimates due to the non-normal distribution of scores.

## RESULTS

### Response Rates

Cooperation rates were calculated according to the American Association for Public Opinion Research definition (AAPOR, 2009), i.e., the number of online and telephone interviews divided by the number of eligible respondents who were contacted and capable of completing each interview. Survey cooperation rates were 80% and 75% for the online and CATI samples, respectively. Using the AAPOR definition of response rate (number of interviews divided by the number of respondents who were eligible or estimated to be eligible, response rates for the online and telephone samples were 21% and 13%, respectively. These cooperation and response rates are similar to those obtained in other research comparing prevalence estimates by survey mode (e.g., Nagelhout et al., 2010).

### Self-Attributed Problems in the Previous Year

About half of respondents reported experiencing any past-year addiction problems. Only about half of the participants (54.3% in the CATI sample and 46.5% in the online sample, respectively; see Table 3) reported that they did *not* experience any problems with any of the addictive behaviours in the year preceding the surveys. The most prevalent self-attributed substance-related addiction problems were with tobacco (20.7% and 15.9%) and

alcohol (5.8% and 3.6%), while the most common self-attributed behavioural addiction problems were related to eating (23.0% and 19.4%) and work (17.8% and 17.0%).

When comparing these self-attributed prevalence estimates with the most recent Canadian prevalence estimates derived from surveys using measures reflecting current addiction nomenclature; see ‘Previous Canadian estimate’ column in Table 3), we observed comparable rates for some problems (e.g., gambling, tobacco), but higher rates for problems with eating, work, and shopping. In contrast, other prevalence estimates (e.g., self-attributed problems with alcohol, sex, video gaming, and cannabis) were lower than current Canadian estimates.

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Table 3 about here

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#### Perceived Prevalence of Problems

Our data regarding the frequency of knowing someone personally who struggles or struggled with the excessive behaviours (see in the columns labelled "Acquaintances" in Table 3) revealed that the most commonly perceived problems among the substance-related addictive behaviours among respondents’ acquaintances was problematic drinking, followed by tobacco use. As for the non-substance-related addictive behaviours, problematic eating and working were reported to be the most prevalent among the acquaintances of the participants.

Respondents’ judgements about population prevalence for each addictive behaviour (with the exceptions of tobacco use and excessive eating in the online panel sample) were highly overestimated in both samples relative to published estimates and also to self-reported prevalence rates (Table 3). Respondents estimated that the population prevalence of tobacco problems was the most common substance-related addiction followed by problematic drinking.

Finally, exploratory tests indicated that respondents who experienced past-year problems with these behaviours exhibited significantly larger population prevalence estimates for every addictive behaviour assessed, compared to respondents who did not report experiencing problems with these behaviours (Table 3).

#### Survey Mode Differences

With regard to the self-reported past-year prevalence of problematic addictive behaviours, the two data sets exhibited small, though statistically significant differences across almost all behaviours studied. The only exceptions were cocaine use ( $\chi^2(1) = 3.05$ ;  $p = 0.087$ ;  $V = 0.02$ ) and excessive work ( $\chi^2(1) = 0.57$ ;  $p = 0.449$ ;  $V = 0.01$ ). Concerning all other substance-related (alcohol:  $\chi^2(1) = 13.63$ ,  $p = 0.001$ ,  $V = 0.05$ ; tobacco:  $\chi^2(1) = 20.00$ ,  $p < 0.001$ ,  $V = 0.06$ ; marijuana:  $\chi^2(1) = 14.95$ ,  $p < 0.001$ ,  $V = 0.05$ ) and non-substance-related (gambling:  $\chi^2(1) = 17.67$ ,  $p < 0.001$ ,  $V = 0.05$ ; eating:  $\chi^2(1) = 9.82$ ,  $p = 0.002$ ,  $V = 0.04$ ; shopping:  $\chi^2(1) = 3.98$ ,  $p = 0.046$ ,  $V = 0.03$ ; sex:  $\chi^2(1) = 65.87$ ,  $p < 0.001$ ,  $V = 0.11$ ; video-gaming:  $\chi^2(1) = 14.86$ ,  $p < 0.001$ ,  $V = 0.05$ ) addictive behaviours, self-attributed prevalence of problems were higher among respondents in the online panel survey (Table 3).

#### Patterning Across Measures and Survey Modes

Rank-order correlations were calculated among the prevalence estimates, within and across our samples in order to determine whether, regardless of measure and survey mode, there was any evidence for *joint monotonicity* (Sneath & Sokal, 1973), i.e., when the prevalence estimates using one measure and survey mode were ranked from most to least common, they were in the same order as when they are ranked using different measures and/or survey modes. As shown in Table 4, we found strong evidence of joint monotonicity across identical measures (i.e., rank order correlations among the same prevalence measures were 0.90 – 0.98 across online and CATI samples). The other rank order correlation coefficients (between different prevalence measures within and across the data sets) were

somewhat lower but still strong (0.72 - 0.90), with the exception of the coefficients between self- and acquaintance-attributed prevalence rates.

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Table 4 about here

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## DISCUSSION

Addictions are of great public health relevance, considering their adverse affects on the physical and mental health status of both the individual and society as a whole. In recent years, the concept of addiction has been broadened by including non-substance-related addictive behaviours in both psychiatric nosology and in popular media. As well, upcoming changes in the DSM system will change criteria at the symptom and syndrome level for inferring addictions. Epidemiologic studies of addiction will be profoundly influenced by these changes, but to date, little research has been conducted to explore lay conceptions of a broad range of substance-related and behavioural addictions. To address this gap, the present study explored whether a lay epidemiology perspective could be useful in describing the scope and accuracy of problems that might qualify as addictions. Specifically, we attempted to (1) describe prevalence of self-attributed substance-related and behavioural addiction problems, without imposing particular symptoms and syndromes derived from any nosological systems informing the standard screening and assessment tools typically used in population surveys; (2) describe perceived prevalence of these addictions in the reference population; (3) examine whether prevalence estimates differed across two different survey modes, i.e., online versus CATI methods; and (4) explore possible patterning across addictive behaviours by examining the relationships among different prevalence measures.

Our findings concerning the prevalence rates of self-attributed substance-related and behavioural problems were, in general, surprisingly consistent with previous Canadian

estimates derived from measures that incorporate diagnostic criteria commonly used in epidemiological studies. Divergent results we obtained (e.g., higher self-attributed problems with eating, work, shopping in comparison with existing Canadian rates; lower self-attributed problems with alcohol, sex, and video gaming) can be explained at least partly by the fact that several earlier studies were based solely on adolescent and young adult samples (MacLaren & Best, 2010; Turner, et al., in press) or samples where the proportion of these age groups was larger (Snider, 2012) than in the present study. Thus, it would be expected that the prevalence rates of age-related disorders would differ (e.g., more substance- and less work-related problems). On the other hand, because of the use of the term 'problem' in our measures, addicted individuals who are not self-aware of their problem may not have been identified, which may give an alternative explanation for the lower prevalence rates of our study compared to previous findings derived from the use of more complex and structured measurement instruments, most of which assess more specific symptoms.

Our results also revealed that while about half of the respondents reported that they had problems with any of the addictive behaviours, about one-fifth of the participants reported experiencing problems with more than one of the behaviours under investigation. Further studies should investigate how the different substance-related and behavioural addictions co-occur in different populations (e.g., MacLaren & Best, 2010; Sussman et al., 2013; Sussman, Lisha, & Griffiths, 2011). The most prevalent addictions, for example, appear to reflect nurturant (eating, workaholism) and hedonistic (alcohol, tobacco) motives (MacLaren & Best, 2010; Sussman et al., 2013). Identifying the patterns of such co-occurrences could aid in the development of targeted prevention and intervention programs, which may be more effective than those utilizing a general approach without considering the unique characteristics of different poly-addicted groups (Monga et al., 2007).

With regard to lay perceptions about population prevalence, we observed that between 16% - 90% of respondents reported that they personally knew someone exhibiting one of the addiction problems under investigation, suggesting that there is a very high degree of public awareness and familiarity with a broad range of substance-related and behavioural addiction problems among Canadian adults, and particularly for alcohol, tobacco, eating problems, and work problems. While both samples estimated accurately which problematic addictive behaviours are more prevalent relative to each other, respondents consistently overestimated the prevalence of addiction problems in the general population, relative to self-attributed problems. Such overestimation of population prevalence may be systematically related to problem severity (Sussman et al., 1988), which is consistent with our results showing that respondents who reported that they had experienced past year problems exhibited greater overestimation of population prevalence relative to those not reporting that specific problem. Alternatively, given the increasing extent to which addictions – and particularly behavioural addictions – are portrayed in popular culture, future research could examine whether exposure to media moderates the extent of respondents' overestimation of the prevalence of addictive behaviours in the general population (e.g., Busselle & Shrum, 2003; Shrum & O'Guinn, 1993). Further research is needed to investigate these possibilities, and to determine whether accuracy or overestimation of addictive behaviours in the general public predicts self-initiated behaviour change and/or help-seeking behaviour.

The third aim of our study was to detect potential survey mode differences. Our findings replicated previous results documenting that prevalence estimates of substance-related problems were greater among online respondents, compared to those recruited using computer-assisted telephone interviews (Spijkerman et al., 2009). We also extended these findings by demonstrating that prevalence estimates of behavioural addiction problems were similarly higher among online respondents. Further research emphasizing precision of



prevalence estimates should focus on determining the extent to which the cheaper and more convenient online panel method is associated with coverage, selection, and measurement biases.

Concerning our fourth goal, we observed striking joint monotonicity among the prevalence estimates, within and across measures and survey modes. These intriguing findings indicate that the relative prevalence of lay-perceived problematic addictive behaviours can be estimated quite reliably using either survey mode, and suggest that there may be a natural patterning of a broad spectrum of addiction problems that could be investigated in future classificatory research.

One strength of our study is the use of two independent, relatively large samples representative of the Alberta adult population across gender, age group, and region. A further strength is the simultaneous evaluation of a large number of both substance-related and behavioural addictions, providing the opportunity of taking a broader look at the whole addiction field. On the other hand, there were several limitations of the present research that deserve to be highlighted. First, response rates were relatively low in both survey modes, which weakens the generalizability of our findings. In addition, although the single question method used here for assessing problematic addictive behaviours is often employed in epidemiological surveys (Bowling, 2005; Cook, 1987), the reliability of single item scales is generally weaker than that of multi-item scales. A more reliable and nuanced description of the behaviours in question would certainly be provided by using extended and more complex measurements. On the other hand, this type of data collection let us cover a broad spectrum of addictive behaviours, many of which do not currently have a validated assessment instrument.

The validity of the wording of single items is also unclear. Our aim was to provide a brief behavioural description of each behaviour that emphasized impairment and to avoid the

use of terms such as addiction. How exactly participants interpreted these items was not examined in this study, and it is possible that impairment was defined broadly in some instances. For example, 'working in a way that creates problems in life' can be interpreted not only as the overcommitment of workaholics but also as negligent labour which would not be classified as an addiction. Further research on the development of brief but psychometrically sound assessment items for behavioural addictions is warranted.

Despite these limitations, the present study calls our attention to the considerably large number of people who attribute problems to themselves and others across a wide range of substance-related and behavioural domains. Considering the enormous health, social, and financial costs of these behaviours for both the individual and society as a whole, the treatment system may need to be better resourced in order to better meet the identification, assessment, prevention, and treatment needs represented by a broad array of problematic behaviours. In addition, the high degree of convergence across our estimates and survey modes with regard to rank-order prevalence suggests that future classificatory work may be fruitful. In general, our results suggest that a lay epidemiology perspective can be useful in documenting both the scope and accuracy of substance-related and behavioural addiction problems in the general public.

Table 1. Sociodemographic characteristics of the samples

	CATI sample (N=2,000) N (%)		Online sample (N=4,000) N (%)	
	Unweighted	Weighted	Unweighted	Weighted
<b>Gender</b>				
Male	888 (44.4)	994 (49.7)	1426 (35.7)	2,000 (50.0)
Female	1112 (55.6)	1,006 (50.3)	2574 (64.3)	2,000 (50.0)
<b>Age group</b>				
≤34	431 (21.9)	647 (32.8)	942 (23.8)	1305 (32.9)
35-54	869 (44.1)	796 (40.4)	1845 (46.5)	1592 (40.1)
≥55	670 (34.0)	528 (26.8)	1180 (29.7)	1071 (27.0)
<b>Educational level</b>				
Grade 9 or less	42 (2.1)	40 (2.0)	18 (0.5)	24 (0.6)
Some high school	122 (6.1)	132 (6.6)	184 (4.6)	177 (4.4)
High school diploma	272 (13.7)	270 (13.5)	658 (16.5)	645 (16.1)
Some university, college or post-secondary trades/technical	390 (19.6)	400 (20.1)	936 (23.4)	958 (24.0)
College or post-secondary trades/technical diploma	512 (25.7)	503 (25.2)	1052 (26.3)	1,034 (25.8)
Completed university undergraduate degree	328 (16.5)	333 (16.7)	771 (19.3)	776 (19.4)
Completed university graduate or professional degree	326 (16.4)	314 (15.8)	381 (9.5)	386 (9.7)
<b>Marital status</b>				
Married/common law	1416 (70.9)	1,398 (70.0)	2687 (67.7)	2,597 (65.4)
Separated/divorced	199 (10.0)	174 (8.7)	500 (12.6)	450 (11.3)
Widowed	108 (5.4)	86 (4.3)	119 (3.0)	106 (2.7)
Single/never married	274 (13.7)	339 (17.0)	664 (16.7)	817 (20.6)
<b>Employment status</b>				
Employed 30 hours a week or more	1057 (53.0)	1,112 (55.8)	2046 (51.5)	2,173 (54.7)
Employed less than 30 hours per week	231 (11.6)	213 (10.7)	467 (11.8)	424 (10.7)
Unemployed	84 (4.2)	85 (4.3)	273 (6.9)	269 (6.8)
Student	59 (3.0)	86 (4.3)	115 (2.9)	161 (4.0)
Retired	301 (15.1)	240 (12.1)	601 (15.1)	542 (13.6)
Not working due to disability	80 (4.0)	68 (3.4)	198 (5.0)	174 (4.4)
Other	181 (9.1)	187 (9.4)	273 (6.9)	231 (5.8)
<b>Yearly household income before taxes</b>				
Under \$20,000	113 (6.4)	121 (6.8)	166 (5.1)	181 (5.4)
\$20,000-\$29,999	117 (6.6)	120 (6.7)	190 (5.8)	198 (5.9)
\$30,000-\$39,999	138 (7.8)	141 (7.9)	259 (7.9)	280 (8.4)
\$40,000-\$49,999	166 (9.4)	171 (9.6)	312 (9.5)	313 (9.4)
\$50,000-\$59,999	148 (8.4)	148 (8.2)	355 (10.9)	356 (10.7)

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\$60,000-\$69,999	134 (7.6)	134 (7.5)	273 (8.4)	281 (8.4)
\$70,000-\$79,999	136 (7.7)	135 (7.6)	266 (8.1)	281 (8.4)
\$80,000-\$89,999	145 (8.2)	150 (8.4)	252 (7.7)	256 (7.7)
\$90,000-\$99,999	119 (6.7)	119 (6.6)	290 (8.9)	287 (8.6)
\$100,000 or more	556 (31.4)	549 (30.7)	905 (27.7)	909 (27.2)

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Table 2. Definitions of problem behaviours provided to respondents

Problem Behaviour	Definition
Alcohol	An “Alcohol problem” means misuse of beer, wine, and/or hard liquor.
Tobacco	A “Tobacco problem” means misuse of cigarettes, cigars, chew, cigarillos, and any other tobacco products.
Marijuana	A “Marijuana problem” means misuse of cannabis, hashish, hash oil, weed, grass or pot.
Cocaine	A “Cocaine problem” means misuse of crack, powder cocaine, blow, snow, or snort.
Gambling	A “Gambling problem” means playing slot machines, online gambling, casino games, lotteries, scratch tickets, and any other betting for money that creates problems in life.
Eating	An “Eating problem” means any problems related to eating, whether it is too much or too little.
Shopping	A “Shopping problem” means shopping in a way that creates problems in life.
Sex	A “Problem with sex” means having sex in a way that creates problems in life, and/or inappropriate use of pornography, whether online or offline.
Video Gaming	A “Video gaming problem” means playing video games such as X-Box, Wii, Playstation, and other online or offline video games in a way that creates problems in life.
Work	A “Problem with work” means working in a way that creates problems in life.

Table 3. Past 12-month prevalence estimates of problematic addictive behaviours, rank-ordered using the CATI sample, and in comparison to best available previous Canadian prevalence estimates (bootstrapped standard errors).

	CATI sample N = 2,000				Online sample N = 4,000				Previous Canadian prevalence estimate
	Self <sup>1</sup> % (SE <sub>%</sub> )	Acquaintan ces <sup>2</sup> % (SE <sub>%</sub> )	Perceived general population <sup>3</sup> M (SE <sub>M</sub> )	Difference in over- estimation <sup>4</sup>	Self <sup>1</sup> % (SE <sub>%</sub> )	Acquaintan ces <sup>2</sup> % (SE <sub>%</sub> )	Perceived general population <sup>3</sup> M (SE <sub>M</sub> )	Difference in over- estimation <sup>4</sup>	
Eating	19.39 (0.97)	78.68 (0.92)	42.88 (0.54)	16.98 (U = 211419.5; p<.001)	22.96 (0.72)	66.50 (1.03)	35.53 (0.41)	15.55 (U = 745209.5; p<.001)	14.9 (MacLaren & Best, 2010)
Work	17.76 (0.92)	77.78 (0.96)	40.70 (0.61)	18.11 (U = 183807.5; p<.001)	16.96 (0.69)	62.43 (1.03)	36.38 (0.48)	18.85 (U = 482363.; p<.001)	12.4 (MacLaren & Best, 2010)
Tobacco	15.91 (0.87)	87.39 (0.76)	40.60 (0.52)	9.73 (U = 226765.5; p<.001)	20.74 (0.72)	81.62 (0.85)	39.08 (0.38)	6.36 (U = 960136.5; p<.001)	19.5 (World Health Organizati on, 2011b)
Shopping	5.19 (0.52)	50.65 (1.22)	32.27 (0.57)	20.75 (U = 59646.0; p<.001)	6.48 (0.45)	39.12 (1.07)	25.87 (0.42)	15.62 (U = 239734.0; p<.001)	21.8 (MacLaren & Best, 2010)

Alcohol	3.56 (0.49)	90.40 (0.71)	38.63 (0.54)	12.19 (U = 48223.5; p<.001)	5.76 (0.48)	86.13 (0.70)	35.43 (0.38)	4.04 (U = 329982.5; p=.008)	9.5 (Rush, et al., 2010)
Sex	3.02 (0.42)	34.85 (1.13)	28.78 (0.56)	20.86 (U = 29600.0; p<.001)	8.61 (0.52)	23.10 (1.02)	23.96 (0.40)	18.41 (U = 195242.0; p<.001)	10.3 (MacLaren & Best, 2010)
Video Gaming	2.60 (0.41)	43.86 (1.16)	27.60 (0.53)	14.21 (U = 32644.0; p<.001)	4.67 (0.43)	35.12 (1.01)	25.27 (0.38)	10.11 (U = 195441.0; p<.001)	9.4 (Turner, et al., in press)
Marijuana	1.72 (0.35)	58.72 (1.12)	29.02 (0.50)	23.44 (U = 16909.5; p<.001)	3.48 (0.40)	53.74 (1.02)	27.19 (0.38)	12.83 (U = 130319.0; p<.001)	11.0 (Snider, 2012)
Gambling	1.50 (0.32)	59.51 (1.12)	30.01 (0.52)	16.87 (U = 19360.5; p<.001)	3.40 (0.36)	52.33 (1.00)	27.22 (0.36)	12.19 (U =140889.0; p<.001)	3.8 (Afifi, et al., 2010)
Cocaine	0.62 (0.20)	40.88 (1.23)	19.23 (0.39)	16.66 (U = 8182.; p=.050)	1.05 (0.23)	36.76 (1.00)	16.30 (0.28)	14.69 (U = 30662.5; p<.001)	1.25 (Snider, 2012)

*Note.* Bootstrapped standard errors for percentages and means provided in parentheses.

<sup>1</sup> Rate of answers 'Yes in the past 12 months' to the question 'Thinking back over your life, have you ever personally had a problem with [addictive behaviour]?'

<sup>2</sup> Rate of answers 'Yes' to the question 'Have you ever known someone who has had a problem with [addictive behaviour]?'

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<sup>3</sup> Mean and standard deviation of the answers to the question ‘What percentage of Alberta adults do you think experienced a problem with [addictive behaviour] in the past 12 months?’

<sup>4</sup> Overestimation was computed by subtracting self-reported prevalence mean (reported in the ‘Self’ column) from each respondent’s estimate for the general population. *Difference in overestimation* was calculated as the percentage difference between the overestimation scores for respondents who did versus did not report that they personally experienced a problem with each behaviour.



Table 4. Rank-order correlations among prevalence estimates within and across survey modes

		CATI sample		
		Self-attributed problems	Acquaintance-attributed problems	General population prevalence estimate
Online sample	Self-attributed problems	0.95***	0.44 <sup>ns</sup>	0.78**
	Acquaintance-attributed problems	0.54 <sup>ns</sup>	0.98***	0.79**
	General population prevalence estimate	0.72*	0.90***	0.90***

<sup>ns</sup>p > 0.05; \*p < 0.05; \*\*p < 0.01; \*\*\*p < 0.001

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