Journal of Gambling Issues
Issue 39, September 2018
http://igi.camh.net/doi/pdf/10.4309/jgi.2018.39.4
DOI: http://dx.doi.org/10.4309/jgi.2018.39.4

special section

Gambling Behaviours and Problem Gambling Among Older Adults Who Patronize Ontario Casinos or Racinos

Nigel E. Turner,[1,2] Mark van der Maas,[1] John McCready,[1,3] Hayley A. Hamilton,[1,2] Tracy Schrans,[4] Anca Ialomiteanu,[1] Peter Ferentzy,[1] Tara Elton-Marshall,[1] Salaha Zaheer,[1] & Robert E. Mann[1,2]

[1] Institute for Mental Health Policy Research, Centre for Addiction and Mental Health, Toronto, Ontario, Canada
[2] Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada
[3] Healthy Horizons Consulting, Toronto, Ontario, Canada
[4] Focal Research Consultants, Halifax, Nova Scotia, Canada

Abstract

This study examined the rate of gambling problems among Ontario older adults at gambling venues. Herein we describe an intercept survey that took place at casinos and horse racing tracks with slot machines or other forms of casino games (racinos) in southwestern Ontario, Canada. This method provided a significant opportunity to obtain a large sample of older adult casino gamblers in order to understand the gambling habits and gambling problems of this population. We used an intercept recruitment method to obtain a sample of 2,103 older adults (aged 55 and older) who were gambling at each of the seven gaming venues, as well as a systematic quota sampling method for age category (e.g., 55–64, 65–74, and 75 and above) and sex. On average, the participants engaged in 3.6 forms of gambling in the past year, and 78.6% reported playing slot machines or other forms of electronic gaming machines monthly or more often. They reported spending an average of 3.29 hr gambling at casinos or racinos per visit and 134.9 hr at casinos or racinos per year. Just over one-fifth of the sample reported spending more than $6,000 in casinos or racinos in the past year. Based on the Problem Gambling Severity Index (PGSI), the proportion of the sample experiencing severe problem gambling (PGSI = 8+) was 6.9%, and an additional 20.3% reported moderate gambling problems (PGSI = 3 to 7).

Keywords: problem gambling, older adults, prevalence, on-site intercept study, bus tours

Résumé

Cette étude a examiné le taux de problèmes de jeu de personnes âgées de l'Ontario sur les sites de jeu. On y décrit un sondage par interception qui a eu lieu dans des casinos et des pistes de course de chevaux où se trouvent des machines à sous ou d'autres formes de jeux de casino (racinos) dans le sud-ouest de l'Ontario, au Canada. Cette méthode a fourni une occasion importante d'obtenir un vaste échantillon de joueurs de casino adultes plus âgés afin de comprendre les habitudes de jeu et les problèmes de jeu de cette population. Nous avons utilisé une méthode de recrutement par interception pour obtenir un échantillon de 2 103 aînés (âgés de 55 ans et plus) qui jouaient à chacun des sept sites de jeu, ainsi qu'une méthode d'échantillonnage systématique par quotas pour les catégories d'âge (p. ex. 55–64, 65–74 et 75 ans et plus) et le sexe. En moyenne, les participants ont joué à 3,6 formes de jeu au cours de la dernière année, et 78,6 % ont déclaré jouer aux machines à sous ou à d'autres formes de machines de jeux électroniques tous les mois ou plus souvent. Ils ont déclaré avoir consacré en moyenne 3,29 heures à jouer dans les casinos ou les racinos par visite et 134,9 heures dans les casinos ou les racinos par année. Un peu plus d'un cinquième de l'échantillon a déclaré avoir dépensé plus de 6 000 $ dans des casinos ou des racinos au cours de la dernière année. Selon l'Indice de gravité du jeu problématique (IGJP), la proportion de joueurs de l'échantillon ayant eu des problèmes de jeu excessifs (IGJP = 8 +) était de 6,9 %, et une autre partie de 20,3 % des joueurs a signalé avoir des problèmes de jeu modérés (IGJP = 3 à 7).

Introduction

The purpose of this study was to examine gambling habits and gambling problems among older adults who attend casinos and slot venues adjacent to racetracks, often referred to as racinos, in southwestern Ontario in order to identify and assess demographic risk factors for this population of gamblers.[1] A racino in Ontario is a racetrack that also includes slots and electronic or virtual table games, but no live table gaming (Ontario Lottery and Gaming Commission, 2017). Overall, little research has been done on gambling among older adults. Often, evidence on older adults is drawn from studies of gambling in the general adult population (Wiebe, Single, Falkowski-Ham, & Mun, 2004) or in clinical samples (e.g., Levens, Dyer, Zubritsky, Knott, & Oslin, 2005; Petry, 2002). Although this information is useful, these studies may be limited by small or biased samples. To improve our understanding of casino gambling in the older adult population, we focused our research on gambling venues.

[1]For this study, the four "Resort Casinos" in Ontario were excluded from the sample because of a higher expected volume of non-local and tourist visitors attending these larger destination-style gaming sites compared with Ontario Lottery and Gaming community-based casino sites and slot machine venues Ontario Lottery and Gaming Commission, 2017).

In this paper, we report the results of an intercept study of older adults gambling in casinos and racinos in Ontario, Canada. We describe gambling behaviour and gambling problems in this sample.

Gambling is a common behaviour among adults in Ontario (McCready, Mann, Zhao, & Eves, 2008; Wiebe, Single, & Falkowski-Ham, 2001). Gambling among the province's older adults appears to be generally similar to that seen among younger adults (e.g., McCready, Mann, Zhao, Birchall, & Eves, 2010; McCready, Mann, Zhao, & Eves, 2005). Evidence also suggests that adults aged 55 and over (hereafter referred to as older adults) may experience rates of problem gambling and harmful consequences broadly similar to those seen in younger cohorts (Ariyabuddhiphongs, 2012; McCready et al., 2005, 2008; Tse, Hong, & Ng, 2013; Tse, Hong, Wang, & Cunningham-Williams, 2012). Some research studies focussing on general gambling behaviour in older adults have suggested that gambling is a relatively problem-free recreational activity that provides positive social benefits for most older adults (Hope & Havir, 2002; Stitt, Giacopassi, & Nichols, 2003; Wiebe, 2000). For example, bingo can provide socialization, as well as excitement, and can function therapeutically to improve cognitive performance among older adults who have disorders such as Parkinson's and Alzheimer's (Laudate et al., 2012). Wiebe and colleagues (2004) found that 33.9% of older adults in Ontario reported that gambling provides a chance for "winning money," which might indicate a potential problem. However, Wiebe and colleagues (2004) also reported that 30.7% indicated that it provides "excitement and fun," and 20.9% reported that gambling is an opportunity to "socialize"—a healthier entertainment motive for gambling.

There has been concern that older adults may be at greater risk of developing gambling-related problems (Korn & Shaffer, 1999; Wiebe, 2002). General population studies, however, find that older adults gamble less often than younger adults (Korn & Shaffer, 1999; Wiebe, 2002). Nonetheless, the concern is that among those who do gamble, they may be at more risk for adverse consequences and less able to recover from those consequences. Although older adults do not display higher problem gambling rates than other age groups, some factors are worthy of special attention given that gambling participation among older adults has been on the rise with the advent of a greater variety, and greater accessibility, of gaming options (Gerstein, Murphy, Toce, Hoffman, & Palmer, 1999; Levens et al., 2005; Petry, 2002). Some studies have found that proximity to gambling opportunities is a strong predictor of problem gambling (Gerstein et al., 1999; Sévigny, Ladouceur, Jacques, & Cantinotti, 2008; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2004), and, according to Lister and Nower (2013), accessibility of gaming venues is a strong predictor of gambling participation among older adults. However, Shaffer (2005) has argued that the situation is more complex, suggesting that gambling problem rates may rise initially after the introduction of a gambling venue, but then gradually fall over time as people adapt to the presence of gambling.

In addition, it is important to consider that many community centres and retirement homes promote gambling as a recreational activity, including organizing bus tours to

casinos. The impact of these bus tours on the rates of problem gambling among older adults is unknown. Furthermore, the impact of gambling on older adults may be particularly adverse, as many are on fixed incomes with limited financial resources. It has been suggested that for older adults with fixed incomes, even small losses can have significant financial and legal impacts (Lemay, Bakich, & Fontaine, 2006; Levens et al., 2005; McComb, Lee, & Sprenkle, 2009). Conversely, other older adults sometimes have access to large sums of money from retirement savings, settlements, insurance policies, or other resources that are meant to sustain them through retirement. In either case, with a fixed income or access to savings, they may have a limited ability to recover financially from excessive gambling losses. Van der Maas, Mann, Matheson, et al. (2017) reported that people who take casino bus tours were twice as likely to have a severe gambling problem. The current study examined this effect in more detail by using multiple regression (rather than logistic regression) to see whether it is linear and to test whether it interacts with other variables.

Based on general population prevalence studies, older adult participation in gambling typically has been similar to that of the rest of the adult population or even lower than that of other adult cohorts, especially for higher risk forms of gambling; this has played a role in keeping the prevalence of gambling problems lower in this age group. For example, in the 2001 New Brunswick (NB) Senior Gambling and Substance Use Prevalence Study, the vast majority (97%) of seniors in NB were not identified as having any risk for problem gambling (Schellinck, Schrans, Walsh, & Grace, 2002). Only 3% of NB older adults scored as being at risk, with less than 1% scoring as severe problem gamblers. These rates were lower than those noted for adults in general in NB at that time, which was 1.4% (Schrans & Schellinck, 2001). This lower risk was primarily due to lower levels of involvement in machine gambling among older adults, which was associated with 90% of gambling problems that were identified in the province at that time (Schrans & Schellinck, 2001). However, Schrans and Schellinck (2001) concluded that changes in the distribution of gambling options available in NB may influence participation by seniors and their risk for problem gambling if games are introduced that have a greater appeal to seniors, such as bingo and slot machines.

The current study was designed to examine a number of questions related to problem gambling: (1) What are the patterns of gambling behavior, including frequency and spending, among older adults who patronize casinos and racinos? (2) How much money do older adults spend in total at gambling venues and how much do they spend relative to their income? (3) What is the rate of problem gambling among older adults who patronize casinos and racinos? (4) Based on the proximity theory, are people who live closer to the gambling venue at an increased risk of problem gambling? (5) Are people who take bus tours to gambling venues more likely to report gambling problems? (6) Are older adults who are on a fixed income disproportionately vulnerable to a gambling problem? If this is the case, will we find higher rates of problem gambling among the oldest participants (e.g., 75+) in the sample who are on a fixed income, which would produce an interaction of age and income?

Method

Procedure and Design

The fieldwork for the project was conducted by Focal Research, and the project was reviewed and approved by the Centre for Addiction and Mental Health ethics review board as Protocol #086/2013. At each location, four to six survey staff were available on-site during each data collection shift to provide assistance and oversight to participants who were asked to self-complete the survey on portable computer devices, specifically tablets. Assistance was given to any participant who asked for help. During each shift, eligible respondents were approached by trained interviewers in the exit/entrance area of participating gaming sites. Systematic quota sampling procedures were used to collect a target sample of 300 participants at each of seven sites, with representation from each of the key population segments. To ensure that the sample was representative of the full range of customers, we set up data collection to ensure balanced coverage of the days of the week and time of day (24-hr shift coverage), as well as desired cell quotas for sex, age, and time of day. We determined the interception sampling strategy by first observing the site for a day and then sampling to ensure that it was spread out across the day. If a site was very busy at a particular time of day, the sampling might be one in six people passing through the entrance area. If the traffic was slower, perhaps one in three would be sampled. Assisted administration of the survey was provided in a private area. Participating respondents were introduced to the study, provided with a written project description, and then asked for consent prior to taking part in the survey. On average, the survey length was approximately 20 min, ranging from 15 min to 45 min, depending on an individual's abilities and responses. Participants received a $10 gift card for completing the survey.

Participants

From July to September 2013, a total of 2,103 participants, aged 55 years and older, completed the survey. Systematic quota sampling procedures were implemented at each site, with stratification by age group (55-64, 65-74, and 75 and above) and sex (males and females) to ensure that samples were representative of older adults participating in gambling at these sites. People who fit the profile of the target sample were approached and told about the study. Each respondent was first screened to confirm age and residency eligibility and then introduced to the project. For each age and sex group, as quotas became filled, only those participants in the groups that had not been filled were invited to continue (e.g., once the quota for males aged 55 to 60 had filled, no more males in that age category would be surveyed). Participants had to be permanent residents of Ontario, age 55 or older, and able to complete the survey in English. In total, 4,345 potential casino patrons were intercepted over the seven casino sites, 2,103 participated in the study, and 774 were disqualified primarily because of age ineligibility (e.g., <55), with an overall refusal rate of 33.8% (n = 1,468). The completion rate (Completed + Terminated)/Total Approached) was 66% ([2,103 + 774]/4,345) and ranged from 61% to 73% across the seven sites.

Measures

The survey instruments included sociodemographic questions and measures of gambling behaviours and gambling-related problems. Problem gambling was measured by using the Problem Gambling Severity Index (PGSI), a widely validated measure that is part of the Canadian Problem Gambling Index (Ferris & Wynne, 2001). Problem gamblers for this study were defined as those scoring 8 or higher on the PGSI. Demographics included sex (male, female, other), age, marital status, education (less than high school, high school, high school, vocational training, college/university, postgraduate training/professional), employment (full time, part-time, self-employed, retired, homemaker, disabled, other), and household income (under $20,000, $20,001–$40,000, $40,001–$60,000, $60,001–$80,000, $80,001–$100,000, over $100,000). Education was measured by the highest level of education completed as reported by the respondent. Sex was self-reported as male, female, or other and coded dichotomously into "male" and "female" (no one selected other). Age was coded as a categorical variable with five levels ranging from 55 to over 75; however, in some of the tables, age is reported as three levels to save space.

Respondents were asked if they participated in the following gambling activities: instant win/scratch or daily lottery tickets (e.g., Keno), lottery draw tickets (e.g., 649), sports lottery (e.g., Proline), bingo, slot machines in slot locations/casinos, other casino games (e.g., poker, roulette), Internet or online gambling, live horse racing at a track or off-track betting parlour, playing cards/board games for money with family/friends, other forms of gambling. The questions were asked by using a 6-point scale: 0 (*never*), 1 (*less then monthly*), 2 (*monthly*), 3 (*more than monthly but less than weekly*), 4 (*weekly*), 5 (*daily*). Participants were also asked about the amount of money they spent gambling in the past year, frequency of casino visits, nature of casino visits (e.g., attending by oneself or as part of an organized bus tour), and number of non-casino gambling activities. In addition, respondents were asked how far they lived from the nearest gambling venue (in kilometres) and how many times in the past year they had gone to the casino as part of an organized bus tour or group visit. The total amount (in CAD) spent per year in a casino or slot venue was computed from two questions. The first question asked, "About how many times have you gone to a casino/slots location?" The second question asked, "On average, how much money do you spend gambling at the casino or slots location each time you go?" The participants' responses to these two questions were multiplied.

Analysis

Two sets of weights were computed. First, we computed weights from the relative customer flow through the seven gambling venues obtained from Ontario Lottery and Gaming, so that the result could be generalized to the overall patron population of the gambling venue. A sample of 300 was drawn from each venue regardless of size. To more accurately estimate the overall prevalence, we weighted up venues that had more visitors and weighted down venues with fewer visitors. For example, the Woodstock venue had the smallest number of customers and Woodbine had the

largest number, and so the weight for Woodstock participants was smaller than the weight for Woodbine participants, as shown in Formula 1:

$$\text{Weight } 1 = \text{PC}/\text{PS} \tag{1}$$

where PC is the proportion for each venue in terms of actual customers and PS is the proportion in the sample.

Second, we reverse-weighted the sample from the frequency of attending the gambling venue. The reason for this is that people who visit the gambling venues most are more likely to be sampled, which creates a frequency bias and distorts the outcome. To correct for it, we weighted down the most frequent visitors (weights less than 1) and weighted up the least frequent (weights greater than 1). The weights were computed directly from the individual's gambling frequency, as shown in Formula 2:

$$\text{RF} = (366 - F) \times n \tag{2}$$

$$\text{AF} = \text{sum } (\text{RF})/N$$

$$\text{Weight } 2 = (\text{RF}/\text{AF})/n$$

where RF = reverse frequency, F = frequency in the past year, n = number of people in the frequency category, N = total sample size, and AF = average frequency. The last line ensures that the resulting sample size will be the same as the original sample. These two sets of weights were multiplied together to create the final set of weights, as shown in Formula 3. Note that these calculations were done in Excel and then the weights imported into SPSS:

$$\text{Final weight} = \text{Weight } 1 \times \text{Weight } 2 \tag{3}$$

After the weights were computed, we examined the sample size with and without the weights to ensure that the sample size in the final result was correct.

Because of missing values for the frequency variable, the sample was reduced to 2,071. Most variables had between 0.5% and 1.6% additional missing values, except for the household income question, which had 17% missing values because people are often reluctant to provide their income (e.g., Mann et al., 2010). Analysis of the data included computation of cross-tabulations, analysis of variance, correlations, and multiple regression. For simple correlations, Spearman correlations were used because they are non-parametric and not biased by skew. For analysis of variance and for multiple regression, the scores of several variables were transformed because skewed data can produce distorted results and do not meet the assumptions of the statistical analysis procedures used in this paper (see Kirk, 1982, p. 79). Various transformations, including logarithmic, have been used in previous studies (e.g., Clarke, 2004; Mishra, Lalumiere, & Williams, 2017; Turner, Jain, Spence, & Zangeneh, 2008; Turner, Preston, Saunders, McAvoy, & Jain, 2009). A log transformation was selected because it corrects for the skewness, is easy to understand (e.g., a log score of 3 = 1,000), and mathematically can be translated back into non-log units to obtain the geometric mean. PGSI scores (raw data skew = 2.8, *SE* = .05; log 10 skew = -0.003, *SE* = .05),

money spent (raw skew = 13.8, *SE* =.05; 1og 10 skew = -0.37, *SE* = .05), and proportion of income spent (raw data skew = 10.2, *SE* =.06; log 10 skew = -0.22, *SE* = .06). were transformed by using a log 10 transformation to reduce skew of the data. Results are presented in terms of raw mean, log mean, and geometric mean. The geometric mean was computed based on 10 to the power of the log mean (10^{logmean}).

Results

The final data set comprised 949 males (45.8%) and 1,122 (54.2%) females. The sample included 712 individuals aged 55–64 years, 761 aged 65–74 years, and 596 aged 75 years or more. The largest portion of the sample reported being married or living with a partner (65.9%), whereas only 6.5% reported being single or never married, and 16.1% reported being widowed. Nearly 40% were high school graduates, followed by 30% who had completed college or university and 18% who reported not completing high school. Regarding employment, the sample was predominantly composed of retired individuals (70.9%), with 12.7% reporting full-time employment. The modal household income range reported by the sample was $20,001–$40,000 (27.3%), and a household income of more than $100,000 was reported by the lowest proportion of the sample (4.0%).

Table 1 presents the types of gambling reported by respondents and how often they participated in these forms of gambling. Overall, respondents reported participating in a mean of 3.61 different types of gambling. The most frequent form of gambling reported was playing slot machines in casinos or racinos, with 78.6% of the sample reporting engaging in these games monthly or more often. Significant differences were observed in this measure by sex and age, which were examined by using Spearman correlations. Males reported participating in more games overall (ρ = -.13, $p < .001$) and, in particular, they more frequently played horse racing (ρ = -.17, $p < .001$), other casino games (ρ = -.20, $p. < .001$), sports lotteries (ρ = -.18, $p < .001$), and even slot machines (ρ = -.13, $p < .001$). Bingo was the only game that females reported playing more often than males did (ρ =.16, $p < .001$). The younger gamblers also reported playing more types of games (ρ = -.13, $p < .001$) and more often participating in several games, including instant wins (ρ = -.14, $p < .01$) and sports lotteries (ρ = -.11, $p < .01$). However, older gamblers reported playing slot machine games somewhat more often than younger players did (ρ = .13, $p < .01$). Although some of these effects are highly significant, the effect sizes for both age and sex differences ranged from small to very small.

The next most commonly reported forms of gambling were instant win/scratch or daily lottery tickets (e.g., Keno) and lottery draw tickets (e.g., 649). Most participants reported engaging in these forms of gambling, with only 24.8% reporting that they had not participated in win/scratch or daily lottery tickets in the past year, and 17.1% reporting that they had not participated in lottery draw tickets in the past year. The majority of respondents had participated in these forms of gambling in the past month (52.1% and 61.3%, respectively).

Table 1
Percentage Reporting Type and Frequency of Gambling (N = 2,071).

How often in the past year have you spent money on …	Not in last year	Less than once/ month	Monthly or more often	Correlation with age		Correlation with female	
				ρ	*p*	ρ	*p*
Instant win/scratch or daily lottery tickets (e.g., Keno)	24.8%	23.0%	52.1%	-0.14	**	0.00	
Lottery draw tickets (e.g., 649)	17.1%	21.7%	61.2%	-0.08	**	-0.11	**
Sports lottery	85.1%	5.5%	9.4%	-0.11	**	-0.18	**
Bingo	80.9%	9.2%	9.9%	0.03		0.16	**
Slot machines in casinos or racinos	0.7%	20.7%	78.6%	0.13	**	-0.13	**
Other casino games (e.g., poker, roulette)	81.0%	7.1%	12.0%	-0.12	**	-0.20	**
Internet or online gambling	96.2%	1.2%	2.6%	-0.07	**	-0.10	**
Live horse racing at track or off-track	77.8%	12.5%	9.7%	-0.06	**	-0.17	**
Playing cards/board games for money with family/friends	81.5%	8.3%	10.2%	-0.04		-0.06	**
Other forms of gambling	89.8%	6.2%	4.0%	-0.11	**	-0.05	*
Average number of games played (*SD*)	3.6 (1.5)			-0.13	**	-0.13	**

Note. For sex, female = 2, male = 1, and so a negative correlation means that males play that game more often. Age is based on age category (1 = 55 to 64, 2 = 65 to 74, 3 = 75 and over). All games were scored on an ordinal 6-point frequency distribution from 0 (*never*) to 5 (*daily*). Number of games is the total number of games the participants played in.
* $p < .05$.
** $p < .01$. *ns* = $p > .05$.

Other forms of gambling were less common, but still reported by a significant number of respondents. Past-year participation in sports lotteries, bingo, other casino games such as poker or roulette, live or off-track horse racing, and playing cards or board games for money were each reported by about 15–20% of respondents, with about 10% reporting that they participated in these activities monthly or more often.

Finally, participation in Internet gambling and other forms of gambling not listed was less common. Less than 10% of participants reported engaging in these types of gambling activities in the past year, with less than 5% of the sample reporting regular playing patterns of at least once a month or more often.

Table 2 presents the mean hours spent gambling at casinos or racinos, per visit and per year, by age group, sex, frequency of casino visits, nature of casino visits, dollars spent on gambling in the past year, and number of non-casino gambling activities reported. Respondents reported spending an average of 3.29 hr gambling at casinos or racinos per visit and 134.9 hr gambling at casinos or racinos per year. There were no age group differences for hours spent gambling per visit. However, older respondents spent significantly more hours per year gambling in casinos or racinos than younger respondents did. Females (M = 3.48, SD = 2.59) spent more hours per visit in casinos or racinos than males did (M = 3.05, SD = 1.76, t = -4.6, $p < .001$).

Table 2
Number of Hours Spent Gambling at Casinos or Racinos.

	Total (*N*)	Mean hours/visit (*SD*)	Mean hours/year (*SD*)
Total sample	2,054	3.29 (2.26)	134.89 (214.81)
Age		*ns*	*ns*
55–64	705	3.42 (2.38)	128.87 (195.59)
65–74	753	3.18 (2.13)	132.43 (263.53)
75+	593	3.25 (2.28)	145.01 (161.71)
Sex		***	*ns*
Male	937	3.05 (1.76)	144.51 (193.43)
Female	1,117	3.48 (2.59)	126.84 (231.01)
Frequency of casino visits		***	*ns*
<1 time/month	425	2.92 (1.77)	25.38 (43.11)
1+ times/month	1,593	3.41 (2.38)	165.70 (233.67)
Nature of casino visits		***	***
Attend independently (not on a bus)	1,211	3.09 (1.76)	112.84 (159.61)
Attend in organized group (e.g., bus)	835	3.58 (2.82)	167.11 (273.67)
$ Spent on gambling, past year		***	***
Less than $1,800	843	2.58 (1.35)	37.65 (40.48)
$1,800–6,000	766	3.21 (1.62)	128.36 (86.50)
Over $6,000	409	4.86 (3.64)	344.86 (380.90)

Note. Significance of group differences (age, sex, etc.) for dollars spent based on *t* or *F* tests:
***$p < .001$. *ns* = $p > .05$.

However, males ($M = 45.48$, $SD = 45.06$) reported visiting the casino more often than females did ($M = 33.15$, $SD = 33.59$, $t = 7.2$, $p < .001$). These two differences cancel each other out and, as a result, there was no significant difference between the estimated total yearly hours spent gambling between males and females ($t = 1.8$, $p = .06$). Individuals who reported visiting the casino once a month or more also reported spending more hours per visit ($M = 3.41$, $SD = 2.38$) than did those who reported visiting the casino less than once a month ($M = 2.92$, $SD = 1.77$) and, not surprisingly, more hours per year gambling in casinos or racinos. Individuals who reported attending casinos or racinos as part of a group reported spending more hours per visit and more hours per year gambling in casinos or racinos than did those who reported visiting casinos or racinos independently. Among the total sample, 41.8% reported spending less than $1,800, 37.9% reported spending between $1,800 and $6,000, and 20.3% reported spending more than $6,000. Not surprisingly, as the amount of money spent in casinos or racinos in the past year increased, so did the hours spent in casinos or racinos per occasion and in the past year.

Table 3 presents the amount of money spent gambling in casinos or racinos by age group, sex, frequency of casino visits, nature of casino visits, dollars spent on gambling in the past year, and number of non-casino gambling activities. There was substantial variability in the amounts people reported spending, with the maximum amount spent per visit ranging up to $3,000 and the maximum spent per year ranging up to $480,000. The amount spent per year or per visit did not differ by age group. Neither per visit nor per year spending differed between males and females.

Table 3
Amount of Money Spent on Gambling at Casinos or Racinos.

		Spent per year		$ Spent per visit		
	Total (*N*)	Mean per year ($)	Median per year ($)	Mean per visit ($)	Median per visit ($)	Maximum per visit ($)
Total sample	2,023	5,698.67	2,400	137.85	100.00	3,000
Age		*ns*		*ns*		
55–64	712	5,708.10	2,080	150.03	100	3,000
65–74	761	5,858.28	2,215	132.85	100	3,000
75+	596	5,484.53	2,500	129.44	100	1,500
Sex		*ns*		*ns*		
Male	926	5,996.79	2,488	129.37	100	3,000
Female	1,100	5,472.44	2,000	146.07	100	3,000
Frequency of casino visits		***		***		
<1 time/month	421	914.27	480	110.68	80	1,000
1+ times/month	1,571	7,057.44	3,000	148.97	100	3,000
Nature of casino visits		*ns*		*ns*		
No bus tour to casino	1,193	5,038.97	2,000	140.43	100	3,000
Bus tour to casino	825	6,685.15	2,400	136.18	100	3,000

Note. Significance of group differences (age, sex, etc.) for dollars spent based on *t* and *F* tests:
***$p < .001$. *ns* = $p > .05$.

Not surprisingly, compared with people who reported visiting the casino less than once a month, people who reported visiting the casino more than once a month reported spending over 7 times more in total per year and spending more per visit. Respondents who reported attending casinos or racinos in groups reported spending over $1,000 more per year at casinos or racinos than did those who reported attending casinos or racinos only independently (not as part of a bus tour). However, after the log 10 transformation, the *t* test of this difference fell just short of significant ($t = 1.7$, $p = .08$).

Table 4 summarizes levels of problem gambling, as determined by the PGSI among respondents, by age group, sex, frequency of casino visits, nature of casino visits, dollars spent on gambling in the past year, and number of non-casino gambling activities reported. Overall, the largest proportion of respondents fell into the no-risk category with a score of 0 on the PGSI (42.1%), followed by the low-risk category with a score of 1–2 (30.6%). Scores of 3–7 correspond to a moderate risk of problem gambling, with 20.3% of respondents falling into this category, whereas scores of 8 or more correspond to severe problem gambling, with 6.9% of respondents falling into this category. Significant differences in PGSI scores were seen with age. The older respondents were less likely to fall into the severe problem gambling category. Nearly 10% of those aged 55 to 65 scored in the severe problem range, but only 4.5% of those over 75 were severe problem gamblers. No significant differences between males and females were found. The frequency of casino visits had a significant impact on PGSI scores, with people who attended one or more times a month more likely than

Table 4
Percentage Reporting Levels of Problem Gambling.

	Total (*N*)	No risk 0	Low risk (1–2)	Moderate risk (3–7)	Severe problem (8+)
Total sample	2,060	42.1%	30.6%	20.3%	6.9%
Age***					
55–64	704	35.2%	27.6%	27.4%	9.8%
65–74	757	47.8%	29.9%	16.8%	5.5%
75+	595	43.2%	35.6%	16.6%	4.5%
Sex, *ns*					
Male	943	43.3%	28.1%	21.7%	6.9%
Female	1,117	41.2%	32.8%	19.2%	6.9%
Frequency of casino visits***					
<1 time/month	423	54.1%	30.0%	14.7%	1.2%
1+ times/month	1,600	38.6%	31.2%	21.8%	8.4%
Nature of casino visits***					
Attend independently	1,212	45.2%	30.0%	20.0%	4.8%
Attend in organized group	839	38.0%	31.1%	20.9%	10.0%
$ Spent on gambling, past year***					
Less than $1,800	837	54.2%	29.7%	13.6%	2.4%
$1,800–6,000	769	38.9%	32.2%	23.1%	5.7%
Over $6,000	413	21.5%	30.3%	29.5%	18.6%

Note. Significance of group differences (age, sex, etc.) for dollars spent based on chi-square tests:
***$p < .001$. *ns* = $p > .05$.

less frequent attendees to fall into the severe problem gambling category (8.4% vs. 1.2%, respectively). The nature of casino visits also exerted a significant effect on PGSI scores, with those who typically attended as part of an organized group being more likely to fall into the severe problem gambling category than were those who attended independently (10.0% vs. 4.8%, respectively). The likelihood of being classed as a problem gambler by the PGSI increased with amount spent on gambling. Among those who spent less than $1,800, spent between $1,800 and $6,000, and spent more than $6,000, the proportions classified as being severe problem gamblers were 2.4%, 5.7%, and 18.6%, respectively. Finally, the number of gambling activities reported by respondents also affected the likelihood of being identified with severe problem gambling by the PGSI. In addition, participants who reported engaging in more than three types of gambling activities were significantly more likely to fall into the severe problem category (12.9%) than were those who reported participating in three or fewer types of games in the past year (6.4%).

Additional analyses found that problem gambling rates were related to marital status, income, and employment. For marital status, the prevalence of severe problem gambling was lower among married respondents (5.5%) and higher among divorced (12.9%), separated (9.9%), widowed (8.1%), and single (8.5%) participants, χ^2 (15, n = 2,062) = 65.4, $p < .001$. For income, severe problem gambling was highest among those who reported earning less than $20,000 (10.6%), ranged from

Table 5
Mean and Standard Deviation for Raw and Log-Transformed Money Spent in Past Year by Problem Gambling Severity Index (PGSI) Category.

PGSI category	*N*	Mean	*SD*	Log mean	Log *SD*	Geometric mean	Sum	Percentage of total spent
No risk	842	3,136	5,560	3.09	0.66	1,237	2,640,512	22.9%
Low risk (1–2)	621	6,267	28,305	3.33	0.59	2,147	3,891,807	33.7%
Moderate risk (3–7)	413	7,545	16,403	3.50	0.61	3,135	3,116,085	27.0%
Severe problems (8+)	141	13,401	17,958	3.84	0.54	6,893	1,889,541	16.4%
Total	2,018	5,722	18,560	3.30	0.66	2,000	11,546,996	100.0%

Note. Bonferroni-corrected tests on the log-transformed values indicate that all means are significantly different. Log 10 transformations were used because of the skewness of the variables.

6.9% to 7.5% for those who earned between $20,000 and $100,000, and was lowest among the small number of people who reported earning over $100,000 (4.9%), $\rho = -.105$, $p < .001$. In terms of employment, problem gambling was lowest among those who reported that they were retired (4.5%) or who were homemakers (7.5%) and highest among those who reported being employed full time (12.9%) or who were supported by disability benefits (16.7%). Those who were employed part-time or were self-employed had intermediate levels of problems (9.6% and 9.2%, respectively). The severity of problem gambling was not related to sex or education.

On average, severe problem gamblers reported spending $13,401 on gambling in the past year, which was significantly more than all other groups (see Table 5). As noted earlier, spending was highly skewed and so the values were log transformed. The geometric mean for spending by problem gambler was $6,893, which is more than 2 times the geometric mean of spending by the moderate-risk group, 3 times the geometric mean of the low-risk group, and more than 5 times the geometric mean of the no-risk group. A one-way analysis of variance on the log 10-transformed spending per year was highly significant $F(3, 2023) = 87.01$, $p < .001$. Bonferroni-corrected post hoc tests indicated that all of the PGSI categories of gamblers differed significantly in terms of spending. In total, the sample reported spending 11.5 million dollars at the casino. Severe problem gamblers alone reported spending just over 1.9 million dollars in total. From these numbers, we estimate that 16.4% of the money spent at the casino by this sample was spent by severe problem gamblers and a further 27.0% by moderate-risk gamblers.

In addition, we computed the amount of money spent by the participants as a proportion of their income. The results shown in Table 6 indicate that severe problem gamblers on average spent 68.6% of their income on gambling, whereas non-problem gamblers on average reported spending 10.2% of their income on gambling. However, as noted in the Analysis section, money spent was skewed and the geometric mean of income spent (10^{logmean}) was 23.4% for severe problem gamblers and 3.4% for non-problem gamblers. A one-way analysis of variance on log 10-transformed spending per year was highly significant, $F(3, 1701) = 79.1$, $p < .001$. Bonferroni-corrected post hoc

Table 6
Mean, Standard Deviation, Log Values Mean, and Geometric Mean for Percentage Income Spent on Gambling by Problem Gambling Severity Index (CPGI/PGSI) Category.

PGSI category	*N*	% of income spent	*SD*	Geometric mean	Log mean	Log *SD*
No risk	690	10.2%	19.9%	3.4%	-1.47	0.71
Low risk (1–2)	522	17.5%	50.5%	6.2%	-1.21	0.64
Moderate risk (3–7)	362	29.5%	57.5%	10.2%	-0.99	0.65
Severe problems (8 +)	132	68.6%	145.6%	23.4%	-0.63	0.64
Total	1,706	21.1%	59.3%	6.0%	-1.22	0.72

Note. Bonferroni-corrected tests conducted on the log mean values indicated that the proportion of income spent by severe problems was significantly different from that of all other groups. All groups differed significantly. Log 10 transformations were used because of the skewness of the variables. CPGI = Canadian Problem Gambling Index.

Table 7
Distance the Participant Lives From Nearest Casino/Racino and Problem Gambling Severity Index Average Scores.

Distance from nearest casino/slot location	*N*	% of population	*M*	*SD*	Log mean	Log *SD*	Geometric mean
1. 0–10 km	561	27.5%	2.07	3.29	-0.12	0.74	0.76
2. 11–25 km	757	37.1%	2.09	2.84	-0.13	0.75	0.74
3. 26–50 km	545	26.7%	1.78	2.89	-0.23	0.75	0.59
4. 51–100 km	131	6.4%	1.58	2.36	-0.21	0.72	0.62
5. Over 100 km	48	2.3%	3.62	5.27	0.06	0.80	1.15
Total	2,043	100.0%	2.00	3.05	-0.15	0.75	0.71

Note. Over 100 km is significantly different from all other distances. Geometric mean was computed based on 10 to the power of the log mean.

tests indicated that all of the PGSI categories of gamblers differed significantly in terms of spending.

As shown in Table 7, 27.5% of the participants reported living within 10 km of the gambling venue, and another 37.1% lived between 11 and 25 km from their nearest gambling venue. Only 2.3% reported travelling more than 100 km. As expected, people who lived less than 25 km away had somewhat higher scores on the PGSI than did those who lived 26 to 100 km away. However, the highest PGSI scores were among those living more than 100 km from the casino. Analysis of variance found a significant difference in means, depending on distance $F(4, 2068) = 2.9$, $p < .05$, and, in particular, a significant deviation from linearity $F(3, 2068) = 3.8$, $p < .01$, suggesting that problem gambling is highest among those who have the farthest or the least distance to travel.

As noted earlier, people who attended the casino as part of an organized bus tour scored higher on the PGSI. In Table 8, we present the results of bus data broken

Table 8
Number of Bus Tours Attended in the Past Year and Problem Gambling Severity Index (PGSI) Scores.

Bus tour or organized group	*N*	Mean	*SD*	Log mean	Log *SD*	Geometric mean
0	1,213	1.79	2.715	-0.21	0.74	0.61
1	225	2.15	3.81	-0.17	0.75	0.68
2	191	2.48	2.89	0.02	0.72	1.05
3	106	2.50	4.56	-0.19	0.80	0.64
4	53	2.20	2.596	0.05	0.77	1.12
5 or more	263	2.38	3.26	-0.05	0.76	0.90
Total	2,052	2.01	3.06	-0.15	0.75	0.70

Note. Log means were computed because of the skewness of the PGSI score. Geometric mean was computed based on 10 to the power of the log mean.

down in terms of how many bus tours the individual has been on. As shown in Table 8, 13.4% reported going to a casino or racino as part of an organized bus tour five or more times in the past year. Also shown in Table 8, in general, people who attended the casino as part of an organized bus tour more often scored higher on the PGSI ($\rho = .08$, $p < .001$). In fact, 11.0% of people who attended as part of a group scored in the severe problem gambling category compared with only 5.2% of those who attended independently, χ^2 (3, 20161) = 29.4, $p < .001$. Additional analysis to examine whether those who travelled more than 100 km were more likely to be on a bus tour found no significant association ($\chi^2 = 0.35$, *ns*).

These analyses revealed a number of variables related to problem gambling, including income, being retired (retired vs. other), marital status (married vs. other) and age range, bus tours, and distance to the nearest casino or racino. These variables were entered into a multiple regression analysis on log 10-transformed PGSI scores. As shown in Table 9, the negative slope for income indicates that higher income individuals are less likely to report problems. Age, being married, and being retired all had negative slopes, indicating that these variables were associated with lower PGSI scores. The positive slope for bus tours indicated that the more a person attended the casino by bus, the higher they scored on the PGSI. Distance to the nearest casino was not significant. The overall model was highly significant, $F(6, 1701) = 16.7$, $p < .001$, $R = .236$.

In Tables 7 and 8, distance to the nearest casino and number of bus tours showed a trace of a curvilinear relationship with log PGSI scores. Curve estimation also suggested a slight curvilinear relationship between these two variables and PGSI scores. Furthermore, as noted earlier, we hypothesized (Hypothesis 6) that the oldest adults in the sample (e.g., 75+) with a low income could be disproportionately affected by gambling problems, and thus age and income would interact. In addition, although age is negatively correlated with PGSI scores ($r = -.12$), the number of bus tours was positively correlated with problem gambling ($r = .06$) and with age ($r = .14$, $p < .01$).

Table 9
Regression Models for Log 10-Transformed Problem Gambling Severity Index Scores.

Model		*b*	*SE*	β	*t*	*p*
1	(Constant)	-0.16	0.02		-9.22	0.000
	Income range	-0.08	0.02	-0.11	-4.27	0.000
	Retired	-0.10	0.02	-0.13	-4.90	0.000
	Number of bus trips	0.04	0.02	0.06	2.32	0.020
	Distance to nearest venue	-0.03	0.02	-0.04	-1.54	0.123
	Married	-0.08	0.02	-0.11	-4.61	0.000
	Age range	-0.13	0.06	-0.06	-2.22	0.027
Final	(Constant)	-0.13	0.03		-3.77	0.000
	Income range	-0.08	0.02	-0.10	-3.97	0.000
	Retired	-0.10	0.02	-0.14	-4.93	0.000
	Number of bus trips	0.13	0.04	0.18	3.73	0.000
	Distance to nearest venue	-0.04	0.02	-0.06	-2.30	0.022
	Married	-0.08	0.02	-0.11	-4.40	0.000
	Age range	-0.13	0.06	-0.06	-2.27	0.024
	Quadratic bus trips	-0.07	0.02	-0.14	-2.88	0.004
	Quadratic distance	0.03	0.01	0.06	2.42	0.016

Note. The initial block and final block are shown (N = 1,708). Retired and married were both coded at 1 vs. else = 0. Block 1 variables were entered simultaneously. After Block 1, stepwise regression was used to determine whether any of the interactions and non-linear effects were significant.

These correlations suggest the possibility of interactions between bus tours and age. Thus, we tested two possible interactions: an age by income interaction and an age by bus tours interaction.

To test the possible interactive and non-linear effects, age, income, distance, and bus tours were first centred by converting them to z scores. The curve component for bus tours and distance was computed by squaring the z scores, and the interaction terms were computed by multiplying age with income and age with number of bus tours. The six variables in Model 1, as shown in Table 9, were first entered into the model and then these two curvilinear effects and the two interaction variables were regressed onto the log-transformed PGSI scores in a stepwise manner. The quadratic effect of distance (β = .06, t = 2.4, $p < .05$) and the quadratic effect of bus trips (β = -0.14, t = 2.88, $p < .01$) were significant. Neither the interaction of bus use and age (β = -.007, *ns*) nor the interaction of age and income (β = 0.002) was significant. The final model is shown in Table 9. The overall effect was as follows: $F(8, 1699)$ = 14.4, $p < .001$, R = .252. Note that distance was not significant in the first model, but after the two quadratic effects were entered into the model, distance from the casino was significant.

Discussion

As the Ontario population ages, and with the increasing availability of gambling in the province, older adults have taken up gambling as a recreational activity in the

same way as other adults have (McCready et al., 2005). We observed here that gambling is a regular activity in this sample of older adults gambling in casinos. Respondents reported participating in a mean of 3.61 different types of gambling, and 78.6% reported participating in slots or casino gambling monthly or more often. Unlike most studies of gambling, we did not find any sex difference between males and females in terms of problem gambling. In fact, there were few sex-related differences found in the study. Previous studies have identified older adults who report gambling in casinos or racinos as showing an increased likelihood of problem gambling (McCready et al., 2008, 2010). Concerns were raised that living on fixed or limited incomes (McCready et al., 2008, 2010) might make older adults vulnerable to a gambling problem. This study was motivated by these earlier findings, an interest in characterizing older adults who gamble in casinos or racinos, and an interest in understanding the risks that casino gambling may hold for them. Notably, there are also likely benefits of casino gambling in terms of entertainment, socializing, and even cognition for those who play games that use an element of skill. The focus in this study was to understand the risk factors for problematic play. However, a recent study by van der Maas, Mann, McCready, et al. (2017) that used the same data reported that people who attended the casino for musical events, socialization, and excitement were less likely to have gambling problems.

In the Introduction, we presented a number of questions that the study was designed to examine. The first question was, "What are the patterns of gambling behavior, including frequency and spending, among older adults who patronize casinos and racinos?" In addition to gambling at casinos or racinos, participants reported playing instant win/scratch or daily lottery tickets and lottery draw tickets, with 75.2% and 82.9%, respectively, participating in these activities in the past year. This compares with 30.9% and 66.9% of the general older adult gambling population participating in these activities in 2002 (McCready et al., 2010). As well, a large proportion reported participating in these activities on a regular basis, with 52.1% and 61.2%, respectively, reporting that they had participated in these activities in the past month. In 2002, 22.9% and 46.0% of Canadian older adults who gambled reported participating in these two activities monthly or more often. Although the largest portion of respondents (40.6%) reported spending less than $1,800 per year in casinos or racinos, almost as many reported spending between $1,800 and $6,000 per year (37.3%), and a substantial proportion (20.0%) reported spending more than $6,000 per year. In contrast, in a 2002 survey of older adults in the general population, only 4.98% reported spending more than $1,000 per year on all forms of gambling combined (McCready et al., 2010). These data confirm the perception that, on average, older adults who participate in casino gambling are more frequent and heavier gamblers than is the case in the general population of older adults.

The second question was, "How much money do older adults spend in total at gambling venues and how much do they spend relative to their income?" On average, the sample reported spending $5,722; however, the distribution was highly skewed. The geometric mean was $2,000 in the past year. Participants who scored 0 and who scored in the low-risk range (1 to 2) on the PGSI reported a geometric mean of

$1,237 (3.4% of income) and $2,147 (6.2% of income), respectively. At the other extreme, severe problem gamblers reported a geometric mean of $6,893, which represents approximately 23.4% of their income. In short, severe problem gamblers spend a substantial amount of money and a substantial proportion of their incomes on gambling. When testing the log-transformed data, all of the groups on the PGSI were significantly different from each other in terms of amount of money spent and proportion of income spent gambling.

The study also revealed that most older adults who were classified as being at no risk or low risk for problem gambling are gambling an amount that would not seem to be an excessive strain on their incomes. Because of differences in income, the amount spent on gambling is not generally considered a particularly good indicator of problem gambling. Nonetheless, in the current sample, 18.6% of those who spent over $6,000 in the past year scored in the severe problem gambler range. The figures for gambling spending (Table 5) and spending as a proportion of income (Table 6) also suggest that the PGSI does an excellent job of separating severe problem gamblers from all the other groups, both in terms of money spent and proportion of income. This supports the validity of the problem gambler category, as found by Currie, Hodgins, and Casey (2013). In addition, all four of the PGSI categories were significantly different from each other with the log-transformed data. In contrast to Currie et al. (2013), we found significant differences between the low- and moderate-risk PGSI categories for the log-transformed spent and proportion of income spent.

From the reported spending of the participants, we estimate that 16.4% of the money spent at the casino by this sample was spent by severe problem gamblers and a further 27.0% by moderate-risk gamblers. This means that 43.4% of the casino or racino revenue generated from older adults is derived from those with some degree of difficulty in controlling their gambling. These estimates of spending are consistent with those of other studies that have found that moderate and severe problem gamblers jointly contribute 30% to 60% of the total amount spent at casinos and similar venues (Productivity Commission, 1999; Schellinck, Schrans, Chen, & Chambers, 2010; Schrans & Schellinck, 2003; Schrans, Schellinck, & MacDonald, 2008; Williams & Wood, 2007). The large percentage of casino revenue derived from people with some level of problems suggests that more needs to be done to reduce the harm of gambling for this group.

As noted in the Method section, we weighted the sample to remove any frequency bias wherein people who attend more often are more likely to be sampled. Without correcting for frequency bias, the severe problem gamblers accounted for 19.7% of the amount spent by the sample, but after correction, this figure dropped to 16.4%. Similarly, the moderate-risk gamblers accounted for 25.4% of the total spent before weighting for frequency bias and 27.0% after correcting for it. The combined total for moderate and severe problem gambling thus decreases the total from 45.1% to 43.4% as a result of weighting to correct for frequency bias. Thus, this weighting has a relatively small effect (1.7%) on the percentage of the total amount spent that comes from severe problem and moderate-risk gamblers.

The third question was, "What is the rate of problem gambling among older adults who patronize casinos and racinos?" Examination of the proportions of the sample that fell into the various levels of gambling problems as determined by the PGSI provided further confirmation of the hypothesis that older adults who gamble in casinos or racinos are heavier gamblers with an increased likelihood of gambling problems. We also observed that 6.9% of the sample fell into the severe problem category on the PGSI with a score of 8 or more and that a further 20.3% fell into the subclinical group of moderate-risk gamblers. These numbers are much greater than those found in the Canadian Community Health Survey 1.2 of the Canadian older adult population: 0.24% for the severe problem category and 1.07% for the moderate-risk category (McCready et al., 2010). In other words, the prevalence of severe problem gamblers among older adults gambling in casinos or racinos is about 29 times higher than that observed in a general population sample, but this is not surprising given that we sampled the patrons at gambling venues. This finding of a high concentration of older adults experiencing problem gambling in casinos or racinos provides clear support for this methodology as a better means of identifying and understanding problem gamblers. It can also be used to justify providing support and counselling services in these venues for those experiencing these problems.

The fourth question was, "Based on the proximity theory, are people who live closer to the gambling venue at an increased risk of problem gambling?" The data found a mixed answer to this question. Many of the participants lived in close proximity to these locations, with more than half living within 25 km of the nearest gambling venue, underscoring the role of accessibility in determining regular involvement and ultimately risk for development of problems. This supports existing literature that has established proximity to gambling opportunities as a strong predictor of problem gambling (Gerstein et al., 1999; Sévigny et al., 2008; Welte et al., 2004). When we tested the possibility that proximity to the gambling venue would be associated with more problems, we found that problem rates were highest among those who lived near the casino and those who lived farthest away. As a result, we found significant positive linear and negative quadratic effects in the regression models. These findings suggest that the relationship between proximity to gambling opportunities and problem gambling is more complex than the simple linear relationship previously assumed.

Our fifth question asked, "Are people who take bus tours to gambling venues more likely to report gambling problems?" We found that a little less than half of the participants (40.1%) reported attending the casino as part of an organized group at some time in the past year (e.g., bus trip). Patrons who reported attending the casino or racino in bus tours tended to be older and they also scored somewhat higher on the PGSI. We found both a positive linear effect and a negative quadratic effect for bus tours. As can be seen in Table 8, using the log mean or geometric mean, problems increased with bus tours, peaked at four tours, and fell off slightly for the more frequent bus users. This finding suggests that the relationship between bus use and problem gambling may be complex.

In general, older participants in the sample were less likely to report gambling problems, but they were also more likely to reach the casino or racino by bus, and, as noted earlier, those who attended by using a bus scored somewhat higher on the PGSI than did those who had never used a bus. Although some studies have included casino bus tour patrons (McNeilly & Burke, 2000), there is almost no research examining their connection to gambling-related harm. This is especially concerning considering how widely this tactic is used by gambling venues. Van der Maas, Mann, Matheson, et al. (2017) reported that bus participants were more likely to have a gambling problem. The current findings qualify this relationship by showing that this relationship has a significant curvilinear component.

The final question we examined in this study was, "Are older adults who are on a fixed income disproportionately vulnerable to a gambling problem?" If this is the case, we argued that we would find higher rates of problem gambling among the oldest adults (e.g., 75 +) in the sample on a fixed income, which would produce an interaction between age and income as predictors of problem gambling. To answer the sixth question, we conducted a multiple regression analysis on the log-transformed PGSI scores. The regression analysis revealed that age and income both had negative slopes, indicating that higher income individuals and older individuals were less likely to report problems. Similarly, the results showed that people who were married and people who were retired also had negative slopes, indicating married and retired people were less likely to have gambling problems. Being married, having a higher income, being older, and being retired all seem to be protective factors. On the other hand, the positive slope for bus tours indicates that the more often a person attended the casino by bus, the higher they scored on the PGSI. Distance to the nearest casino was not significant in Block 1. In addition, we found that distance to the gambling venue and bus use had both linear and quadratic effects. For distance, the linear effect is negative, indicating that people who live farther away have fewer problems, and the quadratic effect is positive, indicating that those who live closest and farthest from the gambling venue have the most problems. The positive slope for bus tours indicates that people who come on bus tours more often have more problems; the quadratic effect for bus tours indicates a negatively accelerated function, where the rate of change decreases. These quadratic effects are small but indicate that the relationship between these variables and problem gambling is complex.

Perhaps as important was what we did not find. We did not find an interaction between age and income or age and bus tours when modelling problem gambling severity. The absence of interactions in this analysis means that income, age, and bus use are additive risk factors. The absence of an interaction between age and income suggests that the people with the combination of being the oldest adults and having a low income were not disproportionately more vulnerable to problem gambling. Instead, these variables are additive; that is, the most vulnerable are those respondents who are not married, have less income, who take a bus tour, are somewhat younger (e.g., 55–65), and are not retired. The negative relationship between age and PGSI scores was consistent for higher (r = -.13) and lower (r = -.11) income earners,

indicating that the oldest adults within the sample (e.g., 75+) were not disproportionately vulnerable. In fact, being in the oldest cohort (e.g., 75+) might be a protective factor. Furthermore, being retired was negatively associated with PGSI scores, suggesting that being retired is not a risk factor but may be a protective factor that decreases a person's risk of developing a gambling problem. However, the retirement and age effects could also be a cohort effect. People in the oldest age group, 75+, reached adulthood in a society in which most forms of gambling were illegal. In addition, living through the Great Depression and the Second World War may have shaped them to be more cautious with their money (Howe & Strauss, 1992). On the other hand, people born in the 1950s grew up during an age of prosperity (Howe & Strauss, 1992) and reached adulthood in the 1970s when lotteries were legal. The low rate of problem gambling among the oldest group may also explain the curvilinear effect of bus usage and gambling problems. The participants in the 75+ age group were the most likely to take a bus, but also had the lowest rates of problem gambling. Longitudinal research is needed to determine whether the lower rate among the oldest participants was a cohort effect or whether aging or retiring in fact decreases a person's risk for problem gambling.

Limitations

As with all research, there are important limitations to keep in mind when interpreting the results. This study relied on self-reports, which are subject to limitations of memory on things like money spent on gambling. In recognition of this problem, we asked each person how much they typically spend during each session and how often they attend the casino or racino. These results were then multiplied together. The result is still vulnerable to memory problems; however, the data showed a great deal of internal consistency. For example, severe problem gamblers spend more money and spend more time gambling than do other groups. The amount of money spent increased in pace with reports of hours spent per occasion and in the past year. In addition, money spent, time spent, and problem severity were all strongly related to each other. However, given the reliability issues with spending estimates, the findings should be taken with a degree of scepticism.

An additional limitation is that the study used a cross-sectional design and therefore causal conclusions cannot be drawn. As well, although the completion rate, at 66%, is very good for this type of study, it is possible that non-respondents may have differed from the sample who consented to participate (e.g., been more or less likely to be problem gamblers). As well, although we consider the results to be representative of older adults gambling in the seven participating locations during the time when the study was conducted, it is possible that results may have been different at other locations or at other times of the year.

Conclusions

This study is the first in Ontario to focus on older adults who gamble in casinos or racinos and on gambling problems in this group; after weighting, it is considered

representative of older adults who gamble in the seven participating locations in the province. The results presented here thus provide an important view of the population of older adults who gamble at casinos or racinos in Ontario. Although casino gambling may provide entertainment and opportunities to socialize, a sizeable proportion of older adults gambling in casinos are experiencing severe gambling problems. Most of the older adults (73%) surveyed did not have a gambling problem, but 6.9% scored in the severe problem gamblers' range on the PGSI. However, those with severe problems accounted for 16.4% of the total spent. In summary, this study identified several risk factors for problem gambling among older adults, including having a lower income, being younger, not being married, being still employed, more often taking bus tours to the casino, and living either very close to or far away from the gambling venue. These findings highlight the need for policies to reduce the harm of gambling. The findings regarding bus tours suggest a need to provide problem gambling help information and other resources to people who arrive on bus tours. More generally, we need to ensure that age-appropriate education information is available about the risks for older adult gamblers. A recent survey of the literature on older adults found few papers that specifically dealt with prevention for problem gambling in the older adult population. Further research is required on the information needs of this population. In addition, evaluation studies are needed to determine the prevention initiatives that can reduce the harm of problem gambling. Given the large portion of income spent by problem gamblers in this population, further investigation is warranted into the impact of their gambling problems. In particular, how often are they losing their homes?

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Submitted March 22, 2016; accepted April 19, 2018. This article was peer reviewed. All URLs were available at the time of submission.

For correspondence: Nigel E. Turner, PhD, Scientist, Institute for Mental Health Policy Research, Centre for Addiction and Mental Health, 33 Russell Street, Toronto, Ontario M5S 2S1; E-mail: nigel.turner@camh.ca

Competing interests: The authors report no conflict of interest for this project. The first author (Turner) acknowledges that he has a separate project where he is working with the Social Responsibility department of Ontario Lottery and Gaming to provide independent evaluation of some of their harm reduction initiatives. Tara Elton-Marshall, Robert Mann, Mark van der Maas, Hayley A. Hamilton, Anca Ialomiteanu, Peter Ferentzy, and Salaha Zaheer report no conflicts of interest. CAMH is an academic research hospital affiliated with the University of Toronto that conducts independent research on a variety of mental health and addiction issues. Healthy Horizons Consulting is an independent research organization, a sole proprietorship owned and operated by John McCready. John McCready and Healthy Horizons Consulting are unaware of any real or perceived conflict of interest or impediments to objectivity that would affect the ability of Healthy Horizons Consulting to perform the duties associated with this project. Focal Research is an independent private full-service research company owned and operated by T. Schellinck and T. Schrans, who have provided research services for a variety of customers, including the Government of Nova Scotia. Focal Research is unaware of any real or perceived conflict of interest or impediments to objectivity that would affect the ability of Focal staff or key investigators to perform the duties associated with this project.

Ethics approval: The project was subject to ethics review by the Centre for Addiction and Mental Health (CAMH). The project was reviewed by the CAMH ethics review board and approved as Protocol #086/2013, August 20, 2013. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964

Helsinki declaration and its later amendments, including informed consent and confidentiality of all personal information.

Acknowledgements: Funding for this project was based on a grant from the Ontario Problem Gambling Research Centre (now called the Gambling Research Exchange Ontario) with additional funding for analysis and manuscript preparation from and the Ministry of Health and Long-Term Care (MOHLTC) as Project No. 3632. The project was sponsored and administered by Healthy Horizons Consulting and conducted in partnership with the Centre for Addiction and Mental Health (CAMH). The ideas expressed are those of the authors and do not necessarily reflect those of Gambling Research Exchange Ontario, MOHLTC , CAMH, or the University of Toronto. We would also like to express our thanks to Ontario Lottery and Gaming for permitting the study to be conducted in several of their casino and slot machine venue locations, as well as to the participants in this study.