The Proportion of Ontario Gambling Revenue

Derived From Problem Gamblers

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Abstract

The proportion of gambling revenue derived from problem gamblers is an important issue when considering the appropriateness of government-sponsored gambling. Figures obtained from prior research are tentative due to methodological problems and the mismatch between reported expenditures and actual gambling revenue. Using improved methods for assessing the prevalence of problem gambling and self-reported gambling expenditures, the present study estimates that the 4.8% of problem gamblers in Ontario in 2003 accounted for approximately 36% of Ontario gambling revenue. This proportion varied as a function of game type, with a lower proportion for lotteries, instant win tickets, bingo, and raffles and a higher proportion for horse racing and slot machines.

Key Words: gambling, problem gambling, government, Ontario, OLG

Introduction

Government's role in gambling varies from country to country. In jurisdictions such as the United States, the government primarily serves as a regulator and receives revenues mostly through taxation of private operators. Canada has more government involvement than most other countries. Here, provincial governments not only serve as regulators, but are directly or indirectly involved in the actual ownership and operation of most forms of gambling as well as being the main recipients of gambling revenue (Azmier, 2005). This type of direct government involvement in gambling is a contentious issue, with some people arguing this enterprise is incompatible with serving the best interests of the people. It is clear that there are some positive social benefits for Canadians, in that it provides a popular form of entertainment and it generates substantial government revenues that are used for the public good. However, there are also some significant drawbacks, the most important of which is the creation of problem gamblers[1]. Provincial surveys between 2001 and 2005 have found past year problem gambling prevalence rates ranging from 1.6 to 5.9%, with an average of 3.6% (Alberta Gaming Research Institute, 2007). Equally important, and the focus of the present study, concerns the proportion of gambling revenue that is derived from this vulnerable segment of the population. If a substantial portion of gambling revenue is derived from problem gamblers then it creates serious ethical problems for governments involved in this business.

Several jurisdiction-wide prevalence surveys have investigated the proportion of gambling revenue derived from problem gamblers. All of these studies have found these individuals to account for a disproportionate share of this revenue (Lesieur, 1998; Productivity Commission, 1999; Volberg et al., 1998; 2001; Williams & Wood, 2004). However, there has been much less consistency in what that actual portion is. In a study of three Canadian provinces and four American states, Lesieur (1998) found the contribution of problem gamblers to total gambling revenues to range from 23% to 41%, with an average of 30%. However, a U.S. national survey estimated that problem gamblers accounted for only 15% of revenues (Gerstein et al., 1999). An Australian study of this issue estimated that problem gamblers accounted for about 33% of revenues in that country (Productivity Commission, 1999). A New Zealand study estimated that problem/pathological gamblers were responsible for approximately 19% of gambling expenditure (Abbott & Volberg, 2000). A Canadian study by Williams & Wood (2004) found a range between 6% and 38% depending on the province, with a provincial average of 23% (32% if weighted by population). These studies have also typically found that this proportion was very much dependent on the type of gambling, with lower proportions for lotteries and higher proportions for electronic gambling machines (i.e., slots/VLTs) (Lesieur, 1998; Productivity Commission, 1999; Volberg et al., 1998).

It is unclear whether the variability in the above estimates reflects measurement error or true differences in the proportion between different jurisdictions. A more worrisome inconsistency concerns the difference between self-reported expenditures and actual gambling revenues. These inconsistencies comprise cases of over-estimation as well as under-estimation. In Washington State, for example, Volberg et al. (1998) found that reported losses were *2 to 10 times higher* than actual revenues, depending on the type of gambling. In the Canadian study by Williams & Wood (2004), self-reported expenditures were *2.1 times higher* than actual provincial gambling revenues. In contrast, Australian and New Zealand studies have found self-reported expenditures to be between *½ to ¾* of revenues (Abbott & Volberg, 2000; Productivity Commission, 1999). In the

national survey of Americans by the National Opinion Research Center, gamblers reported being *ahead* $3 billion at the casinos in the past year instead of having left more than $20 billion, the revenues reported by the casino industry. Gamblers also reported being ahead $2 billion at the racetrack and $4 billion in private gambling. Only when it came to lotteries did they admit to a loss of $5 billion (Gerstein et al., 1999). With such a mismatch between reported expenditures and actual revenue, the proportion of revenue accounted for by problem versus nonproblem gamblers in each of these studies must be seen as tentative. The potential reasons for these inconsistencies are explored in the next section.

Reasons for Inconsistent Findings

False Positives

The prevalence rate of problem gambling will directly impact on the proportion of revenue that is derived from problem gamblers. Most studies that have estimated problem gambling revenues have identified problem gamblers using the South Oaks Gambling Screen (SOGS). This instrument was designed principally for use in clinical settings rather than for epidemiological work. Clinical screening measures typically try to guard against false negatives, at the expense of creating an excess of false positives. This false positive bias is compounded by the way in which the SOGS computes prevalence rates to include people who have had a problem in the past, in addition to people currently with a problem (Dickerson, 1993). The inclusion of both current and past problem gamblers stems from the assumption that problem gambling is an enduring, chronic problem, whereas current evidence suggests it may be transient for some (Abbott, Williams, & Volberg, 1999; Wiebe, Single, Falkowski-Ham, 2003). In recognition of this, the SOGS-Revised was developed in 1991, that also asks about "current gambling problems" (past 6 or 12 months). Although the SOGS-R produces fewer false positives, evidence indicates it still has a significant false positive bias relative to other instruments or clinical interviews (Abbott & Volberg, 1996; Ladouceur et al., 2000; Ferris & Wynne, 2001).

A high false positive rate is a particularly problematic issue when investigating gambling expenditures and revenues. Overestimates of problem gambling among the general population will produce an inflated estimate of the proportion of gambling revenues stemming from problem gamblers. This, in turn, will lead to an underestimate of the average net expenditure of individuals who actually are problem gamblers. Thus, in examining the relationship between problem gambling and gambling revenues, it is imperative to utilize a measurement that keeps false positive assessment to a minimum.

Under-Sampling of Problem Gamblers

Most studies reporting gambling expenditures have employed telephone surveys. While this procedure does have its advantages, it also has its problems. For one, it likely results in an under-representation of problem gamblers, as they are more likely to have the phone disconnected; more likely to be in residential treatment; more likely to be in prison; less likely to answer the phone; and perhaps less likely to be at home (Ferris, Wynne & Single, 1999; Lesieur, 1994; Walker & Dickerson, 1996). A Swedish national survey found that the rates of probable pathological gambling were 3 times higher for people who could not be contacted by telephone, but did complete survey information by mail (Rönnberg, Volberg, Abbott, et al., 1999). Surveys of residential treatment facilities have typically yielded probable pathological gambling prevalence

rates 2 to 4 times higher than those obtained from general adult population surveys (Abbott & Volberg, 1999).

Social Desirability and False Negatives

The validity of reports concerning sensitive subject matter is strongly influenced by respondents' perceptions of the social desirability of their behaviour (Fowler, 1993; Schaeffer, 2000; van der Heijden et al, 2000). In other words, participants' responses to questions are often shaped by their perception of how positively or negatively others (particularly the interviewer) will evaluate their behaviour (Fowler, 1993). This is particularly true of sensitive issues, which would presumably include gambling behaviour. As evidence of this, an Australian study of 401 problem gamblers in treatment found that only 29% of them indicated they would have participated in a survey and answered questions about their gambling honestly before seeking help (Productivity Commission, 1999). Supporting these findings, there is clear evidence that gamblers often minimize their losses, while exaggerating their wins, in order to convey the impression they are "successful" gamblers (Ruehlman, 2001).

There is consistent evidence that the validity of self-report is enhanced when questionnaires are self-administered, as opposed to being administered in a face-to-face context by the researcher (e.g., Aquilino, 1997; McAllister and Makkai, 1991; Supple et al, 1999; Tourangeau and Smith, 1996; van der Zouwen and de Leeuw, 1990). Potential evidence of this is seen in the 2002 *Canadian Community Health Survey* (Statistics Canada, 2002). The prevalence rate for problem gambling obtained in this survey (~2%) was less than half the rates obtained by means of several provincial surveys conducted between 2001 and 2003, despite using the same instrument (Canadian Problem Gambling Index) (Ferris & Wynne, 2001). The difference may be due to the face-to-face administration of the CCHS versus the more anonymous telephone administration of the provincial surveys.

Ambiguous Question Wording

Exactly how a question is worded strongly shapes the reply (Schwarz, 1999). Virtually all studies have obtained self-reported expenditures as part of a telephone survey investigating the prevalence of problem gambling in a particular jurisdiction. Certain questions in these surveys have asked people how much they "spend" on a specific gambling activity in a "typical" month. Figures for each activity are then added up to arrive at a typical monthly expenditure.

The usual intent of these questions is to obtain an estimate of the respondent's <u>average net</u> monthly gambling loss or win (i.e., the amount of money they have at the end of the month compared to the beginning of the month). However, even among educated medical students, only 32% to 64% interpret "how much do you spend gambling?" to mean <u>net</u> expenditure (Blaszczynski, Dumlao, & Lange, 1997). Many medical students interpreted it as initial outlay or total outlay (initial outlay + reinvestment of winnings). Volberg et al. (1998) have speculated that this latter interpretation occurred in the Washington state study where self-reported estimates were 2-10 times higher than revenues. Blaszczynski et al. (1997) also found that some people include travel and meal costs when calculating gambling expenditures. Also problematic, it is unknown whether people interpret "typical" as mean, median or modal expenditures. It is quite plausible that people believe "typical" to mean their usual (modal) expenditure, rather than their statistical average that takes into account occasional large losses (Wood & Williams, 2007).

Fallible Memory

Even if people correctly interpret question wording, and even if question wording does not bias them, their ability to accurately provide average net monthly win/loss is doubtful. This is a difficult statistical calculation to make in a few seconds that most researcher-administered surveys provide. The fact is that these figures are usually not available and the person is just relying on their memory of these expenditures to make these calculations. Even if people are encoding their daily/weekly/monthly expenditures in terms of net win/loss, memories have differing valence, making them more or less available for retrieval (Tourangeau, 2000). Indeed, selective memory is a characteristic and well-documented feature of problem gambling (McCusker & Gettings, 1997; National Research Council, 1999; Toneatto, 1999; Toneatto, et al., 1997).

Out-of-Jurisdiction Revenue and Expenditures

The ability to validate self-reported expenditures against actual revenues depends on the extent to which residents are gambling in their own jurisdiction and the extent to which revenues are derived primarily from within-jurisdiction residents. Certain jurisdictions (e.g., Las Vegas) derive most of their revenue from out-of-state residents. In places with limited gambling opportunities it might be expected that many residents travel to other jurisdictions to gamble. A comparison between expenditures and revenues is possible only if there is accurate information concerning the percentage of out-of-jurisdiction gambling and the percentage of revenues derived from out-of-jurisdiction residents. Australia derives a significant portion of their gambling revenue from Asian customers (CNN, 2001), which might help explain why Australian self-reported expenditures fall short of Australian gambling revenue.

Using Improved Methodology to Investigate the Proportion of Revenue from Problem Gamblers

The primary purpose of the present study was to use improved methodology to investigate the gambling revenue contributions of problem gamblers in Ontario. These methodological improvements are as follows:

Better Assessment of the Problem Gambling Prevalence Rate

Using a more appropriate instrument will improve the accuracy of the problem gambling prevalence rate. As opposed to being developed for use in clinical settings, the Canadian Problem Gambling Index (CPGI) was designed to assess gambling behaviour in general populations and is geared towards the gambling opportunities available in the Canadian context (Ferris and Wynne, 2001). Moreover, it is characterized by high levels of face, criterion, and construct validity (Ferris and Wynne, 2001).

Better sampling techniques will also improve the accuracy of the prevalence rate. Response rates to random digit dialling (RDD) surveys can be improved with more attempts to contact the designated person, a longer sampling period, more sampling during the evenings and weekends, shorter surveys, and recontacting refusals at a later time. However, even the most rigorous and exhaustive RDD sampling typically achieves differential response rates depending on age (fewer young people), gender (fewer males), and ethnicity (fewer ethnic minorities due to language difficulties). Giving appropriate weightings to these characteristics is sometimes not done in prevalence studies, but is necessary in order to approximate the true population prevalence.

In addition, adjustments to the prevalence rate also need to be made to take into account individuals not available for sampling because of incarceration, being in a residential treatment facility or serving at an Armed Forces base at the time of the survey. In the present study, all of these features were incorporated into the RDD protocol.

Better Assessment of Self-Reported Expenditures

Prospective diaries involve participants recording relevant behaviours or experiences in a logbook or diary, on a daily basis, for a certain period of time. There is substantial support for the contention that prospective diaries provide the most valid data concerning sensitive and socially undesirable behaviour (e.g., unsafe sex, alcohol use). They consistently produce higher estimates of sensitive and socially undesirable behaviour than do retrospective diaries or global estimates, and they also come closest to matching objective measures of the behaviour when they have been available (e.g., per capita alcohol revenues) (Carney et al., 1998; Corti et al., 1990; Lemmens, Tan & Knibbe, 1992). It is thought that the self-administered format enhances anonymity and the daily recording of behaviour minimizes memory demands. Thus, the present study investigated the utility and validity of obtaining reports of gambling expenditure by means of 1-week prospective diaries. Included in these diaries were very explicit and clear instructions on what constituted 'net expenditure'.

Better Tabulation of Ontario Expenditures and Revenues

The present study will assess all gambling expenditures and eliminate spending that does not contribute to documented Ontario revenue (out-of-province casinos; Internet betting; betting with friends; speculative stock market investments). Similarly, when tabulating government, charity, and horseracing revenues, an attempt will be made to determine the percentage of revenue derived from out-of-province residents and exclude this amount from the total.

Research Questions & Hypotheses

There were four primary research questions guiding this research:
1. *What is the prevalence rate of problem gambling in Ontario using optimal RDD assessment methodology and adjusting for individuals not available for sampling?*
   Our hypothesis was that the prevalence rate will be higher than previously obtained.
2. *What proportion of gambling revenue in Ontario derives from problem gamblers?*
   Our hypothesis was that problem gamblers will account for a disproportionately large share of gambling revenue, but we are uncertain about the actual percentage.
3. *Which forms of gambling derive the greatest proportion of revenue from problem gamblers?*
   Our prediction was that electronic gambling machines would derive revenues from problem gamblers to a greater extent than other forms of gambling.
4. *How does the amount of money the Ontario government spend on prevention and treatment of problem gambling compare to the amount of money derived from problem gamblers?*
   Our hypothesis was that government spending represented a small fraction of the money derived from problem gamblers in Ontario.

Method

Telephone Survey

The Institute for Social Research (ISR) at York University in Toronto was contracted to conduct a random digit dial (RDD) telephone survey of 6654 Ontario adults using a computer-assisted telephone interview (CATI). The following procedures were used to ensure optimal random sampling and valid self-report:

- The telephone number databank, from which numbers were randomly drawn, included unlisted numbers (12.4% of Ontario households have unlisted numbers), and excluded cell phones to prevent multiple sampling of the same household.
- The household interviewee was randomly determined by requesting the interview be conducted with the adult (18+) having the next birthday.
- Maximal effort was made to complete an interview with the randomly designated person.
    - There were exhaustive attempts to contact the person. In some cases this meant phoning <u>36 times</u> over several months to establish contact (substantially more than the maximum number of contact attempts in other Canadian studies).[2]
    - The majority of the phoning occurred in the evening and on weekends.
    - Most refusals were contacted again at a later time and asked to reconsider doing the survey.
    - The survey was kept very short to increase the chances the person would participate (5.5 minutes for the screener and 9.6 minutes for the full interview).
- Phone calls were spread over a 9 month period, from March to November 2003, to mitigate any seasonal fluctuations in gambling behaviour and to maximize the chances of contacting the person.
- The interviewer's work received periodic visual and audio monitoring for quality control by a supervisor.
- The importance of honesty was explained and emphasized at the beginning of the interview.

The first part of the survey was an screening question that asked the person how much they had spent in a typical month in the past year on lottery, raffle or instant win tickets; playing Sports Select; playing slot machines and table games at Ontario casinos and racetracks; horse race betting; and bingo. People who spent less than $9 were just asked a few questions about their demographic characteristics and thanked for their time. People who indicated they spent $9 or more were administered the nine questions from the Canadian Problem Gambling Index that determined the person's gambling status (severe problem gambler; moderate problem gambler; low risk gambler; or nonproblem gambler). Once the gambling category of the person had been established, a determination was made about whether the person would be asked to complete a 4-week diary of gambling expenditures. All severe problem gamblers and most moderate problem gamblers were asked due to their low prevalence rate. A small percentage of the nonproblem gamblers and low risk gamblers were also randomly selected for this request. Requests continued until 100 completed diaries per group were met or all 6654 telephone interviews had been completed, whichever came first.

Prospective Diary

People who agreed to complete the prospective diaries were subsequently sent four 1-week diaries and four pre-paid envelopes. They were instructed to record their gambling activities starting on the first Monday after receiving the package and to continue for 4 consecutive weeks. Each day of the diary asked whether there had been any gambling activity or not. If there was, the person was asked to identify the type of gambling, the time spent, and their net win/loss. Clear and complete instructions on how to calculate net daily wins or losses was provided for different types of gambling. At the end of each week the person was asked to mail their completed diary to the Institute for Social Research. As a reminder, each Sunday, someone from the ISR phoned the person to remind them to send in the diary. Participants were sent a $50 honorarium upon receipt of all four diaries. The diaries were then sent to the University of Lethbridge where their content was tabulated.

Results

Prevalence of Problem Gambling in Ontario

An overall response rate of 51% to the RDD survey was achieved using calculations recommended by the Council of American Survey Research Organizations (CASRO, 1982). Weightings were assigned to the sample to approximate the general Ontario population in terms of age, gender, and ethnicity from the Statistics Canada 2001 census. In addition, each case was given a household weighting to offset the unequal probabilities of being selected for the interview in a one-person household, versus two-person, or three-person, etc.

Results indicated that 87.78% of the sample were either non-gamblers or non-problem gamblers (CPGI = 0); 7.51% were low risk gamblers (CPGI = 1-2); 3.74% were moderate problem gamblers (CPGI = 3-7); and .99% were severe problem gamblers (CPGI = 8+), with an overall of prevalence of 4.73% for moderate and severe problem gamblers combined. A portion of the Ontario adult population was not available for sampling because of attending a residential treatment facility, incarceration, or serving at an Armed Forces base at the time of the survey. An examination was made concerning whether these populations could have a significant impact on prevalence rates of problem gambling:

In 1996/97 there were approximately 174,279 health care and long-term care beds in Ontario (Statistics Canada, 1999). Roughly 7,000 of these were for psychiatric patients and/or substance abusers, who are known to have significantly higher rates of problem gambling (Crockford & el Guebaly, 1998; Spunt, 2002; Spunt et al., 1998). On the other hand, it is to be expected that the majority of people in long-term care facilities are frail elderly people with significantly lower rates of gambling and problem gambling. The higher and lower rates in these two subsets may offset each other. It is difficult to speculate on the rates of problem gambling in beds not occupied by these two groups. Thus, for the present analysis, it would seem that there is no compelling justification for adjusting the problem gambling prevalence rate because of not having sampled people from residential treatment/care.

In 2001 there were approximately 7,850 adults incarcerated in Ontario correctional facilities (Statistics Canada, 2006). Research indicates that approximately 33% of these

individuals can be expected to meet criteria for problem gambling (Williams, Royston & Hagen, 2005). In 2003, there were approximately 10,000 adults serving in Canada's Armed Forces in Ontario bases. The prevalence rate of problem gambling is unknown, but likely higher than average due to higher rates of male gender and depression (Statistics Canada, 2003). For the purposes of this analysis, it will be assumed that the rate is 1.5 times the rate in the general population: 7.1%. Thus, among incarcerated individuals and members of the Armed Forces, there is estimated to be approximately 3301 problem gamblers out of a population of about 17,850. Factoring this into the overall prevalence rate for Ontario has only a very small effect, increasing the rate from 4.73% to **4.76%** $\pm$ 2.34% at a 95% confidence level.

Even if some of these above estimates are considerably higher or lower than projected, it is evident that there are too few people attending a residential treatment facility, incarcerated, or serving at an Armed Forces base to have any significant impact on the prevalence of problem gambling in the general Ontario population. Even if all of these people were problem gamblers, the overall prevalence rate would increase by only 0.2%.

As expected, this adjusted Ontario prevalence rate of 4.76% is significantly higher than two previous Ontario prevalence studies: 3.8% obtained by Wiebe, Single, & Falkowski-Ham in 2001 and 2.0% obtained by the Canadian Community Household Survey (CCHS 1.2) for Ontario in 2002 (Statistics Canada, 2002). Table 1 reports the prevalence rate for each group in the present study and Table 2 reports the demographic characteristics of each group.

Ontario Gambling Revenue from Ontario Residents in 2003

The Ontario provincial government owns, operates, and collects the revenue for all lotteries, instant win tickets, sports betting, linked satellite bingo, gambling machines, and casinos (except for the one Aboriginal casino). The business management of these gambling operations is conducted by the Ontario Lottery and Gaming Corporation (OLGC). The OLGC divides these operations into 'Lottery Products & Satellite Bingo'; 'Commercial Casinos'; 'Charitable Casinos'; and 'Slots at Racetracks'. In 2003 there were 3 large commercial casinos whose revenues went to the provincial government; 5 smaller charity casinos whose revenues were used to support charities; and gambling machines at 15 horse race tracks. Table 3 reports OLGC gambling revenues for fiscal year April 2002 to March 2003. These are revenues after prizes and winnings are deducted, but before operating expenses. Revenue derived from non-gambling sources (e.g., food) is not included.

However, only a portion of this revenue is from Ontario residents. In 2000 it was reported that approximately 42% of the 38 million patrons to OLGC facilities were U.S. visitors (OLGC, 2000). Table 3 projects expenditures for Ontario residents assuming that roughly 58% of the expenditures derive from Ontario residents and that the proportion of U.S. patrons in 2003 was unchanged. (A small percentage of visitors also come from other provinces or from outside North America, but this figure was not available).

Charitable organizations own, operate and collect the revenue for bingo, raffles, and break-open tickets. The Alcohol and Gaming Commission of Ontario (AGCO) is responsible for the regulation of all charitable gaming (and OLGC gambling). It estimated that the gross wager on charity bingo, break-open tickets, and raffles was $1,775,000,000 in fiscal year 2002/2003, and that net revenues were $563,000,000 (AGCO, 2003).

Ontario horse racing is regulated and supervised by the Canadian Pari-Mutuel Agency

(CPMA). The CPMA reported that Ontario racetracks (on and off-track) had gross wagers of $1,205,193,343 in the calendar year 2003. Twenty three percent of these wagers are deducted from the pari-mutuel pool and are thus 'lost' by bettors: $277,194,500.

There is one Aboriginal owned casino (Great Blue Heron). Its gambling machines are owned and operated by the OLGC. However, revenue from the 50 table games goes directly to the band. Revenue from the Great Blue Heron's table games was unavailable. However, based on per table revenues at the other charity casinos, annual revenues were estimated to be approximately $20,000,000.

Thus, total gambling expenditures by Ontario residents in 2003 was estimated to be $4,037,603,000. As there were approximately 9,441,668 adults (18+) in Ontario in 2003, the average yearly reported expenditure should be $427.64, and the average monthly expenditure should be $35.64.

Estimates of Gambling Expenditure from the Prospective Diary

Eight hundred and eleven people were asked if they would be willing to complete the 1-month diary of gambling expenditures. Five hundred and twenty (64.1%) people agreed to participate. A total of 344 people returned completed diaries for all four weeks and another 20 returned diaries for between one and three weeks. This return rate represents 70.0% (364/520) of people who agreed to complete the diary and 44.9% (364/811) of people who were asked if they would be willing to do so. An investigation was made to see whether there were any significant differences in the characteristics of the people who provided prospective diaries and people who did not. Variables tested were: age, gender, household income, retrospective expenditure estimate, and CPGI scores. These comparisons were made for each of the four categories of gamblers. As seen in Table 4, there were no significant differences in these characteristics for any of the four CPGI categories of gamblers.

Table 5 reports the mean, median and modal expenditures as reported by people in their prospective diaries, organized by gambling category. Since the sample sizes are relatively small, the averages are significantly impacted by a few individuals reporting very large losses or wins. Thus, average expenditures are also calculated when winsorizing[3] the top and bottom 1% of the data within each category of gambler (minimum of 1 data point winsorized at each end). Also, in an attempt to improve the reliability and validity of the data, average expenditures are also calculated when eliminating anyone who reported winning money or breaking even (among regular gamblers, being ahead or breaking even is a statistical impossibility, with the exception of a few people who experience a single or occasional very large win).

For comparison purposes, the retrospective estimates of gambling expenditures reported by these individuals in the telephone survey are also reported in the bottom part of Table 5. Pearson correlations found the retrospective estimates to be poor predictors of amounts obtained by way of prospective diaries. Furthermore, these correlations were uniformly weak for all categories of gamblers: Nonproblem Gamblers ($r = -.05$; -.22 for winsorized data); Low Risk Gamblers ($r = .26$; .29 for winzorized data); Moderate Problem Gamblers ($r = .18$; .19 for winsorized data); Severe Problem Gamblers ($r = .09$; .05 for winsorized data).

Table 6 presents projected (over 52 weeks) expenditures, and ratios of expenditures to actual revenue, using the winsorized and losses-only data. As can be seen, the total winsorized expenditures are 36% below actual revenues, and the losses-only total is 37% higher than actual

revenues. These disparities are expected, considering that the largest expenditures have been winsorized in the former estimates and all wins have been eliminated in the latter estimates. All in all, these ratios provide reasonable support for the contention that the prospective diary data is an accurate reflection of true expenditures (especially in light of some of the previous mentioned uncertainties involved in tabulating revenues).

Further corroboration of the validity of these reported expenditures is seen in the average amount of *time* gambling each category of gambler reports spending every week in Table 5 (time spent is perhaps less sensitive information compared to money spent). There appears to be a very close correspondence between time spent and money spent. Although not done in the present study, expenditures could also be determined simply on the basis of time spent on each form of gambling, multiplied by the expected loss per hour on that form. It is clear that problem gamblers will again account for a substantial portion of the total revenue based on their average time investment of 5.3 hrs/week, compared to < 1.1 hrs/week by the low risk and non-problem gamblers.

Proportion of Ontario Gambling Revenue Derived from Problem Gamblers

Table 7 reports the proportion of gambling revenue derived from the moderate and severe problem gamblers. Both the winsorized and losses-only data suggest that this proportion is approximately 36%. Using the 95% confidence intervals for the population prevalence of problem gambling (2.42% to 7.10%), the proportion of gambling revenue ranges from 20.1% to 49.2%. Table 8 reports the proportion of revenue derived from problem gamblers as a function of type of gambling. This evidence indicates that gambling machines and horse racing derive a much larger portion of their revenue from problem gamblers, in comparison to other forms of gambling. In rank order, the rough proportions are: 61% gambling machines; 45% horse racing; 32% casino table games; 22% bingo and raffles; and 18% lotteries, instant win, and Sports Select.

Discussion

Summary of Findings

The main findings of this study can be summarized as follows:
1. Using optimal methodology for assessing problem gambling prevalence, the past year prevalence of moderate and severe problem gambling in Ontario in 2003 in a sample of 6654 adults (18+), was found to be 4.8% (3.8% moderate problem gambling; 1.0% severe problem gambling).
2. Prospective diaries appear to provide reasonably valid estimates of gambling expenditures based on their overall match with actual revenues.
3. Expenditures from the prospective diaries of 364 individuals tentatively indicates that about 36% of Ontario gambling revenue is derived from moderate and severe problem gamblers.
4. This proportion varies as a function of gambling type. Up to 61% of revenue from gambling machines in Ontario may derive from problem gamblers. By comparison, lotteries, instant win tickets, bingo, and raffles may only derive 18% of their revenue from problem gamblers.

Limitations of these Findings

Regular gamblers occasionally have very large wins and losses. These statistical outliers have a major influence on the averages, making it very difficult with small sample sizes to establish what the 'true' average expenditures are, so as to compare them with actual revenues. Realistically, there would have to be thousands of people completing prospective diaries from each of the four categories of gamblers to offset the impact of these outliers. The present study compensated for this by using winsorized data and data sets that eliminated winners. This is a reasonable but not perfect solution to this problem.

The proportion of revenue from *severe* problem gamblers is very tentative because of the small number of severe problem gamblers completing prospective diaries (n = 32). There is more certainty in the proportion derived from moderate and severe problem gamblers combined (n = 92). Similarly, the proportion of revenue derived from problem gamblers for particular forms of gambling is also tentative; not all problem gamblers participate in all forms of gambling and so some of these estimates are based on small sample sizes. It seems certain that gambling machines derive more revenue from problem gamblers then other forms of gambling. However, the actual portion for each form of gambling is less certain.

There is not a perfect match between reported expenditure and actual revenue for the prospective diaries. The total winsorized expenditures are 36% below actual revenues, and the losses-only total is 37% higher than actual revenues. This makes some sense considering that the largest expenditures have been winsorized in the former and all wins have been eliminated in the latter. On the other hand, it is also important to realize that the present study found *gambling expenditure exaggeration and minimization to be equally common for all four types of gamblers*, as evidenced by the uniformly low correlations between retrospective estimates and subsequent prospective diary amounts. The implication here is that if there is an over or underestimate of expenditures relative to revenues, it probably does not affect the proportion derived from problem gamblers because of equivalent exaggeration/minimization in each group.

Converging Lines of Evidence

The present study contributes to converging lines of evidence indicating that a substantial portion of gambling revenue is generated by people who are negatively impacted by their involvement in this activity. There will never be a completely unambiguous determination of what that proportion is because of the difficulties of precisely gauging individual gambling expenditures. Some casinos keep detailed files (including expenditures) of 'high-rollers', but there is no tracking of regular players. Some jurisdictions have 'player cards' that allow people to earn credits depending on how much and how often they bet. However, only some gamblers sign up for these cards. Video Lottery Terminals (not available in Ontario) keep a daily record of how much money they earn, but there is no record of how much each individual player spends, let alone what type of player it is (problem or non-problem). Certain European casinos (e.g. Casino Holland) keep track of the number of visits each individual makes, but not their expenditures.

Thus, self-report remains the best method of investigating individual gambling expenditures. Using this method, there is now consistent evidence from several studies that the proportion of revenue derived from problem gamblers is very substantial. If our observed problem gambling prevalence rate of 4.8% is indeed correct, then problem gamblers report a proportion of

expenditure that is more than *seven times* their representation among the Ontario population.

The Exact Proportion Derived from Problem Gamblers Depends on the Circumstances

The proportion of revenue a jurisdiction derives from problem gamblers depends on several things. First it depends on the jurisdiction. Jurisdictions differ on how widely available gambling is, what forms are available, what preventative and policy practises exist to minimize problem gambling, and, consequently, the percentage of the populace who are problem gamblers. Second, the proportion of revenue derived from problem gamblers will probably depend on the time period studied. Gambling availability and government policies can change fairly rapidly in any jurisdiction. Also, places that have had gambling available for a longer period of time may have different rates of problem gambling compared to places that have more recently introduced it.

Lastly, the proportion of revenue derived from problem gamblers depends on how you define and measure problem gambling. Gambling exists on a continuum, with three distinctions along that continuum typically being made. The first is 'social or recreational gambling'. The second is 'problem gambling', or gambling that is associated with some significant adverse consequences for the individual or people in his/her immediate social network (Ferris, Wynne, & Single, 1999). The third type is 'severe problem gambling' or 'pathological gambling', where the person not only experiences persistent and recurrent problems, but also shows signs of being preoccupied by gambling, dependent on it, and some inability to resist engaging in it (American Psychiatric Association (APA), 1994; Rosenthal, 1992). The present study has calculated the proportion of revenue derived from problem and pathological gamblers combined. However, other people might consider that the proportion derived from 'addicts' (i.e., pathological gamblers) (~19%) to be the more relevant figure.

Policy Implications

An argument can be made that because Ontario (and other provinces) appear to derive a substantial portion of their gambling revenue from problem gamblers that government-sponsored gambling is therefore contrary to the interests of the general populace and contrary to the purpose of government. Thirty-six percent would be a problematic figure for private industry, but is especially problematic for a government-run operation, when the purpose of government is to serve the people, not to exploit the people.

The Ontario government is aware of these findings (e.g., Williams, 2006), but have argued that Ontario has an economic need for gambling revenue (e.g., Globe & Mail, 2004), and that Ontario puts more money into prevention, treatment, and research of problem gambling than any other jurisdiction in the world (Sadinsky, 2005). However, it needs to be pointed out that Ontario spends 13 times more money *advertising and promoting* gambling as they do on prevention and treatment (Williams, 2006). Furthermore, the $36 million put into gambling prevention, treatment and research in 2003/2004 only represents 2.6% of the $1.41 billion dollars estimated to have derived from problem gamblers in that time period. It is also far from clear whether gambling revenues represent true economic gain. Gambling revenues largely come from a transfer of wealth, rather than creation of wealth (e.g., Grinols, 2004).[4] Furthermore, this is not an innocuous transfer, as it harms a significant minority of people (problem gamblers) in the process, and it tends to generate its revenue through the cannibalization or crowding-out of other (privately owned)

entertainment industries (e.g., Grinols, 2004).

That being said, at this stage it would be difficult for provincial governments to suddenly stop providing gambling, as it would likely promote illegal gambling and a significant outflow of revenue to neighbouring jurisdictions. It is also not clear that a massive increase in the amount of money redirected to prevention and treatment is needed, as there do not currently exist significant waiting lists for treatment. Rather, what is primarily needed is the implementation of effective policies to minimize the negative impacts of gambling and substantially reduce the disproportionate financial draw from problem gamblers. There are other consumer products whose legal provision results in harm to a segment of users (e.g., cars, firearms, alcohol, tobacco). However, in these cases there exist laws and policies that effectively mitigate the harm. In contrast, while Canadian provinces employ a wide range of 'responsible gaming' policies, very few of them are well designed or effective (Williams, 2006; Williams, West & Simpson, 2007a; 2007b). A comprehensive review of educational and policy initiatives that *are* effective is contained in Williams et al. (2007a; 2007b). Broadly speaking, they include:

- Comprehensive school-based prevention programs.
- Restrictions on the general availability of gambling (e.g., restricting the number and location of gambling venues; restricting or eliminating the most harmful forms of gambling (i.e., gambling machines; Internet gambling)).
- Restrictions on who can gamble (e.g., enforceable casino self-exclusion contracts).
- Restrictions on how gambling is provided (e.g., automatic intervention for at-risk gamblers at gambling venues; restrictions or elimination of concurrent use of alcohol and tobacco; restricting access to money (e.g., automatic teller machines); structural independence between gambling regulators and gambling providers).

Footnotes

1. A problem gambler is defined as someone whose gambling has caused significant adverse consequences for himself/herself or people in his/her immediate social network. These adverse consequences can be financial (e.g., bankruptcy), psychological (e.g., depression), social (e.g., marital problems), legal (e.g., criminal charges), or related to general health (e.g., high blood pressure due to stress) (Ferris, Wynne, & Single, 1999).
2. Contrary to expectation, problem gamblers who participated in the study were not more difficult to contact than nonproblem gamblers. Using exhaustive attempts over several months, the average number of attempts to establish contact for the entire sample was 5.2 compared to 5.7 for moderate and severe problem gamblers. Ninety-five percent of the total sample was contacted within 15 phone calls and 95% of both moderate and severe problem gamblers were contacted within 16 phone calls. Subsequent prevalence studies may wish to use these numbers to guide their RDD protocol.
3. Changing the values of the top and bottom 1% of the data to the values just below the 99th and just above the 1st percentile respectively. For example, the series: 2, 60, ….100,…. 160, 2000 would be changed to 59, 60, ….100,…., 160, 161.
4. Jurisdictions that derive their gambling revenue from nonresidents (as does Ontario to some extent) have a true influx of wealth. Furthermore, there tends to be very little associated economic or social cost to the jurisdiction offering the gambling, as the social problems that are created go home with the nonresidents.

Acknowledgements

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Table 1. Prevalence of Problem Gambling in Ontario using the Canadian Problem Gambling
Index

Category	Percentage	Projected Number in the General Ontario Adult Population
Nongamblers and Nonproblem gamblers CPGI 0	87.75% $\pm$ .8 95% confidence level	8,283,175
Low Risk Gamblers CPGI 1-2	7.51% $\pm$ 2.3 95% confidence level	709,069
Moderate Problem Gamblers [1] CPGI 3-7	3.76% $\pm$ 2.4 95% confidence level	355,007
Severe Problem Gamblers CPGI 8+	1.00% $\pm$ 2.4 95% confidence level	94,417

1. The Moderate Problem Gambling category is also known as the Moderate Risk Gambling category. We believe the 'moderate problem gambling' description is more appropriate for two reasons. The first concerns comparability to other instruments, as people who score 3 to 7 on the CPGI most typically score in the 'problem gambling' range on the SOGS (3 to 4) and people who score 8 and above on the CPGI tend to score in the 'pathological gambling' range on the SOGS and DSM-IV. Secondly, almost everyone scoring 3 and above on the CPGI is reporting problems associated with their gambling. In the present study (as well as other CPGI studies), this most commonly is: feeling guilty about gambling, chasing losses, and betting more than they can afford to lose. Score distributions for the CPGI and SOGS show gambling to exist on a continuum with problem and pathological gambling with no clear pattern of scores or symptoms clearly differentiating 'problem gamblers' from nonproblem gamblers. Thus, self-report of 'problems' would appear to offer the best method of making this demarcation.

Table 2. Demographic Characteristics of the Four Categories of Ontario Gamblers.

	Nongamblers and Nonproblem gamblers (CPGI 0)	Low Risk Gamblers (CPGI 1-2)	Moderate Problem Gamblers (CPGI 3-7)	Severe Problem Gamblers (CPGI 8+)
Age	44.5 (16.6)	39.4 (17.1)	39.9 (15.1)	40.1 (14.5)
Gender	43.6% male	56.4% male	60.7% male	61.6% male
Race/Ethnicity [1]	69.7% European-Canadian 7.0% Asian-Canadian 1.6% Aboriginal 20.2% Canadian 1.4% Other	73.0% European-Canadian 6.3% Asian-Canadian 2.8% Aboriginal 16.8% Canadian 1.1% Other	73.8% European-Canadian 6.0% Asian-Canadian 1.8 Aboriginal 17.4% Canadian 1.0% Other	65.9% European-Canadian 6.2% Asian-Canadian 7.0% Aboriginal 16.2% Canadian 5.0% Other
Marital Status	59% married or common-law 19% widowed, divorced, or separated 21% single (never married)	56% married or common-law 17% widowed, divorced, or separated 27% single (never married)	52% married or common-law 21% widowed, divorced, or separated 26% single (never married)	40% married or common-law 28% widowed, divorced, or separated 30% single (never married)
# Adults in Household	2.0 (0.9)	2.2 (1.0)	2.1 (0.9)	2.3 (1.1)
Household Income	$70,980 (55,482)	$70,289 (59,811)	$60,801 (46,745)	$58,536 (73, 264)
Level of Education	61.4% some education beyond high school	42.4% some education beyond high school	43.2% some education beyond high school	35.1% some education beyond high school
Median Retrospective Estimate of Past Month Gambling Expenditure [2]	0	-$20	-$50	-$200
Average Retrospective Estimate of Past Month Gambling Expenditure [2]	+$10 (16)	-$496 (10,268)	-$615 (4,905)	-$6327 (36,803)

Note: Numbers in brackets are standard deviations.
1.   Primary ethnic/racial group as identified by the respondent.
2.   This is just for the 2528 individuals who reported spending more than $9 in a typical month on gambling.

Table 3. Ontario Gambling Revenues (after prizes/winnings but before operating expenses).

	Total Revenue	Estimated Revenue from Ontario Residents
Gambling Machines [1]	$3,135,660,000	$1,818,682,800
Lottery Products & Satellite Bingo [1]	$1,074,080,000	$1,074,080,000
Casino Table Games [1]	$494,219,000	$286,647,000
Bingo, Raffles, Break-Open Tickets [2]	$563,000,000	$563,000,000
Horse Racing [3]	$277,194,500	$277,194,500
Aboriginal Casino [4]	$20,000,000	$18,000,000
TOTAL	$5,564,153,500	$4,037,603,000

1. As reported by OLGC in fiscal year 2002/2003. Lottery & Satellite Bingo revenue before prizes were deducted totalled $2,208,776,000 (OLGC, 2004).
2. As reported by AGCO in fiscal year 2002/2003.
3. As reported by CPMA in calendar year 2003.
4. Projected revenue based on per table revenue in other charity casinos.

Table 4. Comparison of Diary Participants and Diary Nonparticipants as a Function of Gambling Status

	Nonproblem Participants	Nonproblem Nonparticipants	Significance
age	45	48	t = .03, ns
gender	47.9% male	52.4% male	χ^2= .65, ns
household income	$79,170	$59,690	t = .04, ns
median retrospective expenditure estimate	-$15	-$11	z = -1.2, ns
average retrospective expenditure estimate	+$254	+$40	t = .43, ns
CPGI score	0	0	N/A
	Low Risk Participants	Low Risk Nonparticipants	Significance
age	43	42	t = -.72, ns
gender	48.6% male	50.8% male	χ^2= .11, ns
household income	$61,040	$67,180	t = -.47, ns
median retrospective expenditure estimate	-$20	-$20	z = -.68, ns
average retrospective expenditure estimate	-$2048	+$74	t = -.25, ns
CPGI score	1.3	1.3	t = .29, ns
	Moderate Problem Participants	Moderate Problem Nonparticipants	Significance
age	47	43	t = -.10, ns
gender	45.5% male	55.0% male	χ^2= 1.37, ns
household income	$54,061	$62,570	t = -.25, ns
median retrospective expenditure estimate	-$45	-$63	z = -.75, ns
average retrospective expenditure estimate	-$158	-$1034	t = .33, ns
CPGI score	4.4	4.6	t = -.45, ns
	Severe Problem Participants	Severe Problem Nonparticipants	Significance
age	41	44	t = .41, ns
gender	50% male	57% male	χ^2= .28, ns
household income	$46,330	$67,690	t = -.46, ns
median retrospective expenditure estimate	-$170	-$206	z = -.33, ns
average retrospective expenditure estimate	-$1610	-$9571	t = .44, ns
CPGI score	11.3	12.1	t = -.53, ns

Table 5. Four Week Gambling Expenditures from the Prospective Diaries (as well as Retrospective Estimates from the Telephone Survey).

Prospective Diary Expenditures	N	Average	Average (top & bottom 1% winsorized within category)	Average (only people reporting losses)	Median	Mode	% break even or no spending	% winners	Average Time Spent per Week [1]
NonProblem Gamblers	156	+$13.00	-$19.44	-$63.44	-$18.52	0	8.1%	12.8%	1.0 hrs
Low Risk Gamblers	116	-$91.48	-$96.00	-$127.28	-$27.00	-$24.00	1.7%	15.8%	1.2 hrs
Moderate Problem Gamblers	60	-$101.44	-$76.60	-$239.00	-$71.00	-$21.00	0%	16.9%	3.6 hrs
Severe Problem Gamblers	32	+$573.60	-$453.68	-$743.40	-$247.52	None	0%	18.2%	6.9 hrs
Retrospective Estimates from Telephone Survey	N	Average	Average (top & bottom 1% winsorized within category)	Average (only people reporting losses)	Median	Mode	% break even or no spending	% winners	Average Time Spent per Week
NonProblem Gamblers	156	+$240.45	-$23.51	-$50.64	-$12	-$10	12.8%	8.6%	N/A
Low Risk Gamblers	116	-$1832.37	-$49.35	-$2686.71	-$15	0	12.7%	11.8%	N/A
Moderate Problem Gamblers	60	-$139.83	-$114.07	-$218.00	-$45	-$100	10.9%	12.7%	N/A
Severe Problem Gamblers	32	-$1610.08	-$1163.88	-$1989.19	-$170	-$200	9.0%	9.0%	N/A

1. Number of days gambled in the past 28 was 14.4 (severe problem gambler); 13.1 (moderate problem gambler); 9.7 (low risk gambler); 7.6 (nonproblem gambler).

Table 6. Projected Yearly Gambling Expenditures from the Prospective Diaries.

Category	%	Number in the General Ontario Adult Population	Total Yearly Expenditure (top & bottom 1% winsorized within category)	Total Yearly Expenditure (only people reporting losses)
Nongamblers (people reporting spending $0 in typical month)	40.87%	3,858,810	0	0
Nonproblem Gamblers (spending $1-$8 in a typical month)	17.99%	1,698,556	-$83,772,782	-$83,772,782
Nonproblem Gamblers (spending >$9/mo and CPGI 0	28.87%	2,725,810	-$688,866,703	-$2,248,030,023
Low Risk Gamblers CPGI 1-2	7.51%	709,069	-$884,918,112	-$1,173,253,930
Moderate Problem Gamblers CPGI 3-7	3.76%	355,007	-$353,515,971	-$1,103,006,749
Severe Problem Gamblers CPGI 8+	1.00%	94,417	-$556,856,359	-$912,464,771
Total	100%	9,441,668	-$2,567,929,927	-$5,520,528,256
Ontario Gambling Revenues			-$4,037,603,000	-$4,037,603,000
Ratio of Reported Expenditure to Actual Revenue			.64	1.37

Note: These figures represent the 4 week prospective diary expenditure values from Table 5 multiplied by 13 (to arrive at 52 weeks) multiplied by the estimated number of people in that category in the general population.

Table 7. Estimated Proportion of Ontario Gambling Revenue Derived from Problem Gamblers.

	Winsorized Data	Losses-Only Data
% Expenditure from Moderate Problem Gamblers	13.8%	20.0%
% Expenditure from Severe Problem Gamblers	21.7%	16.5%
% Expenditure from all Problem Gamblers	35.5%	36.5%

Table 8. Estimated Proportion of Gambling Revenue Derived from Problem Gamblers as a
Function of Type of Gambling

	Winsorized Data	Losses-Only Data
Lottery, Instant Win Tickets, & Sports Select	19%	17%
Bingo and Raffles	17%	28%
Casino Table Games	30%	35%
Horse Racing	38%	52%
Gambling Machines	62%	61%