FINAL REPORT

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Profiling Problem Gambling Symptoms in the Australian Capital Territory: Socioeconomic and Demographic Characteristics and Gambling Participation

Tanya Davidson[1]

Bryan Rodgers[2]

1. Centre for Gambling Research, School of Sociology, Research School of Social Sciences, College of Arts & Social Sciences, Australian National University
2. Australian Demographic and Social Research Institute, College of Arts & Social Sciences, Australian National University

gambling.research@anu.edu.au

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1. Executive summary

Background

In January 2011, The Australian National University's (ANU) Centre for Gambling Research was commissioned by the Australian Capital Territory (ACT) Gambling and Racing Commission to conduct the present research profiling gambling symptoms in the ACT. The guiding principle of this research was to disentangle socioeconomic and demographic risk factors, and types of gambling activity, in relation to the occurrence of problem gambling, using data from a prevalence survey undertaken in the ACT in 2009. The *key objectives* were to describe the distribution of problem gambling, in terms of:

(1) its demographic and socioeconomic profile; and
(2) information collected on gambling participation.

The 2009 ACT Prevalence Survey used Computer Assisted Telephone Interviewing (CATI) and random digit dialling methods to contact 5,500 ACT residents. They provided detailed information on their gambling participation in the past year. Over 2,000 interviewees were selected representing the full spectrum of participation and they were interviewed in more detail on specific gambling activities, including financial losses from gambling, and their gambling problems. They were also asked a wide range of socioeconomic and demographic questions.

Demographic and socioeconomic profile

As reported in most prevalence studies, a range of demographic and socioeconomic characteristics was associated with gambling problems, these included being young, male, not having children, having never been married, having ever been divorced, a relatively low income, and lower levels of qualifications. After taking into account the considerable overlap between socioeconomic and demographic measures, marital history, age, sex, and qualifications were identified as the most important predictors of gambling symptoms.

The present report adds a better understanding of the importance of combinations of factors in identifying groups within the general population that have a particularly high likelihood of symptoms of problem gambling. For instance, the proportion of

people with problems varied greatly across subgroups of the population reflecting a 26-fold difference. The highest risk (18.1%) was evident for younger men, with lower qualifications who had either never married/lived in a defacto relationship or had a history of divorce. The lowest risk (0.7-1.1%) was evident amongst women with bachelor degrees (or higher) who had married/lived in a defacto relationship but never divorced. This degree of disparity is not revealed by the type of two-way tables that are typically used to report the findings of prevalence surveys.

Gambling intensity and problems

This report also undertook a detailed investigation of how intensity of gambling across all activities and on specific activities related to gambling problems. When considering gambling intensity across all activities, financial losses were the best indicator of gambling problems, followed by frequency of gambling. While the number of gambling activities was associated with symptoms in isolation, the association was not significant after accounting for financial losses and frequency of gambling. Using responses across different types of gambling intensity measures, we identified a group of the highest-intensity gamblers, reflecting approximately 10% of the adult population. A majority of this group reported gambling symptoms (55%) with 27% meeting the criteria for moderate risk/problem gambling. Essentially our findings demonstrate the importance of considering how different types of gambling intensity, i.e. frequency and financial losses combine in relation to gambling problems.

With regard to specific gambling activities, intensity of playing Electronic Gaming Machines (EGMs) better accounted for gambling problems than intensity of gambling across all activities. The findings demonstrate that measures of EGM intensity were better indicators of gambling symptoms than measures of gambling intensity across all activities. To demonstrate, we identified a group of the highest-intensity EGM players based on frequency, financial losses and session duration of EGM participation. A large proportion (61%) of this group reported symptoms and 30% were moderate risk/problem gamblers. This is higher than the equivalent proportions found for all activities. That is, we were better able to identify people with problems, based on EGM participation, than when we considered overall participation across activities.

It is important to note that while gambling on EGMs was most strongly associated with problems, other activities were also implicated, namely gambling using the internet and playing table games at a casino. The likelihood of problems amongst people gambling on these activities was high. However, these activities are not as common in the community as playing EGMs and are usually undertaken by people who gamble on multiple activities. From a population health perspective, they contributed far less to gambling problems in the community than did EGMs.

While this study demonstrated the considerable gains from understanding how measures of intensity combine, a key finding from this report is that financial losses, whether on specific activities or across all activities, were pivotal in understanding gambling problems. While this may not sound surprising, the difficulty in measuring gambling losses has meant that other measures of intensity, such as how often people gamble, have received much greater attention in previous research.

Conclusions

In the context of a population health approach it is immensely valuable to know what features mark out groups with a very high likelihood of problem gambling. The extremely high levels of risk found for subgroups in the population, such as the highest-intensity EGM players, and younger men with low levels of education who either were unmarried or had a history of divorce, therefore have great value in terms of informing population health approaches, including gambling education, awareness and harm reduction strategies. The clearest implications of the findings of this report are firstly that preventive messages and strategies, such as educational material, can be guided by knowing which subgroups of the population have the highest rates of problem gambling. Secondly, preventive resources can be focussed on especially high-risk groups when, otherwise, the cost of such approaches would be prohibitive for use across the general population.

2. Introduction

Australian and international prevalence surveys consistently report that a wide range of socioeconomic and demographic characteristics are associated with problem gambling. People with gambling problems also tend to bet on a wide range of products. However, few studies have attempted to disentangle whether specific types or combinations of socioeconomic factors might pose particular risk for gambling problems. Similarly, the relative contribution of different types of gambling activities to gambling problems has also rarely been investigated.

In January 2011, the Australian Capital Territory (ACT) Gambling and Racing Commission commissioned the Australian National University (ANU) to undertake the current research *Profiling Problem Gambling Symptoms in the ACT: Socioeconomic and Demographic Characteristics and Gambling Participation.* The guiding principle for the project was to disentangle socioeconomic and demographic risk factors, and types of gambling activity, in relation to the occurrence of problem gambling. This principle underlies the purpose, the key objectives and the methods of the research. The research was to use the data from a previous prevalence study undertaken in the ACT in 2009, conducted by the ANU's Centre for Gambling Research.

The *purpose* of the project was to determine the characteristics of people with gambling problems.

The *key objectives* were to describe the distribution of problem gambling, in terms of:

(1) their demographic and socioeconomic profile; and
(2) information collected on gambling participation.

These objectives are reviewed and addressed in chapters 4 and 5 (respectively).

3. Methods

3.0 The 2009 ACT Prevalence Survey

Data from the 2009 ACT Prevalence Survey were analysed for the current project. This was a survey of 5,500 ACT residents and findings on gambling participation and problems in the Territory were reported in detail in a final report (Davidson and Rodgers, 2010b). Some of the main findings are described in Box 3.1.

Box 3.1 Findings from the 2009 Australian Capital Territory Prevalence Survey†.

The main findings included:

- around 70% of adults gambled at least once in the last 12 months;
- 30% of adults played gaming machines at least once in the last year with 3% playing at least once a week;
- using the Canadian Problem Gambling Index (CPGI) the prevalence of problem gambling amongst ACT adults was 0.5%;
- 7.9% of gamblers had at least one symptom of problem gambling, with 2.9% being classified as moderate risk or problem gamblers;
- of those identified as moderate risk or problem gamblers, 90% reported playing gaming machines (but not necessarily exclusively);
- problem gamblers tend to bet on a range of products – the average being four different products;
- the moderate risk/problem gambling group were more likely to be male, young, Australian born, less well educated, never married and either unemployed or employed full time compared with the rest of the population;
- education had the strongest association with problem gambling; and
- problem gamblers and those at risk typically do not seek intervention (ie counselling support) until they are at risk of, or are contemplating, suicide.

†Source: Davidson and Rodgers (2010b).

3.1 Procedure

The procedures for the 2009 ACT Prevalence Survey were broadly based on gambling prevalence surveys undertaken by the Productivity Commission in 1999 (Productivity Commission, 1999) and in the ACT in 2001 (McMillian *et al.*, 2001). All data were collected using Computer Assisted Telephone Interviewing (CATI) by an accredited market and social research company. Data collection commenced on the 8th October and was completed on the 28th November, and interviews were conducted on weekdays (excluding Mondays and public holidays) and weekends.

3.2 Sample selection

Random digit dialling was used to contact 5,500 ACT residents. Random digit dialling involves the ongoing generation of telephone numbers, and attempts to call randomly selected numbers. The range of numbers dialled incorporated all landline numbers in the ACT, including listed and unlisted numbers.

The sampling method was designed to compensate for non-response amongst young adults, particularly males. Upon establishing contact with a household, the interviewers asked to speak to 'the youngest adult male, aged 18 or over, who lives there'. It was evident in the first week of data collection that males were being oversampled and so the introductory script was amended. The age distribution did not show a bias towards the younger age groups, so the decision was made to ask to speak to the youngest adult in the household.

If the appropriate person was not available, the interviewer determined an appropriate time to call back. Interviewers also made appointments to call back if it was not a convenient time to undertake the interview. However, 47% of interviews were completed upon first establishing contact with a household.

3.3 Survey design

All 5,500 people initially identified to do the interview were asked whether they had participated in a range of gambling activities in the last 12 months. They were then asked

how often they had participated in each undertaken activity (if any), and could answer per week, month or year. This information was used to determine total gambling frequency across all activities, and across all activities except lottery and scratch tickets. A global net expenditure question was also asked of everyone.

Table 3.1: Criteria used to select the subsample undertaking the detailed interview.

SELECTION CRITERIA			**SUBSAMPLE**
Total gambling frequency, last 12 months	**Activities included in total frequency†**	**Total out of pocket expenditure (all activities)**	**Proportion selected for detailed interview**
52 or more	All except lottery and scratch tickets	Any	100%
1-51	All except lottery and scratch tickets	Less than $2,000	25%
1 or more	People who only buy scratch tickets or play lottery	Less than $2,000	25%
1 or more	All activities	$2,000 or more	100%
0	All activities	n/a	50%

†At least some lottery or scratch tickets were purchased for themselves.

A subsample was then selected to proceed to a more detailed interview. Probability of selection was determined by people's frequency of gambling and net expenditure as shown in Table 3.1. Table 3.1 shows that everyone who either (i) gambled 52 times a year across all activities except lottery or scratch tickets or (ii) had spent $2,000 or more in the last 12 months was selected to undertake the detailed interview. One in four people who reported gambling 1-51 times in the last 12 months (and who had spent less than $2,000 on all activities) and 50% of non-gamblers were randomly selected to proceed to the more detailed

interview. The method of selecting the subsample was designed to oversample people who had lost large amounts on gambling, high frequency gamblers and non-gamblers. Oversampling ensured that these groups would be large enough to undertake analyses and maximised the probability that people with current gambling problems would complete the detailed interview.

3.4 The sample

Table 3.2 shows the number of people interviewed for each of the criteria used to identify the subsample who proceeded to complete the detailed interview. For instance, this table shows that 55 of the people initially interviewed had a total gambling frequency less than 52, but had spent $2,000 or more in the last 12 months. The proportion and number of people selected to undertake the detailed interview is also described in Table 3.2. Everyone in the above example was selected for the detailed interview.

Table 3.2: Sample size for each of the criteria used to select the subsample undertaking the detailed interview.

SELECTION CRITERIA			ACHIEVED SAMPLE		
Total gambling frequency, last 12 months	**Activities included in total frequency†**	**Total out of pocket expenditure (all activities)**	**Initial sample (n)**	**Subsample completing detailed interview (n)**	**Proportion selected for detailed interview**
52 or more	All except lottery and scratch tickets	Any	338	337	100%
1-51	All except lottery and scratch tickets	Less than $2,000	2098	470	25%
1 or more	People who only do scratch tickets or lottery	Less than $2,000	1263	354	25%
1 or more	All activities	$2,000 or more	55	55	100%
0	All activities	-	1746	873	50%
Total			*5500*	*2089*	-

†At least some lottery or scratch tickets were purchased for themselves.

The final age and gender distribution of the achieved sample is shown in Table 3.3. There was a good spread of ages amongst the achieved sample, but when compared with the adult population of the ACT, those under 35 years of age were underrepresented, with a corresponding over representation of older people. The respondent numbers in each of the age and gender cells provided the basis for weighting the sample in order to provide estimates that reflect the age and sex distribution of the ACT population.

Table 3.3: Proportion of adult men and women in the ACT population and the achieved sample.

	ACT population		Achieved sample†	
	Male	Female	Male	Female
Age group	n=112,434	n=117,960	n=2,663	n=2,827
18-24	16.3%	16.3%	11.1%	6.5%
25-29	10.5%	10.2%	3.8%	4.5%
30-34	10.2%	10.1%	5.9%	6.4%
35-39	10.0%	9.9%	7.9%	10.7%
40-44	9.7%	9.8%	8.7%	11.3%
45-49	9.5%	9.8%	10.2%	11.0%
50-54	8.8%	9.0%	11.1%	10.5%
55-59	8.0%	7.8%	11.7%	10.9%
60-64	5.5%	5.3%	11.2%	10.5%
65-69	3.7%	3.9%	7.1%	7.0%
70+	7.6%	9.5%	11.3%	10.6%

†Ten respondents (3 males and 7 females) refused to provide their age.

3.5 The questionnaire

A summary of the types of measures of relevance to this report, and the people who received them, is given in Table 3.3. In brief, everyone selected to do the detailed interview was asked about their financial losses on gambling, and given the socioeconomic questions. Furthermore, problem gambling was assessed among everyone who had gambled at least 12 or more times in the last 12 months (on activities other than lottery or scratch tickets), or who reported spending $2,000 or more (on any activity).

The majority of measures are described in detail as they are introduced in the report, with the exception of the problem gambling measure, which is described below. The full questionnaire is available on the internet and upon request (Davidson and Rodgers, 2010a).

Two pilot tests were conducted, covering a total of 130 interviews. These interviews tested the CATI technical procedure and questionnaire. The research team were interviewed during the pilot to ensure that the majority of pathways were tested.

Table 3.4: Summary of questionnaire items.

Measures	**Time period**		**Sample†**	**People assessed**
	Lifetime	**Last 12 months**		
Gambling frequency, for each activity		X	Full	All
Global net expenditure screen, across all activities		X	Full	All
Questions about specific activities (eg net expenditure and duration of gambling sessions)		X	Subsample	If undertook activity in last 12 months
Problem gambling (Canadian Problem Gambling Index)		X	Subsample	If gambled 12 or more times in the last 12 months across all activities other than lottery or scratch tickets If reported losing $2,000 or more in the last 12 months on the global net expenditure item or net expenditure summed across all activities
Socioeconomic and demographic	n/a	n/a	Subsample	All

†Full sample=All 5,500 people initially contacted by interviewers; Subsample=those selected to proceed to the detailed interview.

3.6 Measurement and definition of Problem Gambling

The main measure of problem gambling used in the 2009 ACT Prevalence Survey was the Canadian Problem Gambling Index (CPGI: Ferris and Wynne, 2001). Everyone who reported gambling at least once a month across activities other than scratch tickets or lottery tickets, or who had spent $2,000 or more across all activities in the last 12 months was asked all of the questions in the CPGI (n=494).

The CPGI comprises nine items asking how often gamblers experience a range of problems from their gambling, including betting more than they can afford, needing to gamble with larger amounts to get the same feeling of excitement, trying to win back the money they have lost and having financial problems. Response options ranged from 0 ('never') to 4 ('almost always'). Peoples' responses to the nine items are summed, creating the CPGI total score. This score is a continuous measure of the severity of gambling problems (range 0-27).

The CPGI total score is also traditionally grouped into bands that define 'non-problem gambling' (0 score), 'low risk gambling' (1-2), 'moderate risk gambling' (3-7), and 'problem gambling' (8+). For this report, bands were further combined, identifying people reporting any symptom (1+) and moderate risk/problem gambling (3+).

3.7 Ethics approval

The Australian National University human research ethics committee approved this study (protocol 2009/410).

3.8 Weighting

In order to generalise findings from the sample to the ACT adult population it was important to ensure that the survey sample represented the ACT population as much as possible. Therefore potential sources of sample bias needed to be identified and addressed. First, only one adult was selected from each household, so the number of adults in the household *not interviewed* needed to be taken into account. Second, the oversampling of non-gamblers, high frequency gamblers and people losing large

amounts on gambling needed to be taken into account in all analyses using the subsample who completed the detailed interview. Third, people who answer the phone and agree to do a survey might differ from those who do not. Simple statistical weights can be used to compensate for the under or over representation of particular people (or characteristics) in a sample. All analysis for this report was based on the subsample and weighted (defined below).

The weight

Everyone who agreed to complete the interview was asked the number of adults aged 18 or over who normally live in their household. This information was used to compensate for the probability of an individual being selected in the household. The weight also addressed the oversampling described above, so that levels of gambling were proportionately represented. Finally, the detailed interview provided information about the characteristics of the subsample. The weight ensured that the sample proportionately reflected registered marital status, as well as the age and sex, of the ACT adult population.

Throughout the report, findings are presented that represent (1) the adult population of the ACT (i.e. gamblers and non-gamblers combined), and (2) the gambling population (i.e. ever gambled in the past 12 months). The figures and tables give the **actual** number of participants who were interviewed within any particular group whereas percentages and mean values are the **estimated** values using the weights described above.

3.9 Statistical Analysis

As mentioned in the previous section, all analyses were undertaken using the subsample completing the detailed interview (n=2089). Amongst these individuals, 15 people had missing data on gambling frequency and a further 13 had missing data on age, marital status or education. Age and marital status were used in the weight and education was considered pivotal in relation to gambling. Two people were given the CPGI did not complete it. The CPGI was the outcome measure used across the whole report. The final sample for analysis conducted in this report comprised 2,059

individuals with complete information on gambling frequency, the CPGI, age, sex, marital status and education. Some additional people had missing data for other measures included in this report. For this reason the number of people varies somewhat across analyses, depending upon which measures are being investigated. The number of people in each analysis is reported in the tables and figures.

P-values were used to indicate the statistical significance of findings. P-values less than .05 were considered statistically significant, indicating that there was no more than a 5% probability that any particular finding was due to chance. Expressed another way, there was at least a 95% probability that the findings was *not* due to chance. P-values less than .01 and less than .001 indicate that differences between groups were not due to chance with a greater degree of certainty (99% and 99.9% probability respectively).

4. A socioeconomic and demographic profile of problem gambling

4.0 Overview of chapter objectives

Many demographic and socioeconomic characteristics are associated with gambling problems. These characteristics tend to be correlated with each other. There has been little attempt to disentangle whether specific types or combinations of characteristics might pose particular risk for gambling problems.

The aims of this chapter therefore included:

(1) identifying which demographic and socioeconomic characteristics were significantly associated with problem gambling;

(2) determining which individual demographic and socioeconomic factors retain their statistical significance, after taking into account all other demographic and socioeconomic characteristics; and

(3) quantifying the extent to which the prevalence of problem gambling varied across population subgroups, for the implicated demographic and socioeconomic risk factors.

4.1 Background

Previous prevalence surveys conducted in Australia and overseas have established that problem gamblers are not distributed evenly throughout the population. Several risk factors for problem gambling have been identified in these studies, including: sex, age, ethnic and cultural background, education, employment status, and marital status.

Sex

Sex differences in the prevalence of problem gambling are ubiquitous, with higher rates reported for men compared with women in general population samples across several countries including Australia (Productivity Commission, 1999), the U.S. (Blanco *et al.*, 2006, Morasco and Petry, 2006), Canada (Marshall and Wynne, 2003), Norway (Gotestam and Johansson, 2003) and Sweden (Volberg *et al.*, 2001). Differences are pronounced whether they are estimated using the total population or using gamblers only as the denominator,

irrespective of the thresholds that define at-risk, problem, or pathological gambling, and regardless of the measuring instrument used to operationally identify those groups. As examples, the Australian Productivity Commission survey of 1999 reported 2.53% of men and 1.63% of women to be problem gamblers as indicated by a SOGS score of 5 or more and the Canadian Community Health Survey 2002 identified 6.1% of men and 3.5% of women falling into the combined categories of low at-risk, moderate at-risk and problem gambling in the past year (Marshall and Wynne, 2003). Consistent with these findings, the 2009 ACT Prevalence Survey reported that 3.0% of men had a CPGI score of 3 or more compared with 0.9% of women (Davidson and Rodgers, 2010b).

Age

The distribution of problem gambling by age has been less consistent across studies. One generalisation that has appeared in the literature over a number of years is that estimates of the prevalence of problem gambling in adolescents are *higher* compared with adults (Shaffer and Hall, 2001). This however was based on meta-analysis where prevalence estimates for adolescents and adults were obtained from different studies using different methodologies. Recent analyses based on comparable criteria over a broad range of ages contradicted earlier wisdom and reported that problem gambling peaked in the range 31-40 years (Welte *et al.*, 2010). This same study found a progressive decline in problem gambling with increasing age thereafter.

Not all previous studies have found a progressive decline over older adult ages but several have concurred that problem gambling is less prevalent in the elderly (as is often the case for gambling participation rates). In the Australian NGS 1999, prevalence of problem gambling was 0.4% of those aged 70 years or more compared with a range of 1.4% to 2.2% in groups between age 30 and 60 years (Productivity Commission, 1999). Similarly, estimates from the U.S. NESARC sample for combined pathological and problem gambling showed that prevalence dropped off from about 1.4% to 1.6% in those up to age 60 years to about 0.4% in the over 90s (Morasco and Petry, 2006, Pietrzak *et al.*, 2007). Although problem gambling (CPGI score of 3 or more) was more common in the youngest age group (18-29 years) in the 2009 ACT Gambling Prevalence Survey (2.9% compared with between 1.1% and 1.9%) this difference was not statistically significant (Davidson and Rodgers, 2010b).

It is important to acknowledge that age trends in cross-sectional surveys may reflect developmental age changes, cohort differences or a combination of both. For instance, a cohort difference would be implicated if future surveys found higher rates of problem gambling in the elderly. This is consistent with the idea that higher rates in the elderly were a feature of the period of birth of the groups and, consequently, carried through as the individuals aged. By contrast, a developmental age change would be implicated if rates of problem gambling decline over time for groups as they reach older ages. A further possible factor contributing to lower prevalence at older ages is differential survival, if problem gamblers have lower life expectancy that their peers. Ideally, we would use longitudinal studies in combination with cross-sectional data to distinguish these possible processes, but gambling research is some way off using such sophisticated survey designs.

Ethnicity

From the 1999 Australian NGS, problem gambling was estimated at around 3.0% of those speaking a language other than English (LOTE) at home compared with 1.9% of others, and 3.3% of Indigenous people compared with 2.1% of non-Indigenous people. These figures would not necessarily apply to similarly defined groups in the ACT and the proportion of the 2009 ACT Prevalence Survey sample falling into those categories was small (n=48, 2.8% for LOTE and n=27, 1.2% for indigenous status). The small numbers make estimates unreliable, consequently further exploration of these groups is of limited value in the context of this report. While the proportion of participations with CPGI scores of 3+ was higher amongst people born in Australia (2.2%) compared to elsewhere (0.8%), this difference was not statistically significant in a sample of this size (Davidson and Rodgers, 2010b).

Socioeconomic position

When considering the socioeconomic status (SES) of individuals, level of education has been the clearest indicator of risk of problem gambling. In the 1999 Australian NGS, prevalence was associated with education, employment and income, with higher rates of problem gambling amongst the lower SES groups. Comparable finings have been reported for education and income in the U.S. NESARC (Desai *et al.*, 2004, Morasco and Petry, 2006, Pietrzak *et al.*, 2007). In Canada and Sweden, problem and pathological gamblers were more likely to have low education compared with non-problem gamblers (Marshall and Wynne, 2003, Volberg *et al.*, 2001). Education is a less ambiguous measure than many other socioeconomic measures, as there is less of a possibility that problem gambling could lead to

low education, rather than low education leading to problem gambling. The 2009 ACT Prevalence Survey showed a distinctive gradient according to level of education, with the prevalence of CPGI 3+ rising from 0.4% in those with higher degrees to 3.9% in those with Year10 education or less (Davidson and Rodgers, 2010b). The increase was progressive through the intermediate groups at 0.7% (Bachelor's degree), 1.7% (post-school certificate/diploma) and 3.6% (Year 12).

Family characteristics

Some studies have indicated that problem gambling is strongly related to not having a current spouse or partner and it is particularly prevalent in the divorced or separated category in U.S. studies (Morasco and Petry, 2006, Pietrzak *et al.*, 2007). In Australia, problem gambling has been reported to be associated with single status as well as with being divorced or separated, although the strength of the former link may just be a reflection of the comparatively high level of problem gambling in younger Australians (Productivity Commission, 1999). Possible associations with widowhood are difficult to identify in the research literature because of the sex ratio in this group, i.e. the widowed are made up of many more women than men. In one Swedish study, problem gambling amongst the gambling population was more strongly associated with being unmarried than with separation or divorce *per se*, but the very large numbers in the unmarried category in this survey suggest that it used a legal definition of marital status and therefore included many people who had lived in defacto relationships as being 'unmarried' (Volberg *et al.*, 2001).

Multiple risk factors

Overall, there has been little attempt to establish which of the above factors are the most relevant in terms of problem gambling. Given that many demographic and socioeconomic factors are correlated with one another, the risk profile for problem gambling may be much simpler than that represented by a succession of bivariate analyses. When findings from prevalence surveys are presented for each measure in turn, it is not possible to know which aspects of socioeconomic and demographic position are the most important predictors of problem gambling. For example, people with lower levels of education have, on average, lower incomes than those with more education. It is possible that people with low incomes appear to have high levels of problem gambling but that the association is really due to educational level and not income *per se*. If that is the case, making a statistical adjustment for education would remove the apparent association between income and problem gambling.

To establish which demographic and socioeconomic factors are the most pertinent in identifying risk for problem gambling, it is necessary to carry out multivariate modelling using all risk factors in combination. This approach to multivariate statistical modelling can help gain a better understanding of which associations are the most important and which are spurious.

The analyses reported in this chapter use one such type of modelling, multiple logistic regression analysis, to identify which factors are significantly related to the probability of reporting any symptom of problem gambling and to estimate the strength of the underlying associations.

4.2 The socioeconomic and demographic characteristics of the sample

Before exploring how socioeconomic and demographic characteristics relate to gambling problems, it is important to reflect upon how common the characteristics are in the general population. This is discussed here using data from the 2009 ACT Prevalence Survey. Table 4.1 characterises the sample and outlines the measures used in the rest of this chapter. This table shows that 27.1% and 25.4% of the sample were younger men and women (aged 18-44y), respectively. Four out of five people were born in Australia.

Table 4.1: A socioeconomic and demographic description of the sample (weighted).

Measure	Weighted %	Measure	Weighted %
Demographic measures		*Employment measures*	
Age and sex, n=2059		Employment status, n=1988	
Men		Employed	70.8
18-24	9.9	Unemployed looking for work	1.9
25-44	16.2	Retired	17.6
45-64	16.8	Not in paid labour force, home duties	4.0
65+	6.2	Not in paid labour force, studying	3.7
Total	*48.9*	Other	2.0
Women		Main income source, n=1978	
18-24	6.4	Wage/salary	69.5
25-44	19.0	Government pension, allowance, benefit	9.7
45-64	17.9	Superannuation, annuity, or investments	13.6
65+	7.8	No personal income	4.5
Total	*51.1*	Other	2.7
Country of birth, n=2059		Personal income	
Australia	80.4	Lowest tertile (<40k)	36.2
Other	19.6	Mid tertile (40-69k)	27.0
		Highest tertile (>70k)	36.8
Family measures			
Marital history, n=2058		*Education measure*	
Never married	23.3	Highest completed qualification, n=1988	
Married, never divorced	50.5	Year 12 or less	36.5
Married, past divorce	12.2	Trade certificate or diploma	18.3
Unmarried, past divorce	10.7	Bachelor degree or higher	45.2
Widowed, never divorced	3.2		
Having a child (resident) aged < 18y, n=2058			
Yes	68.0		
No	31.2		

In terms of the employment oriented measures, most of the sample (70.8%) were employed in the paid work force on a wage or salary (69.5%), and 13.6% reported their main source of income was from superannuation, annuity or investments. People were asked their own personal income before tax. We divided responses into approximate tertiles, defining the lowest (<$40k), middle ($40k-$69k) and highest ($70k or more) third of personal annual incomes.

The family oriented measures used in this report were complex and need defining. In the 2009 ACT Prevalence Survey, we reported findings for current marital status, for people who had never married, and those who were married or in a defacto relationship, separated or divorced, and widowed. In the current study we also investigated marital history, by

incorporating an item asking ‘how many times, if any, have you been married or lived in a defacto relationship’. We used this item to identify people who had been married or lived in a defacto relationship more than once. Essentially they reflect people who have experienced a major relationship separation. For the rest of the report this group will be referred to as ‘divorced’. Similarly, in our report the term ‘married’ also encompasses defacto relationships.

Combining the marital status items, we identified people who:

(1) had never been married (‘never married’);
(2) were married, but had never experienced divorce (‘married, never divorced’);
(3) were married, but had a history of divorce (‘married, past divorce’);
(4) were unmarried, with a history of divorce (‘unmarried, past divorce’); and
(5) were widowed and never had a major separation (‘widowed, never divorced’).

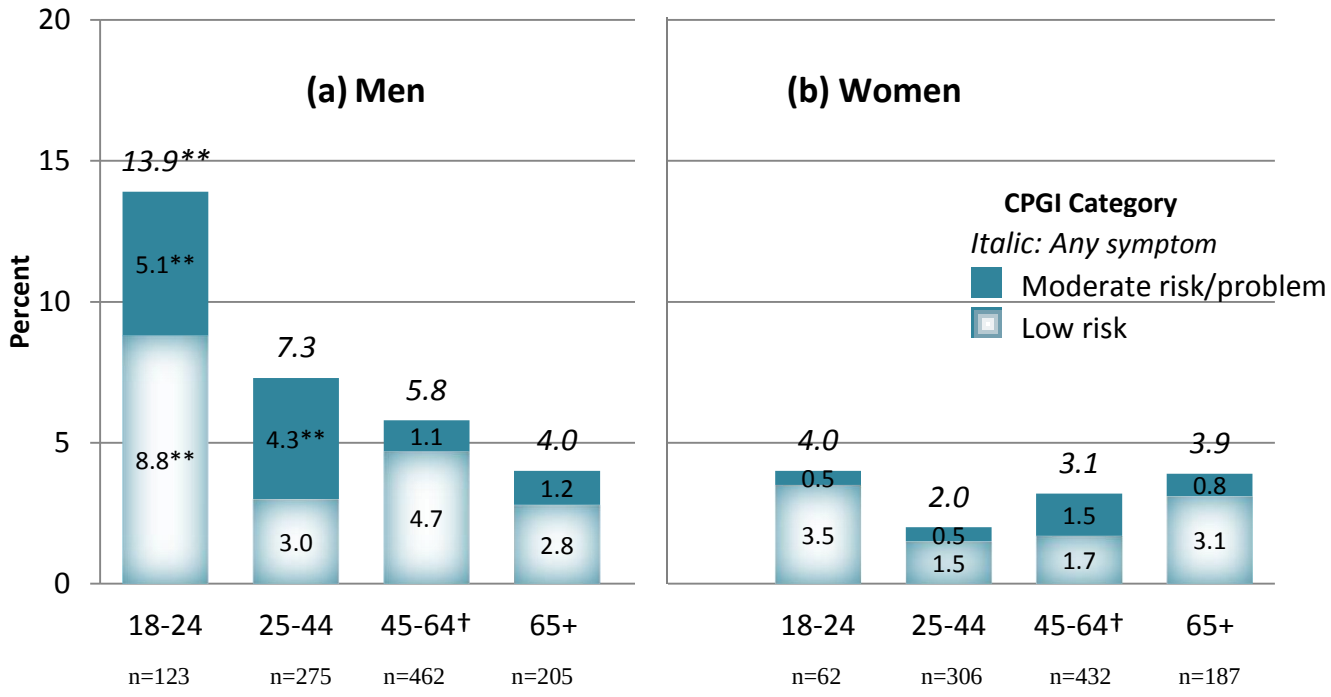
Table 4.1 shows that half the sample were ‘married’ and 23.4% had never been married or in a defacto relationship. A similar proportion had a history of ‘divorce’ (22.9%).

Survey participants were also asked, ‘how many children under 18y do you have (including adopted or step children)’ and to define, ‘how many of these children usually live in their household’. We identified people who had at least one child aged under 18y, who also lived in their household. More than two thirds (68%) of the sample had a child (resident) aged less than 18y.

Finally, people were asked ‘what is the highest level of education you have completed’ and there was scope for the interviewers to code 10 options (see: Davidson and Rodgers, 2010a). Only a small number of people reported not having completed year 12. Therefore, in this report we investigated three main categories, (1) year 12 or less, (2) trade qualifications, certificates and diplomas, and (3) bachelor degree and higher qualifications. Table 4.1 shows that nearly half the weighted sample had a bachelor degree or higher.

4.3 Age, sex and gambling symptoms

Age and sex are simple variables to start with when considering prevalence in the general population. In the 2009 ACT Prevalence Survey, sex was strongly associated with gambling problems. Compared to women, a greater proportion of men reported gambling symptoms (2.9% vs 7.7%, p<.001), and met the criteria for moderate risk/problem gambling (0.9% vs 3.0 %, p<.001). We also found that gambling symptoms decreased significantly with age (p<.05). Previous research has indicated that young men have a particularly high risk for problem gambling. To fully explore the way in which the combination of sex and age was related to CPGI symptoms, we tested multiple logistic regression models including sex, age and the interaction between age and sex. By including the interaction term, the model allows for different patterns by age for men and women. This interaction was statistically significant (p<.001) and Figures 4.1a and 4.1b demonstrate the pattern of the interaction, showing that the proportion of low risk and moderate risk/problem gambling declined steeply across age groups for men, whereas there was no clear trend by age for women. The number at the top of the columns represents the proportion of subgroups reporting any symptoms, i.e. the combination of low risk and moderate risk/problem gamblers. Figures 4.1a and 4.1b show clearly that the greatest prevalence of problem gambling was amongst young men.



Figures 4.1a and b: Proportion of age groups classified as (i) low risk, (ii) moderate risk/problem and (iii) reporting any symptom amongst men and women.
†Reference category; *p<.05; **p<.01; ***p<.001.

4.4 Gambling problems amongst other socioeconomic and demographic groups

Logistic regression was similarly used to explore the relevance of other socioeconomic and demographic measures for reporting any CPGI symptoms and moderate risk/problem gambling. These included measures covering:

(i) country of birth;

(ii) employment (employment status, main source of income, level of personal income);

(iii) family (marital history, having a child); and

(iv) level of education (highest completed qualification).

Initially, individual measures were examined in turn to see whether they were associated with symptoms of problem gambling. Table 4.2 shows that all these measures were associated with gambling symptoms. Odds ratios and 95% confidence intervals can be found in Table 8.1 of Appendix 1. Characteristics associated with a higher prevalence of gambling symptoms were: never having been married, having ever been divorced (regardless of current marital status), being unemployed (and looking for work), being in lower income bands, and having lower levels of education. Characteristics associated with a lower prevalence of gambling symptoms were: being born outside of Australia, having a child, not being in the labour force because of home duties, and having superannuation, annuity, or investments as the main source of income. Not all of these characteristics were associated with both moderate risk/problem gambling and reporting any CPGI symptom to a statistically significant degree, but all were associated with one or other outcome.

Table 4.2: Socioeconomic and demographic characteristics associated with reporting any gambling symptom and moderate risk/problem gambling.

Measure	Any symptom (CPGI >0) %	P-value	Moderate risk/problem (CPGI >2) %	P-value
Country of birth				
Australia†	5.6		2.2	
Other	4.0		0.8	**
Employment measures				
Employment status				
Employed†	5.8		2.0	
Unemployed looking for work	12.2		8.8	*
Retired	4.6		1.1	
Not in paid labour force, home duties	0.6	**	0.6	
Not in paid labour force, studying	0			
Main income source				
Wage/salary†	5.7		2.0	
Government pension, allowance or benefit	7.5		3.7	
Superannuation, annuity, or investments	3.0	*	0.7	*
No personal income	2.3		1.3	
Personal income				
Lowest tertile (<40k)	7.2	**	2.8	**
Mid tertile (40-69k)	5.3		2.1	*
Highest tertile (>70k)†	3.5		0.9	
Family measures				
Marital history				
Never married	9.8	***	2.6	
Married, never divorced†	3.0		1.3	
Married, past divorce	5.8	*	1.8	
Unmarried, past divorce	6.0	*	4.0	**
Currently widowed	3.9		0.8	
Having a child less than 18y				
Yes	3.2	**	2.2	
No†	6.3		1.3	
Highest completed education				
Year 12 or less	8.6	***	3.7	***
Trade certificate or diploma	5.9	**	1.7	
Bachelor degree or higher†	2.3		0.6	

†Reference category; *p<.05; **p<.01; ***p<.001.

4.5 The relative importance of age, sex, family, employment and education

Age and sex

The next stage in the analysis was to determine whether the demographic and socioeconomic measures were still significantly associated with symptoms of problem gambling once sex and age were taken into account. When multiple logistic regression analyses were carried out with sex and age included in the models, employment status and main source of income were no longer significantly associated with symptoms. This was because there was a greater proportion of older women amongst people not in the paid the paid work force (home duties) relative to those in the paid work force. These age and sex characteristics explained the comparatively high risk amongst employed people in the survey (p=.058). Similarly, people on superannuation, annuity or investments tended to be older than those on wages or salaries, and risk of gambling problems is lower amongst older people. Age differences alone explained the lower risk of symptoms relative to those on a wage or salary (p=.076). Personal income, marital history, having a resident child and highest qualification were significantly associated with symptoms after adjusting for age and sex.

From this point forward our analyses were restricted to investigating any symptoms because the number of moderate risk/problem gamblers was insufficient to enable more detailed modelling across the many combinations of demographic and socioeconomic measures. Odds ratios and error estimates for these models can be found in Tables 8.2 to 8.7 of Appendix 1.

Employment

Personal income was the only employment measure that was significantly associated with symptoms after adjusting for age and sex. Figure 4.2 shows that people in the lowest tertile of the population in terms of income (<$40k per annum) were still more likely to report symptoms of problem gambling than those earning the highest incomes (>$70k per annum) after adjusting for sex and age. Taking account of sex and age made little difference to the relationship with those in the lowest tertile still showing a proportion of symptoms (5.9%) that was just over double the proportion (2.9%) seen in those in the highest tertile of income.

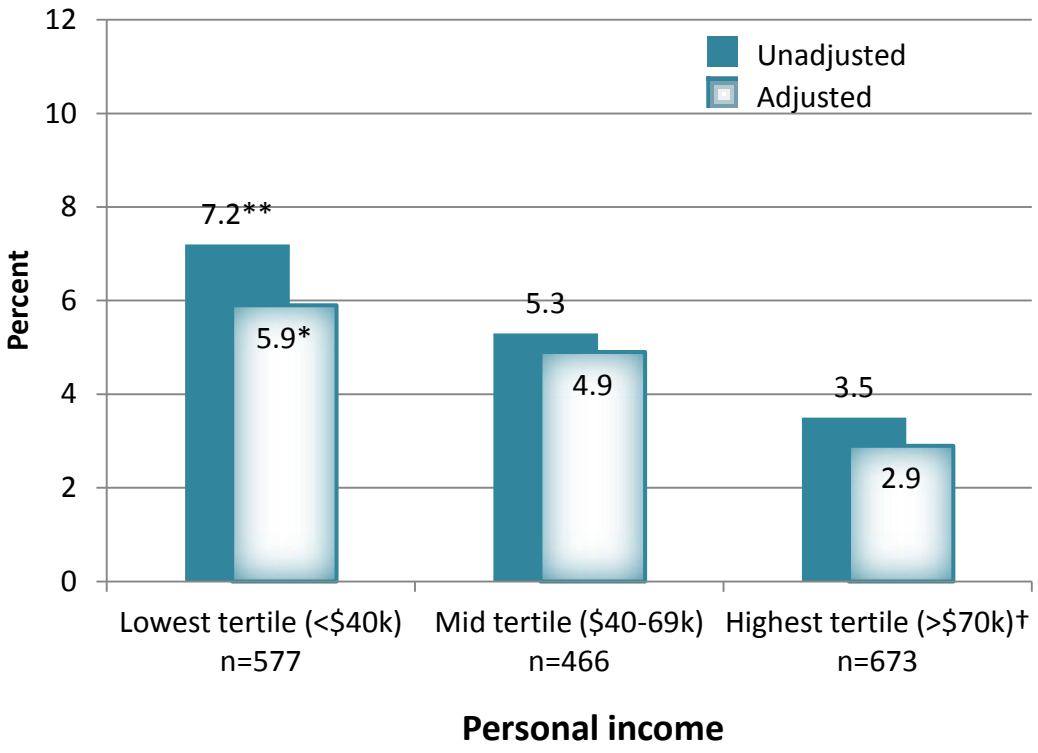


Figure 4.2: The proportion of personal income groups with any CPGI symptom (CPGI score>0), (i) unadjusted and (ii) adjusted by age and sex.
†Reference category; *p<.05; **p<.01; ***p<.001.

Family

Logistic regression was used to model simultaneously marital history, having children, age and sex. Earlier in this chapter (Table 4.2) we showed that there was little difference in symptoms amongst people with a history of divorce, regardless of whether they were currently married. These groups were combined into a single group, reflecting people who had ever been divorced. Figure 4.3 shows that never married and having ever divorced were associated with symptoms in the unadjusted model (See Table 8.3 of Appendix 1 for odds ratios and error estimates). Adjusting for having a child made a big difference to the never married category, but did little to account for symptoms amongst those who have ever divorced. Figure 4.3 shows that people who had never married, or had ever divorced had a higher risk of reporting any symptoms compared with the married and widowed groups, even after adjusting for other variables in the model.

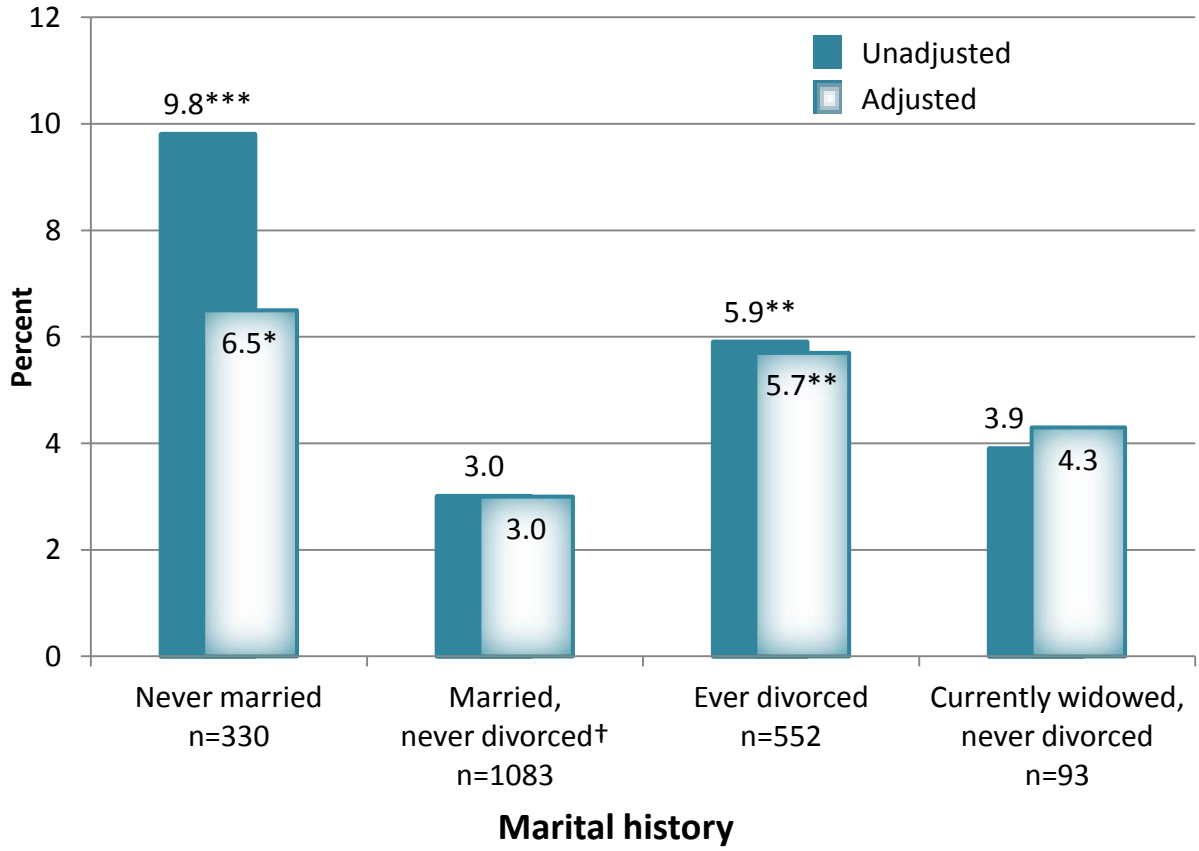


Figure 4.3: The proportion of marital history groups with any CPGI symptom (CPGI score>0), (i) unadjusted and (ii) adjusted by having a resident child under 18 years, age and sex.
†Reference category; *p<.05; **p<.01; ***p<.001.

Although having a resident child had been found to be significantly associated with a lower level of symptoms of problem gambling (even after adjustment for sex and age), further adjustment for marital history meant that having a child was no longer a significant factor in the model (Figure 4.4). This was because participants who had children were far more likely to be married (74%) than never married (4%). Marital history was the relevant characteristic in terms of the increased prevalence of gambling symptoms amongst people without children, rather than whether or not they had a child.

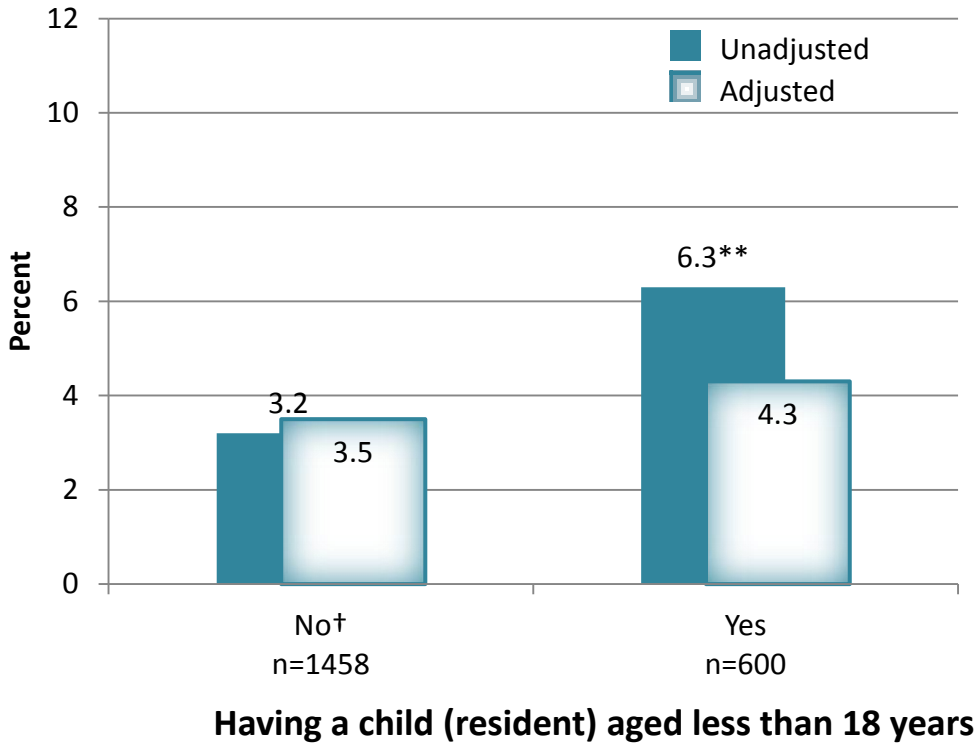


Figure 4.4: The proportion of people with a resident child (under 18yrs) reporting any CPGI symptom (CPGI score >0), (i) unadjusted and (ii) adjusted by marital history, age and sex. †Reference category; *p<.05; **p<.01; ***p<.001.

Education

Figure 4.5 similarly explores symptoms by highest completed qualification, both before and after adjustment for sex and age. Level of completed qualifications was strongly associated with symptoms after taking into account age and sex differences. Those with Year 12 education or less were more than three times as likely as those with degree level qualifications to report symptoms of problem gambling after taking account of sex and age (7.0% compared with 2.1%).

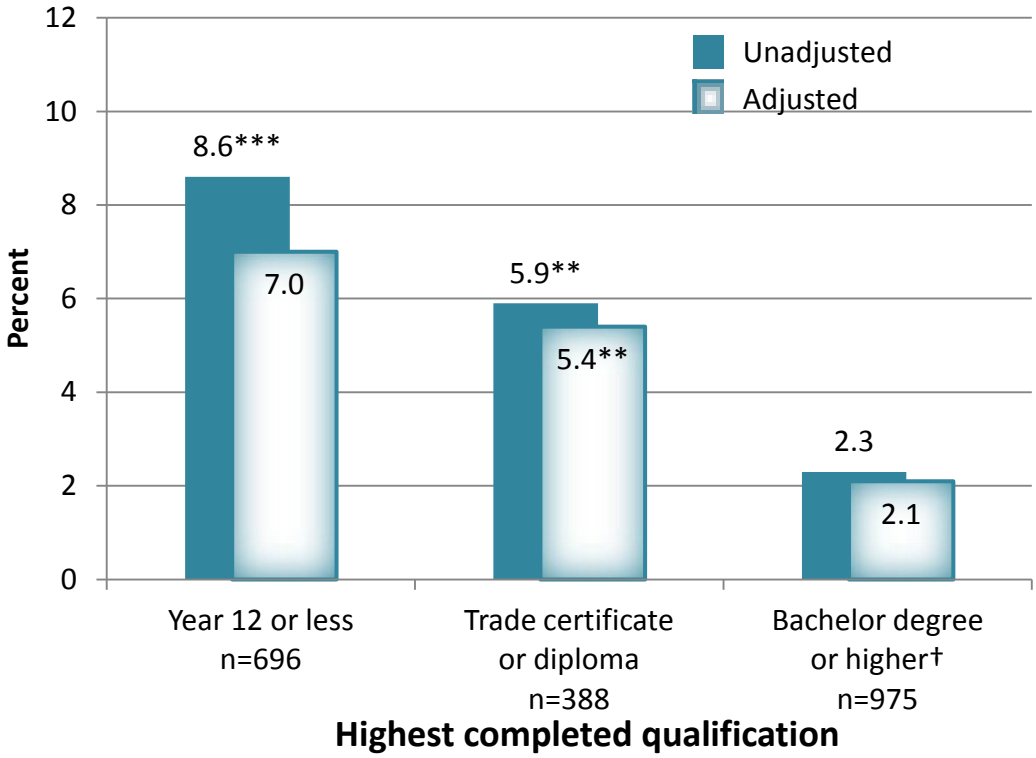


Figure 4.5: The proportion of highest completed qualification groups with any CPGI symptom (CPGI score>0), (i) unadjusted and (ii) adjusted by age and sex.
†Reference category; *p<.05; **p<.01; ***p<.001.

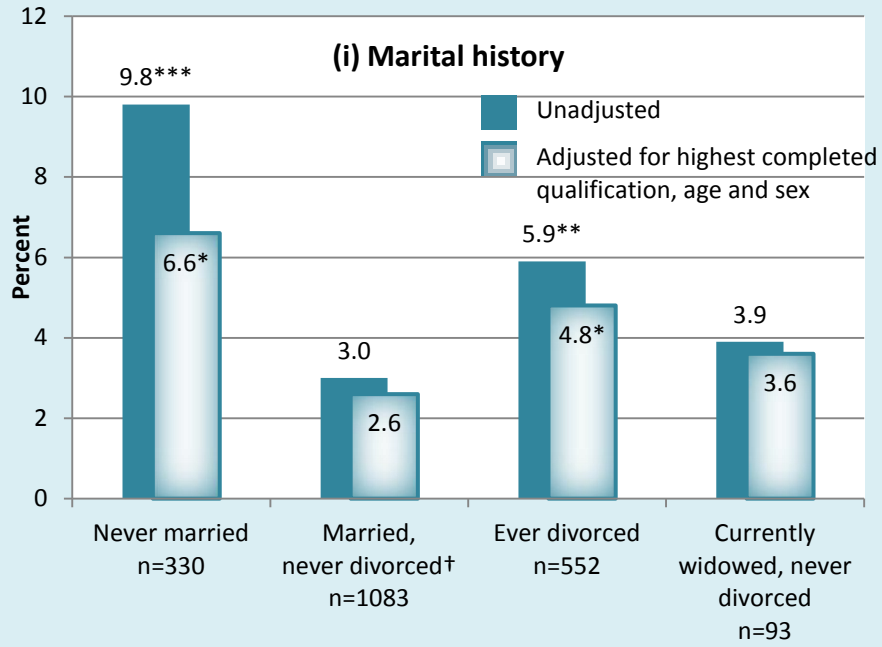
4.6 Which characteristics are significant after taking all other characteristics into account?

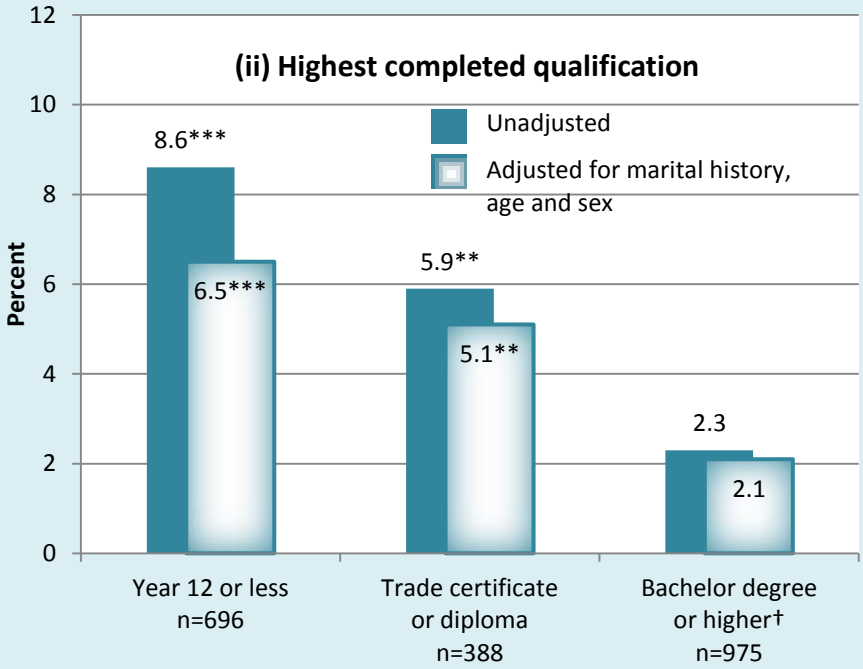
Our final approach was to determine which individual demographic and socioeconomic characteristics were associated with gambling problems, after taking into account all other demographic and socioeconomic characteristics. We modelled characteristics that were associated with gambling symptoms, that is, personal income, completed qualifications and marital history, age and sex. The lowest income group did not differ from the highest income group because people with low incomes also tended to have lower level qualifications (p=.537, Table 8.6 of Appendix 1).

Box 4.1 shows the results from a final model including only those variables identified as having an effect after taking all other characteristics into account. More specifically the graphs in the box show (i) marital history adjusted for highest completed qualifications, and age and sex, and (ii) highest completed qualifications adjusted for marital history, age and

sex. Those who had never married, or ever divorced had a higher proportion of symptoms than those who were married but had never divorced. Lower levels of education were strongly associated with symptoms in this model.

Box 4.1: CPGI symptoms (CPGI score>0) amongst marital history and highest completed qualification groups (i) unadjusted and (ii) the final adjusted model.





†Reference category; *p<.05; **p<.01; ***p<.001..

4.7 Quantifying gambling problems across population subgroups

Tables 4.3 and 4.4 quantify the risk of gambling symptoms combining the characteristics that were identified as being important (age, marital history, and education), for men and women respectively. These tables provide estimates of the proportion of people with gambling symptoms for specific population subgroups. For instance, the first row of Table 4.3 shows that 15.9% of 18-24 year old men, with year 12 or lower qualifications, and who had never married, had at least some gambling symptoms. This table also shows that the highest prevalence of gambling problems was amongst those who have the lowest qualifications and have never married. This finding is consistent across all age groups. The first row of Table 4.4 shows that the comparable figure for women (5.0%) was three times smaller than that reported for men. Overall, the proportions for women are much smaller than for men, but the pattern is largely the same.

Table 4.3: The estimated proportion of socioeconomic and demographic subgroups with any symptom (CPGI score>0), amongst adult men.

		Marital history		
Age	**Highest completed qualification**	**Never married**	**Ever divorced**	**Other†**
18-24	Year 12 or less	15.9	13	7.5
	Trade certificate or diploma	12.6	-	-
	Bachelor degree or higher	5.4	-	2.4
25-44	Year 12 or less	18.1	14.9	8.6
	Trade certificate or diploma	14.4	11.8	6.7
	Bachelor degree or higher	6.3	5.1	2.8
45-64	Year 12 or less	15.9	12.9	7.4
	Trade certificate or diploma	12.4	10	5.7
	Bachelor degree or higher	5.4	4.3	2.4
65+	Year 12 or less	10.8	8.8	4.9
	Trade certificate or diploma	8.5	6.8	3.8
	Bachelor degree or higher	3.6	2.8	1.6

†(i) currently married and never divorced, or (ii) widowed and never divorced.
- Estimate not possible due to insufficient number of participants in subgroup.

Table 4.4: The estimated proportion of socioeconomic and demographic subgroups with any symptom (CPGI score>0), amongst adult women.

Age	Highest completed qualification	Marital history: Never married	Marital history: Ever divorced	Marital history: Other†
18-24	Year 12 or less	5.0	4.0	2.2
	Trade certificate or diploma	3.9	-	1.7
	Bachelor degree or higher	1.2	-	0.7
25-44	Year 12 or less	5.9	4.8	2.6
	Trade certificate or diploma	4.6	3.7	2.0
	Bachelor degree or higher	1.9	1.5	0.8
45-64	Year 12 or less	8.2	6.6	3.7
	Trade certificate or diploma	6.3	5.1	2.8
	Bachelor degree or higher	2.6	2.1	1.1
65+	Year 12 or less	7.1	5.8	3.2
	Trade certificate or diploma	5.5	4.4	2.4
	Bachelor degree or higher	2.3	1.8	1.0

†(i) currently married and never divorced, or (ii) widowed and never divorced.
- Estimate not possible due to insufficient number of participants in subgroup.

We then ranked all subgroups across Tables 4.3 and 4.4, from the highest to the lowest risk subgroups. We also estimated the proportion of the adult population with characteristics identified as important in terms of risk of gambling problems, using our survey data. Table 4.5 shows the highest risk subgroups in the ACT population, representing 20% of the adult population. Table 4.5 shows clear patterns of sex, qualifications and marital history categories. The 10 highest risk subgroups, reflecting 14% of the adult population, all involved men with lower qualifications [year 12 or less (n=6), trade certificate or diploma (n=4)] who had never married (n=6) or had a history of divorce (n=4). None of the ten highest risk subgroups incorporated people aged 65 or older, women, or having a bachelor degree or higher.

Table 4.5 also shows the lowest risk subgroups in the adult population, reflecting 20% of the population. The majority of these subgroups incorporated women with a bachelor degree or a higher qualification. This table also shows the broad range in risk across population subgroups, varying from as little as 0.7% to as high as 18.1%. The former proportion reflects symptoms amongst women aged 18-24 years, with a bachelor degree or higher who have married but never been divorced. The latter

proportion reflects symptoms amongst men aged 25-44 years, who had completed year 12 or less, and never married. Overall, this range represents a 26 fold variation in risk across population subgroups.

Table 4.5: The estimated proportion of socioeconomic and demographic subgroups reporting symptoms (CPGI score>0), amongst the adult population.

Rank	Sex	Highest completed qualification	Marital history	Age Group	% Survey population (cumulative)	% Any symptom
Highest risk subgroups (reflecting 20% of the population)						
1	Men	Year 12 or less	Never married	25-44	1.4	18.1
2	Men	Year 12 or less	Never married	18-24	8.7	15.9
3	Men	Year 12 or less	Never married	45-64	9.0	15.9
4	Men	Year 12 or less	Ever divorced	25-44	9.9	14.9
5	Men	Trade certificate or diploma	Never married	25-44	10.2	14.4
6	Men	Year 12 or less	Ever divorced	18-24	10.4	13.0
7	Men	Year 12 or less	Ever divorced	45-64	12.0	12.9
8	Men	Trade certificate or diploma	Never married	18-24	12.9	12.6
9	Men	Trade certificate or diploma	Never married	45-64	13.0	12.4
10	Men	Trade certificate or diploma	Ever divorced	25-44	14.1	11.8
11	Men	Year 12 or less	Never married	65+	14.3	10.8
12	Men	Trade certificate or diploma	Ever divorced	45-64	15.6	10
13	Men	Year 12 or less	Ever divorced	65+	15.9	8.8
14	Men	Year 12 or less	Other†	25-44	18.3	8.6
15	Men	Trade certificate or diploma	Never married	65+	18.5	8.5
16	Women	Year 12 or less	Never married	45-64	18.8	8.2
17	Men	Year 12 or less	Other†	18-24	19.1	7.5
18	Men	Year 12 or less	Other†	45-64	21.3	7.4
Lowest risk subgroups (reflecting 20% of the population)						
57	Women	Trade certificate or diploma	Other†	25-44	79.4	2.0
58	Women	Bachelor degree or higher	Never married	25-44	81.0	1.9
59	Women	Bachelor degree or higher	Ever divorced	65+	81.6	1.8
60	Women	Trade certificate or diploma	Other†	18-24	81.8	1.7
61	Men	Bachelor degree or higher	Other†	65+	83.5	1.6
62	Women	Bachelor degree or higher	Ever divorced	25-44	85.5	1.5
63	Women	Bachelor degree or higher	Never married	18-24	86.3	1.2
64	Women	Bachelor degree or higher	Other†	45-64	91.4	1.1
65	Women	Bachelor degree or higher	Other†	65+	92.2	1.0
66	Women	Bachelor degree or higher	Other†	25-44	99.7	0.8
67	Women	Bachelor degree or higher	Other†	18-24	100.0	0.7

†(i) currently married and never divorced, or (ii) widowed and never divorced.

4.8 Key findings

(1) As reported in most prevalence studies, a wide range of characteristics were associated with gambling problems, these included being young, male, not having children, having never been married or ever been divorced, a relatively low income, and lower levels of qualifications.

(2) The proportion of people with gambling problems decreased across the lifespan for men, but not for women.

(3) After taking into account the considerable overlap between socioeconomic and demographic measures, marital history, age, sex and qualifications were identified as the most important predictors of gambling symptoms.

(4) The proportion of people with problems varied greatly across subgroups of the population from a low of 0.7% to a high of 18.1%, reflecting a 26-fold difference.

(5) The highest risk was evident for younger men, with lower qualifications who had either never married or had a history of divorce.

5. Participation and problem gambling

5.0 Overview of chapter objectives

People with gambling problems tend to bet on a wide range of products. However few studies have attempted to disentangle the relative contribution of different types of gambling activities to gambling problems. The overarching aim of this chapter therefore was to describe the distribution of problem gambling in terms of information collected on gambling participation.

The specific aims of this chapter included:

(1) describing how overall measures of gambling intensity (across all activities) relate to gambling problems;
(2) identifying a group of high-intensity gamblers, based on overall gambling participation measures, and describing their level of gambling problems;
(3) determining whether gambling on all activities, individual activities (e.g. EGMs), or specific combinations of activities, best accounts for problems in the community;
(4) identifying which combinations of participation measures best account for CPGI symptoms in the community; and
(5) using the information from (4), to identify a group of high-intensity gamblers, and describing their level of gambling problems.

5.1 Background

In addition to demographic and socioeconomic risk factors, it is appropriate to consider how measures of gambling participation and intensity relate to the prevalence of problem gambling. Remarkably little research has been done on this topic (Rodgers *et al.*, 2009). There are a number of published studies pertinent to this research question and they cover different approaches to addressing the topic. It is not easy to reconcile or even summarise their findings because of the variety of approaches and frameworks used for data analysis. In spite of the shortage of good quality empirical evidence, many commentators have taken the view that particular forms of gambling are more likely to lead to problem gambling than others. In Canada, for example, video lottery terminals (VLTs) have received considerable attention as a form of gambling that may be especially addictive due to characteristics of the

machines that promote 'persistence of play' (Smith and Wynne, 2004). In the Australian context, high-intensity gaming machines (referred to as EGMs subsequently) have similarly been widely considered as the most common cause of problem gambling. For example, the Council of Australian Governments (COAG) Select Council on Gambling Reform released a statement in October 2010 stating that:

> 'Ministers noted the 2010 Productivity Commission's findings that electronic gaming machines (poker machines) were the primary cause of problem gambling in Australia.'

The Productivity Commission (2010: p 4.1) report itself said that:

> 'Problems and vulnerabilities rise with the frequency of gambling and are much greater for gaming machines than other gambling forms.'

And, it further noted that [same page]:

> 'The likelihood of problems rises with EGM spending.'

This reinforced the similar conclusions drawn from the previous Productivity Commission (1999) report on gambling which pointed to research findings that EGM players were more likely to say that they had problems with this particular type of gambling than was observed for participants who engage in other forms of gambling. There is also evidence that playing EGMs is the most common form of gambling activity amongst those who receive treatment for problem gambling (Dowling *et al.*, 2005). There are two main reasons for being cautious about the conclusions reached by the Productivity Commission and by COAG. First, playing EGMs is the next most common form of gambling activity in Australia after the purchase of lottery and scratch tickets. Given its popularity, it is to be expected that it will be commonly reported by problem gamblers. Second, asking gamblers themselves to attribute the source of any problems they have may be an inappropriate way to establish a causal connection. This is especially so when problem gamblers are likely to engage in several gambling activities. Dowling et al. (2010) indicated that 'gamblers and problem gamblers often engage exclusively in only one form of gambling', but evidence from population based studies shows that problem gamblers are likely to report multiple gambling activities. The 2009 ACT

Prevalence Study found that moderate risk/problem gamblers reported 3.9 activities on average, low risk gamblers reported 3.8 and non-problem gamblers reported 2.1 types of activity (Davidson and Rodgers, 2010b). This illustrates the difficulty of separating out individual activities as putative causes of problem gambling when multiple activities are commonplace. The same cautionary note applies to other findings from the ACT Survey. Thus, whilst EGM playing was by far the most common activity reported by moderate risk/problem gamblers in the survey (92% reported EGM playing in the past year), the proportion of EGM players with moderate risk/problem gambling was just 6.6%, lower than the percentages found for several other activities, i.e. table games at a casino, private games for money, betting on sports or special events, Keno, playing casino type games on the internet, and bingo.

Shaffer and Martin (2011), in a recent review article, have contrasted studies which investigate gambling participation as an exposure with those that have used similar measures to indicate the extent of 'gambling involvement' in individuals. The former approach carries the implication that engaging in gambling activities represents environmental forces that can lead to or place individuals at greater risk of developing gambling problems. The latter approach carries more of the implication that being involved across a range of gambling activities is a reflection of a propensity towards problematic behaviour. Although the distinction between exposure to gambling and the concept of gambling involvement is easy to understand, research evidence available to date is ambiguous and findings can be used to lend support to either interpretation. This is particularly so when cross-sectional data are used, which has always been the case. It is inevitable that existing cross-sectional data will be utilised before any major investment is made in exploring this topic prospectively. The following studies have contributed to current knowledge in this field.

Using data from the U.S. National Gambling Impact Study Commission survey conducted in 1999-2000, Welte et al. (2004) found that participation in a greater number of types of gambling was strongly predictive of gambling pathology. This was similar to the 2009 ACT Prevalence Survey where moderate risk/problem gambling was present in 8.9% of respondents who engaged in four or more activities, 2.8% of those who reported 2-3 types of gambling, and just 0.2% of those who reported only one type of gambling activity.

In the Canadian Community Health Survey of 2002, Currie at al. (2006) showed that the likelihood of experiencing gambling-related harm increased steadily with frequency of gambling and with money spent on gambling. However, other than excluding gamblers whose only activity was weekly lotteries, no analyses were reported that took account of type of gambling activity.

More recently, LaPlante et al. (2009) reported findings from secondary analysis of the 2007 British Gambling Prevalence Survey where they examined the association between specific types of gambling and prevalence of gambling symptoms. They used multiple logistic regression to separate out the specific associations between each type of activity and presence of symptoms after adjustment for the number of types of activity reported for the past 12 months (i.e. 'gambling involvement'). This statistical adjustment for gambling involvement 'substantially reduced or eliminated all statistically significant relationships between types of gambling and disordered gambling'. Two features of this study are worth bearing in mind when considering the applicability of the results in the Australian context. One is that Britain does not have the availability of high-intensity of EGMs seen across most of Australia. The second feature of the LaPlante et al. (2009) findings was that the association between playing virtual gaming machines and disordered gambling was the notable exception to the study's main conclusion. Gamblers who reported this activity were still more than four times as likely to have gambling symptoms even after adjusting for total number of activities reported.

Essentially, then, previous research is inconclusive as to whether particular types of gambling activity are more likely to lead to problem gambling than other types of activity. In the Australian context, there is a need for good empirical evidence to establish whether EGMs are 'the primary cause of problem gambling'. This is the second main aim of the present project, that is, to undertake the detailed and careful analyses required to separate out associations between particular forms of gambling and problem gambling, drawing on the data from the 2009 ACT Prevalence Study.

Measures of gambling involvement and intensity

As indicated above, previous studies have used different approaches to measuring gambling involvement and intensity. For example, the analyses of British data reported by LaPlante et al. (2009) used a measure of gambling involvement that was a simple sum of the number of

gambling activities reported for the past year. As the authors acknowledge, 'other measures of involvement (e.g. intensity of play, involvement in clusters of games, etc.) might provide weaker or stronger attenuation of the association between types of games and gambling-related problems'. This limitation applies not just to the measure of overall involvement used by LaPlante et al., but also covers the measures they used to describe specific gambling activities. These were simply yes/no variables of whether each activity was reported for the past year and so gave no indication of the intensity of participation in each individual activity.

Potentially, a large number of measures could be used to characterise participation, including frequency of play for specific activities, amount spent on each activity, and (for certain types of activity) the length of gambling sessions. In addition, overall involvement could be represented by overall frequency and total money spent across activities. This makes the task of unpicking which measures are the most relevant for predicting problem gambling both complex and time-consuming. However, given the acknowledged shortcomings of existing studies, this task is fundamentally important to progress in this important and contentious field. The following analyses from the 2009 ACT Prevalence Survey demonstrate the methodological challenges that arise when quantifying the extent of engagement in multiple activities.

5.2 Problem gambling and gambling intensity across all activities

We first explored the associations between participation across all activities and CPGI symptoms. This was done using two complementary analytic methods: (1) multiple linear regression analysis; and (2) plotting the proportions of people with any symptoms and those meeting the criteria for moderate risk/problem gambling. The first analytic approach provides statistical models for predicting the number of CPGI symptoms reported by individual gamblers based on measures of gambling intensity.

The second analytic approach of plotting proportions of people with CPGI symptoms provides a simple visual representation of how the level of symptoms varies with each individual measure of participation and is an aid to understanding the strength and shape of relationships that make up the more complex and opaque statistical modelling.

The initial regression analyses were used to predict CPGI score based on three participation measures relating to the past 12 months:

(i) frequency of gambling on all activities;
(ii) total financial losses (in dollars) across all activities; and
(iii) number of gambling activities.

The term 'predict' is used here in a statistical sense in that the data were all collected at the same point in time in the 2009 ACT Prevalence Survey. Frequency of gambling on all activities was estimated by summing across responses to questions asking people how often they had participated in each activity. People could answer per week, month or year. Total financial losses over the last 12 months were estimated by summing across responses to questions asking about losses for each activity. These questions asked, 'subtracting any winnings, how much money did you spend'. They could answer in terms of average amount per week, month, or year and net profits were also recorded. This measure was designed to assess net expenditure. So, if needed, interviewers prompted answers by further asking, 'How out of pocket were you?' and 'Can you give me an approximate amount?'

The modelling required logarithmic transformation of the CPGI score [$Log_{10}(score_i+1)$], in order to make the scores closer to a normal distribution. The regression models included quadratic as well as linear terms wherever statistically significant. This further increases the complexity of the models and so the statistical detail is presented in the appendix to the report (Appendix 2). However, the importance of the approach lies in the aims outlined at the beginning of the chapter. The outcomes related to these aims are presented both graphically and in the text of this chapter. These results can be appreciated without understanding the underlying statistical techniques.

Frequency of gambling on all activities and gambling problems

Regression analysis indicated that total frequency of gambling across all activities was strongly associated with CPGI score ($p<.001$; Table 9.1 of Appendix 2). The quadratic term was of borderline statistical significance ($p=.053$) indicating that the relationship may not be linear. Figure 5.1 shows the results of the second analytic approach of plotting proportions of moderate risk/problem gambling and of any CPGI symptoms across total gambling frequency. This plot is based on rolling percentages across bands of gambling frequency.

The proportion of gamblers reporting any symptom increased relatively sharply across lower bands of gambling frequency, whereas the proportion of moderate risk/problem gamblers increased more uniformly across gambling frequency. There are indications of a flattening out of the graphs at very high frequencies, consistent with the negative quadratic term in the regression analyses (Table 9.1 of Appendix 2). Caution is necessary when interpreting the far right-hand end of the graphs, because few people in the survey gambled at such extreme levels of intensity. The plots show that around 40% of people who gambled 150 times in the past year (i.e. about 3 times per week) reported any symptoms on the CPGI and about 15% had three or more symptoms (moderate risk/problem gambling). The equivalent proportions for those gambling around 300 times in the past year were about 60% and 30% respectively.

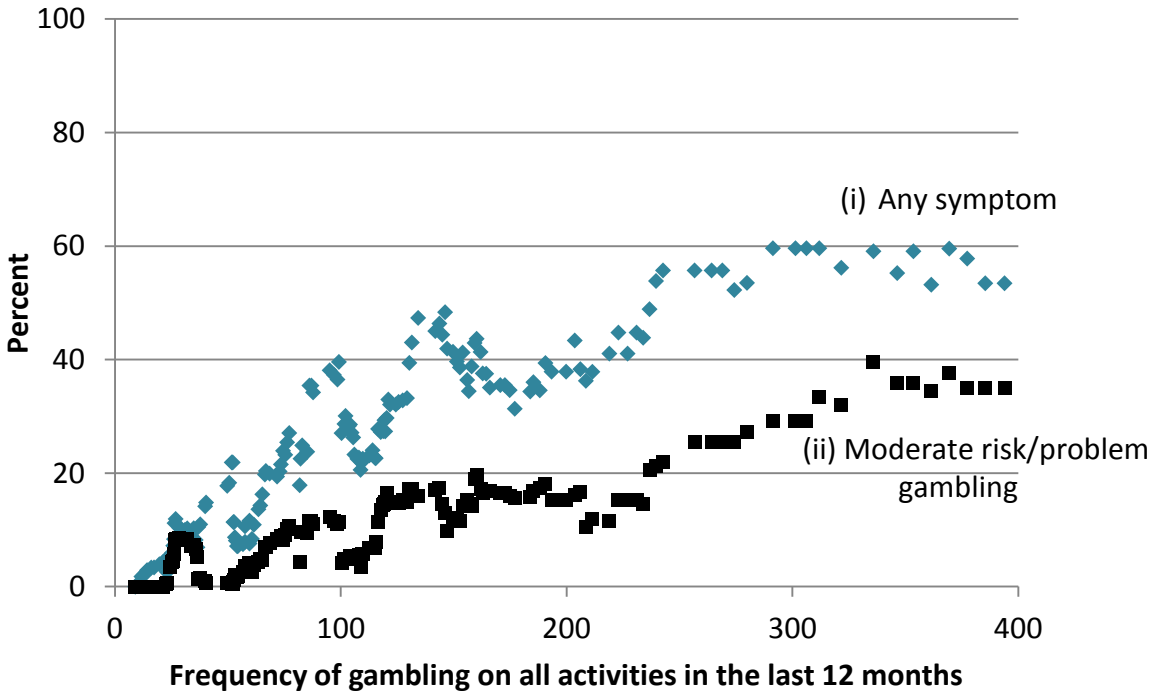


Figure 5.1: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling (CPGI>2) by frequency of gambling on all activities in the last 12 months.

Total financial losses across all activities and gambling problems

A strong association was also found between money lost across all activities and CPGI score ($p<.001$, Table 9.1 of Appendix 2) and the relationship more clearly flattened off at the right hand end of the graph ($p<.001$ for the quadratic term) than was seen for frequency of gambling (comparing across figures 5.2 and 5.1). Overall, the regression model showed that financial losses better accounted for symptoms in the community than was previously found for frequency of gambling.

We can confirm that financial losses better explained symptoms than other measures of gambling intensity by looking at 'variance explained' statistics. Financial losses accounted for 22% of the variance in CPGI score compared with 17% for gambling frequency (Table 9.1 of Appendix 2). People who spend the same amount of money do not all have the same level of symptoms. If a model explained 100% of the variance this would mean that people who had the same expenditure all had exactly the same CPGI score. In practice this could never be achieved because we know that a wide range of factors influence problem gambling, not just a single measure of participation, such as financial losses. Using this same example, if a model explained 0% of the variance, it would mean that CPGI score was completely unrelated to the amount of money lost on gambling. The percentage of variance explained can be used to show whether one measure of participation better accounts for the variation in symptoms in the community than another. The 'variance explained' statistic can also show whether multiple participation measures are better than having a single measure.

The plots of percentages for CPGI symptoms are shown in Figure 5.2 indicating that problems increased rapidly as losses increased. At losses of $100 per week, approximately 50% of gamblers reported some symptoms, with about one in five meeting the criteria for moderate risk/problem gambling. The proportion of gamblers with problems flattened out across extremely high levels of loss consistent with the significant quadratic term reported for the equivalent regression analysis. As with Figure 5.1, the right-hand end of the graph needs to be interpreted with caution because comparatively few people in the survey reported such extreme losses. Only 2% of gamblers lost $200 or more per week.

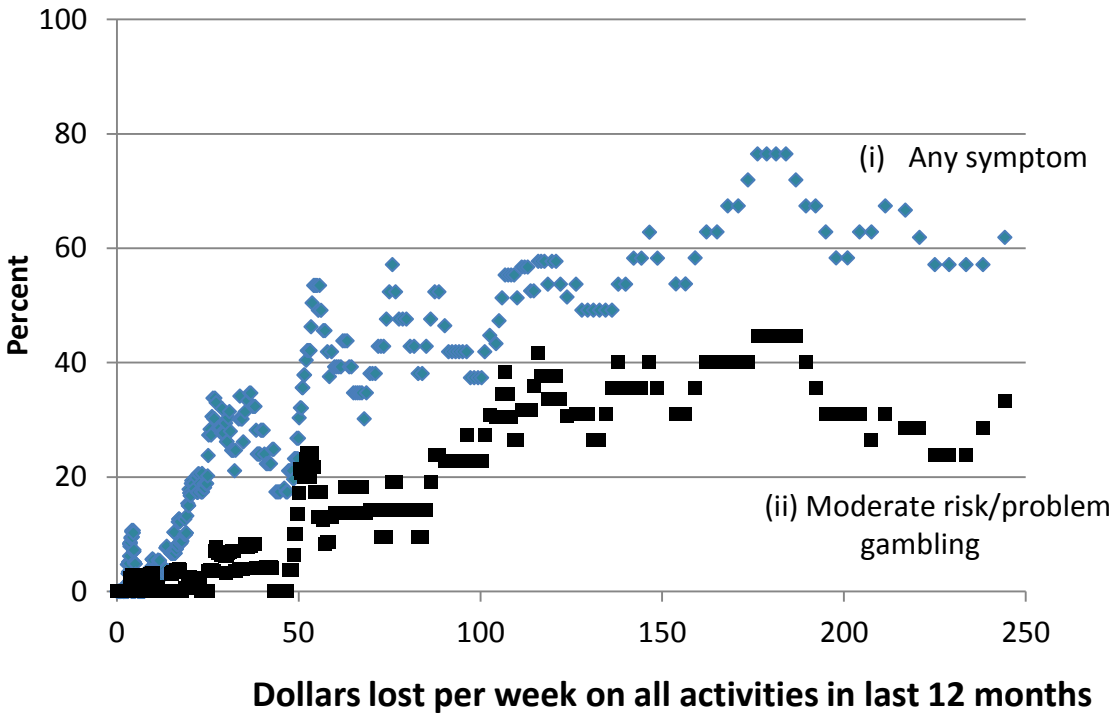


Figure 5.2: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling (CPGI>2) by dollars lost per week in the last year on all activities.

Number of gambling activities and gambling problems

Regression analysis was also used to relate number of activities reported in the past year to CPGI score. Proportions, both for any symptom and for moderate risk/problem gambling, increased slowly across the lower numbers of activities and then increased more rapidly across higher numbers of activities. Again, a significant quadratic term indicated this departure from linearity was significant. As shown in the plots of proportions in Figure 5.3, the shape of the curve was concave (as indicated by a positive quadratic term) rather than convex (as indicated by a negative quadratic term). For five activities, slightly more than one in five gamblers reported symptoms and 10% were moderate risk/problem gamblers. The right-hand end of the graph needs to be interpreted with caution because comparatively few people in the survey reported gambling on very large numbers of activities. Only 3.0% of gamblers participated in six or more gambling activities.

Number of activities accounted for just 9% of the variance in CPGI scores, this is small compared to gambling frequency (17%) and financial losses (22%) (Table 9.1 of Appendix 2). This indicates that number of activities was less useful in accounting for CPGI score than either gambling frequency or financial losses.

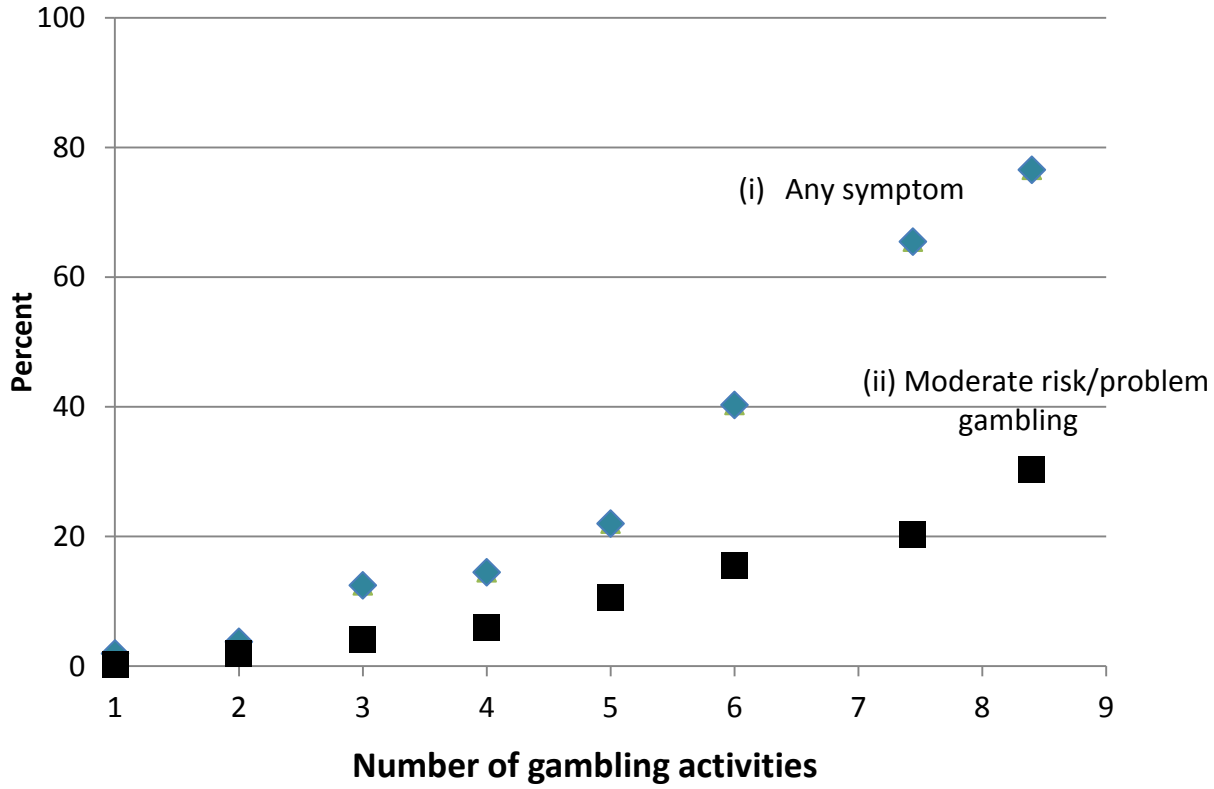


Figure 5.3: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling (CPGI>2) across number of activities.

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A multiple linear regression model, simultaneously incorporating all three measures of overall participation showed that multiple participation measures were better at accounting for CPGI scores than single measures. The variance explained statistic for the multiple regression model was 26% (Model 1 in Table 9.2 of Appendix 2). Overall, the coefficients and p-values shown in Table 9.2 (Appendix 2) demonstrate that financial losses were the most important indicator of individuals with CPGI symptoms. Frequency of gambling was the second most important measure. The inclusion of number of activities in this model did

not further account for CPGI scores compared to having just two participation measures, i.e. financial losses and frequency.

5.3 The highest-intensity gamblers

The 'variance explained' statistic is valuable in indicating the relative value of different combinations of participation measures in accounting for symptoms. The actual practical use of the multiple regression approach can be illustrated by quantifying the extent of problem gambling among a group of people gambling at high intensities.

For the purpose of illustration, a cut-off was used to identify the highest-intensity gamblers (representing the top 10% of the adult population; n=143). These individuals were identified based on all three participation measures (gambling frequency, losses and number of activities) using the multiple regression model. This group included people who gambled at extreme levels in terms of individual measures. However, the group also included people who were identified as highest-intensity gamblers based on their *combined* responses to the participation measures. For instance, they may have lost an amount of money that was average, but they may have gambled more frequently than others. Their responses to each of these questions alone would not identify them as high-intensity gamblers, however their losses and frequency combined put them at increased risk for problems.

This group encapsulated 49.1% of people reporting any symptom, including 56.3% of the moderate risk and 68.8% of the problem gamblers. Figure 5.4 shows the proportions of the highest-intensity gamblers reporting any CPGI symptoms and meeting the criteria for moderate risk/problem gambling (CPGI >2). More than half of this group (55.2%) reported some symptoms and about a quarter (26.6%) had CPGI scores of three or more. These figures are several times greater than the equivalent proportions amongst lower intensity gamblers (excluding those who only gambled on lottery or scratch tickets). The comparison is also shown for those who reported buying lottery or scratch tickets but no other type of gambling activity. This group contained no moderate risk/problem gamblers and only 1.1% reported any symptoms.

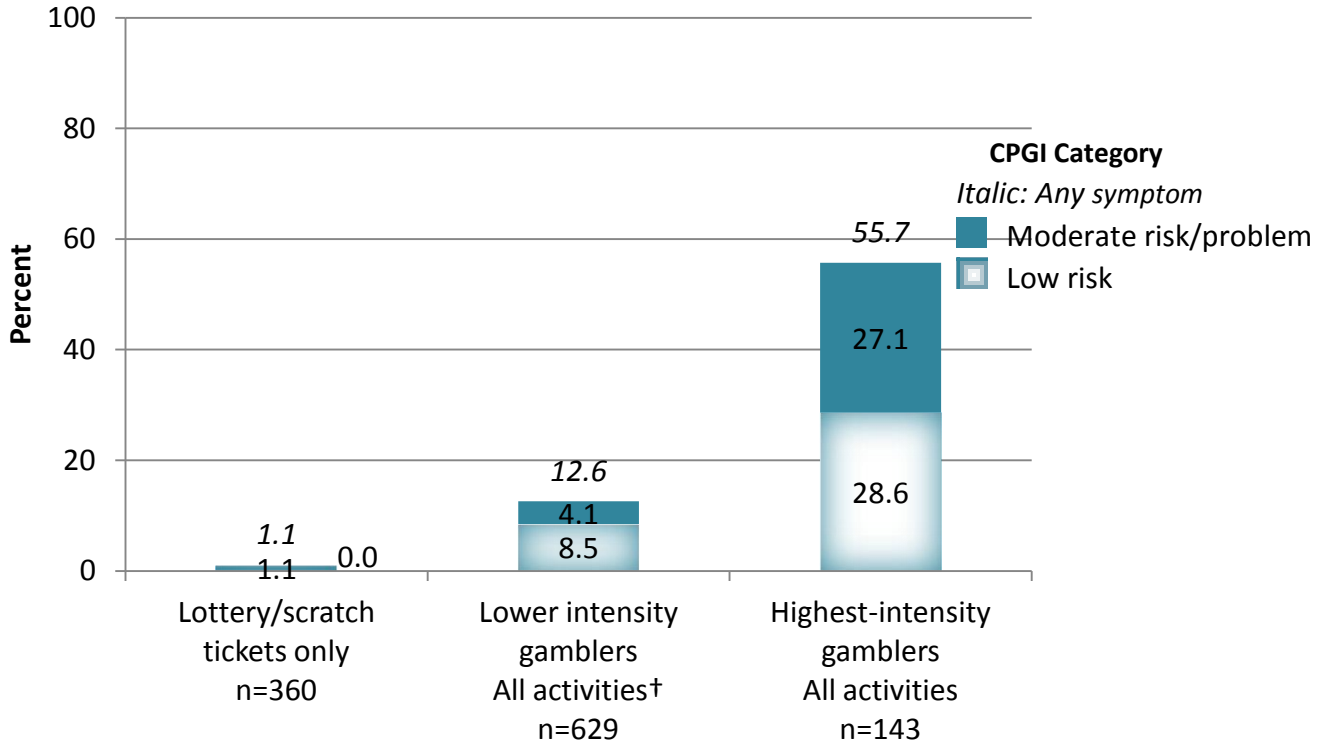
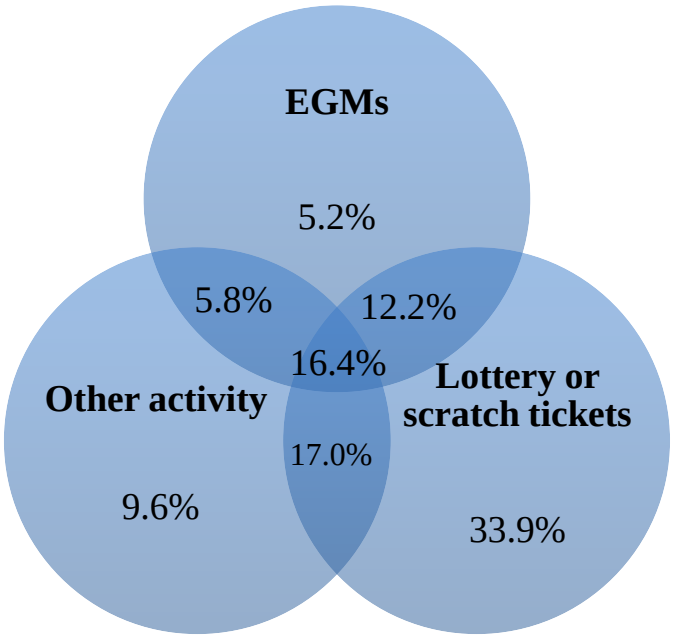


Figure 5.4: Prevalence of low risk and moderate risk/problem gamblers amongst people who (i) only buy lottery or scratch tickets, (ii) are lower intensity gamblers across all activities† and (iii) are the highest-intensity (top 10%) gamblers across all activities.
†excluding those who only buy lottery or scratch tickets.

5.4 Overlap across gambling activities

As mentioned at the beginning of this chapter, we found considerable overlap across individual gambling activities in the 2009 ACT Prevalence Survey, and very few people gambled on only one activity. Figure 5.5 shows the overlap between EGMs, lottery or scratch tickets, and other activities as reported in the ACT Survey. The percentages in Figure 5.5 are based on a denominator of all people who gambled in the past year and the figures presented sum to 100%. The largest single group was the 33.9% of gamblers who reported buying either lottery or scratch tickets (or both) but no other form of gambling in the past year. While 39.6% of all gamblers reported playing EGMs (the sum of the four sections making up the EGMs circle) only 5.2% of gamblers played EGMs as their sole gambling activity and the other 34.4% of gamblers reported playing EGMs plus some other forms of

gambling. In short, reporting more than one type of gambling is the norm and the extent of overlap between activities means that multivariate statistical approaches are required to tease out associations between activities and problems.



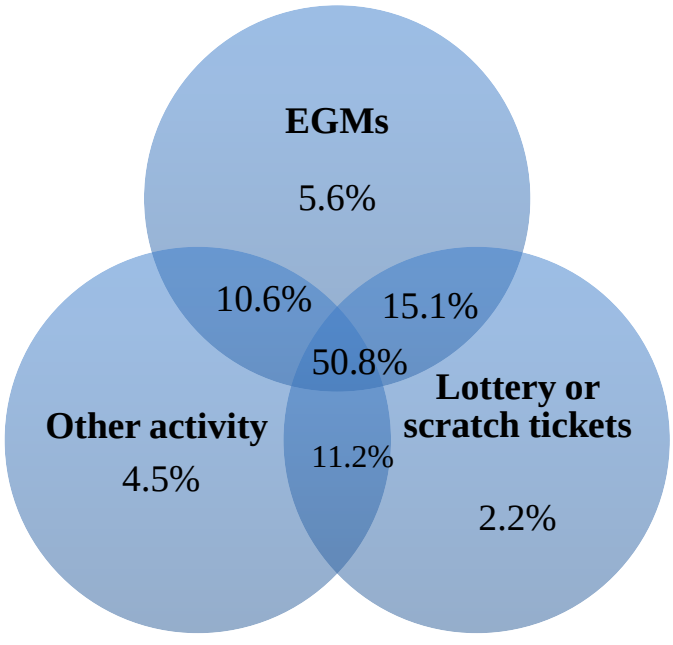
Totals: EGMs =40%, Lottery or Scratch tickets=79%, Other activity=49%.

Figure 5.5: Venn diagram showing the prevalence of gambling on EGMs, Lottery or scratch tickets, and other activities amongst gamblers (Davidson and Rodgers, 2010b: p26).

The categorisation of activities used in Figure 5.5 adopts a common approach in Australian prevalence studies. That is, EGMs are often viewed as a separate, important activity, lottery and scratch tickets are typically removed from analyses as they are considered to be innocuous, while the remainder are classified as 'other activities'. People who report specific activities included in the 'other activity' category are usually too few to investigate separately but are considered to be of some importance and so are grouped together. However, when assessing problems associated with type of activity, the overlap between activities even with this much simplified categorisation has not been taken into account in previous studies.

5.5 Overlap across gambling activities and problem gambling

Figure 5.6 complements the previous figure by showing the distribution of people who reported some symptoms of problem gambling (i.e. CPGI>0) across the segments. Comparing these percentages with those in Figure 5.5, it can be seen that only 2.2% of those reporting some problem gambling symptoms were in the segment for lottery and scratch tickets (but no other type of gambling) contrasted with the 33.9% of all gamblers who were in this category, so the distribution of people reporting gambling symptoms is clearly very different to the distribution of all gamblers across activities. Figure 5.6 also shows that 50.8% of people reporting problem gambling symptoms participated in activities from all three categories whereas only 16.4% of all gamblers were in this segment (Figure 5.5). Only 12.3% (5.6% +2.2% +4.5%) of people reporting problem gambling symptoms had engaged in just one type of activity (and some of these participated in more than one activity within the 'other activity'). This further emphasises the relationship between engaging in multiple activities and problem gambling and highlights the need for sophisticated multivariate statistical techniques to establish whether specific types of activity are related to CPGI symptoms.



Totals: EGMs =82%, Lottery or Scratch tickets=77%, Other activity=77%.

Figure 5.6: Venn diagram showing the activities undertaken by people reporting gambling symptoms (CPGI>0), n=179.

Given that most activities are associated with gambling problems, and there is considerable overlap between activities, how can we tell which activities are likely to be responsible for gambling problems? We used an extension of the linear regression approach to see whether participating in any specific activity was associated with gambling problems after adjustment for overall frequency, expenditure and number of other activities. Initially, we took the model already developed relating CPGI score to total gambling frequency, losses and number of activities and simply added one variable at a time to represent whether someone reported a particular activity or not (i.e. a dummy variable where 0=No and 1=Yes). Model 2 in Table 9.2 (Appendix 2) shows that playing EGMs had a significant association with CPGI score after adjusting for overall frequency, financial losses and number of activities. No other significant findings were obtained (Models 3 to 10) demonstrating that EGM participation stood out from other activities in terms of indicating individuals with gambling problems. Given the unique contribution of playing EGMs, the multiple regression modelling approach was utilised further to explore how the several measures of EGM participation related to CPGI score.

5.6 Problem gambling and intensity of playing EGMs

Linear regression models were used to investigate measures of EGM intensity during the last year in relation to CPGI score. These measures included:

(i) frequency of playing EGMs;

(ii) financial losses playing EGMs; and

(iii) typical session duration on EGMs.

Initially, these measures of intensity were examined one at a time. Frequency, financial losses and session duration each accounted for a large proportion (28%, 38% and 18% respectively) of the variance in CPGI score (Table 9.3 of Appendix 2). To highlight the importance of these estimates, comparable findings are shown in Table 9.4 (Appendix 2) for the equivalent measures of other individual types of gambling activity assessed in the survey. These were all much lower than found for measures of EGM activity and ranged between 2% and 8% of the variance explained. This indicates that measures of EGM intensity better accounted for CPGI symptoms than measures of intensity for other activities. Of even greater significance is that the models based on EGM activity better accounted for CPGI symptoms than the models based on measures across all gambling activities presented previously (section 5.1).

Figures 5.7, 5.8 and 5.9 shows moderate risk/problem gambling and any symptoms across all three measures of intensity of playing EGMs. These figures show that the proportion of people reporting symptoms increased sharply across frequency of playing and financial losses, flattening out at higher levels. These curves are consistent with the significant negative quadratic terms for the equivalent regression models ($p<.001$ in both instances). In contrast, session duration had a more linear association with CPGI score ($p=.343$ for the quadratic term).

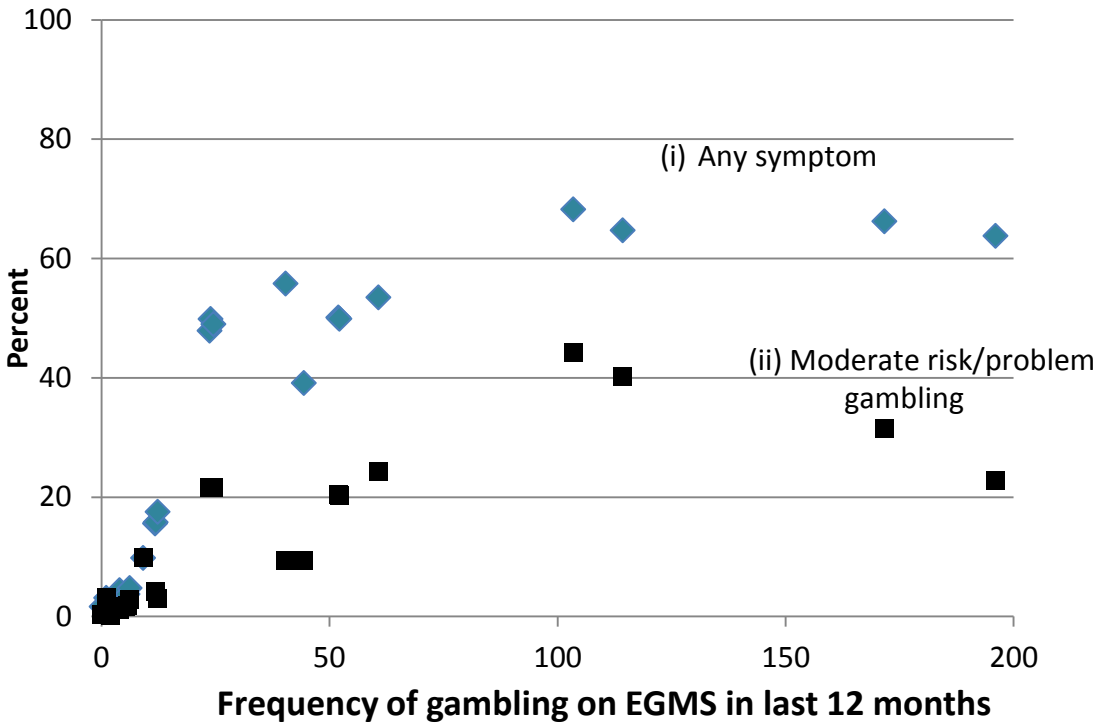


Figure 5.7: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling, by frequency of gambling on EGMs in the last 12 months.

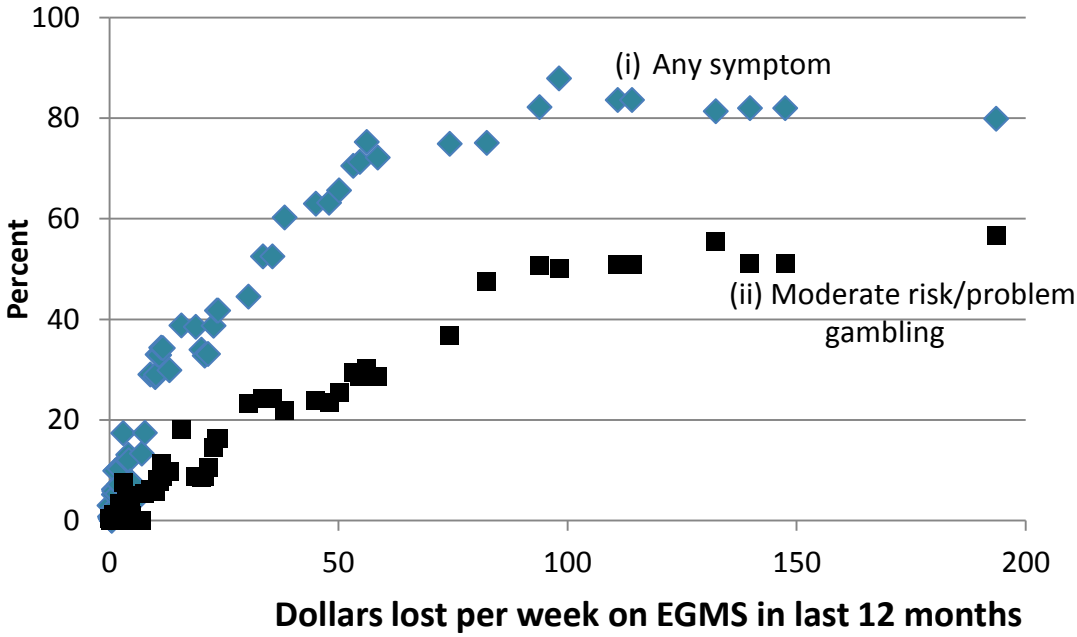


Figure 5.8: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling, by dollars lost on EGMs (per week) in the last 12 months.

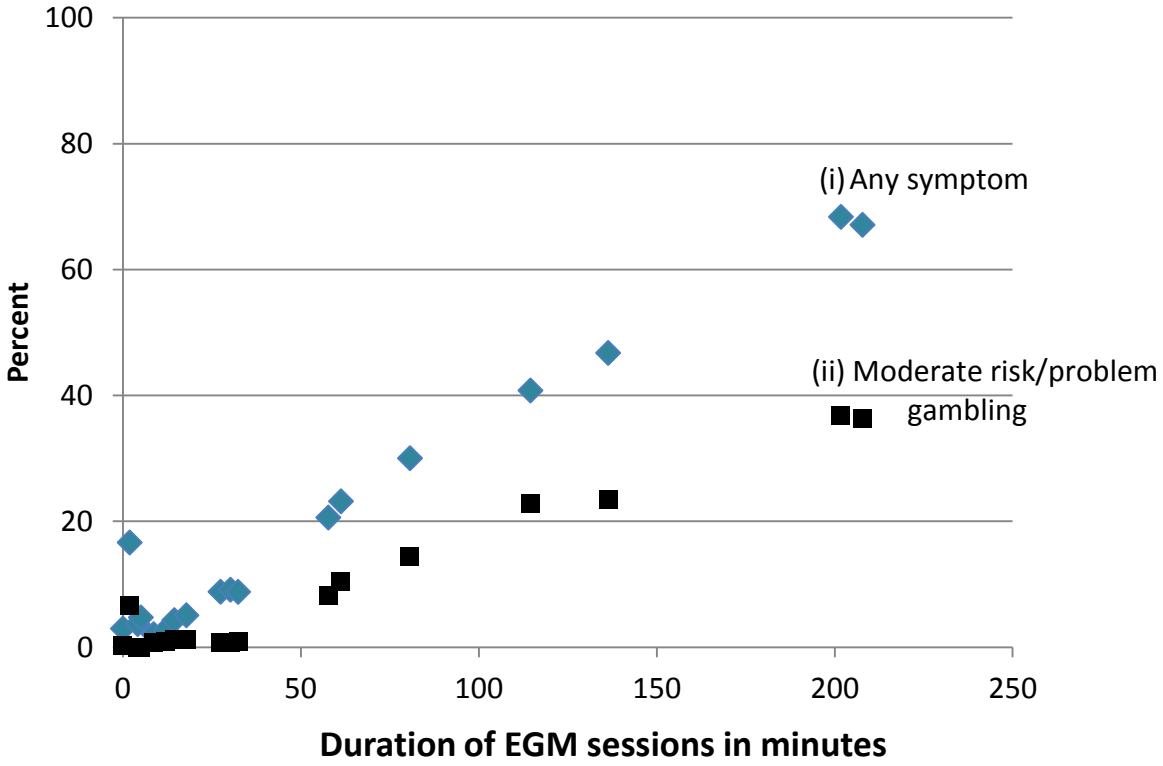


Figure 5.9: The proportion of (i) gamblers reporting any symptom (CPGI>0) and (ii) moderate risk/problem gambling, by EGM session duration (in minutes).

We then used a multiple regression model, simultaneously incorporating all three measures of EGM intensity, to investigate whether collectively the measures better account for CPGI scores than any single EGM measure. The variance explained statistic for this multiple regression model was 40% (Model 1, Table 9.5 of Appendix 2), which was marginally better than that found when only modelling financial losses from playing EGMs (38%). Overall, the coefficients and p-values indicated that of all three EGM measures, financial losses from playing EGMs was the best indicator of CPGI symptoms. Frequency of playing EGMs was the second most important measure. The inclusion of typical session duration in this model did not further account for CPGI scores compared beyond having just two participation measures, ie financial losses and frequency.

5.7 The highest-intensity EGM players

The following illustration demonstrates the practical value of the information from the multiple regression model. Using the same approach as reported earlier for overall measures of gambling participation (section 5.1) the above multiple regression model was used to identify a group of highest-intensity EGM players, based on all three EGM intensity measures (financial losses, frequency and session duration). Again, for the purposes of illustration, a cut-off was used to identify the EGM players who played at the highest levels of intensity, reflecting the top 10% of the adult population (n=145). Figure 5.10 shows the highest-intensity EGM players, in terms of their frequency and financial losses playing EGMs. The area of the graph with solid shading represents the frequencies and financial losses of the highest-intensity EGM players. This figure shows that almost everyone who had gambled more than 100 times on EGMs in the last 12 months were included in the highest-intensity group, regardless of their financial losses.

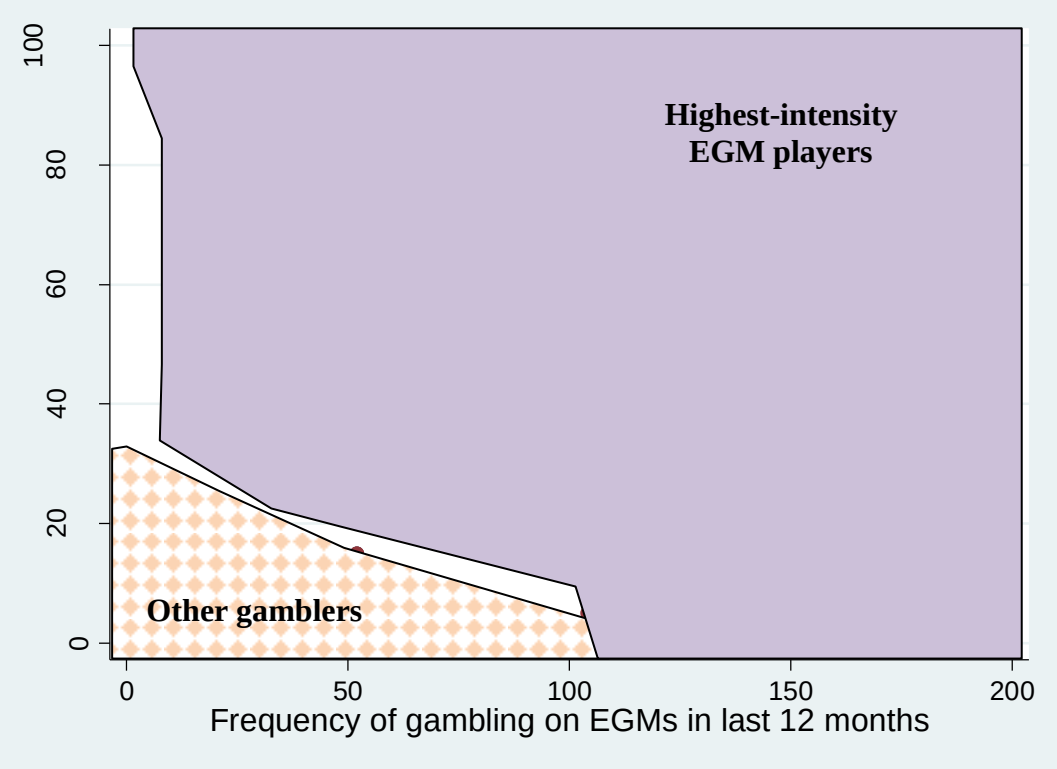


Figure 5.10: Frequency of gambling on EGMs and dollars lost per week on EGMs amongst participants identified as the highest-intensity EGM players and other gamblers.

Similarly, everyone reporting losing $40 per week or more on EGMs (on average) were included in the highest-intensity group. However, some people were identified as highest-intensity players based on the combination of their gambling frequency and financial losses.

For instance, people playing 50 times in the last year were identified in the highest-intensity group if they also lost $20 per week or more. The area of the graph with diamond shading represents the frequencies and financial losses of other (lower intensity) EGM players. The section of the figure that is unshaded represents frequencies and losses that were not reported by people in the study. For instance, no-one reported playing EGMs once in the last year and losing more than $40 per week.

The *highest-intensity* EGM players encapsulated 54.6% of people reporting any symptom, including 64.6% of moderate risk and 75.0% of problem gamblers. Figure 5.11 shows the proportions of this group with moderate risk/problem gambling and any CPGI symptoms. Over 60% (61.4%) reported some symptoms and almost a third (29.7%) had CPGI scores of three or more. These figures are far greater than the equivalent proportions for lower intensity EGM players, for those who reported buying lottery and/or scratch tickets but no other type of gambling activity, or for those who reported other gambling activities but not EGMs.

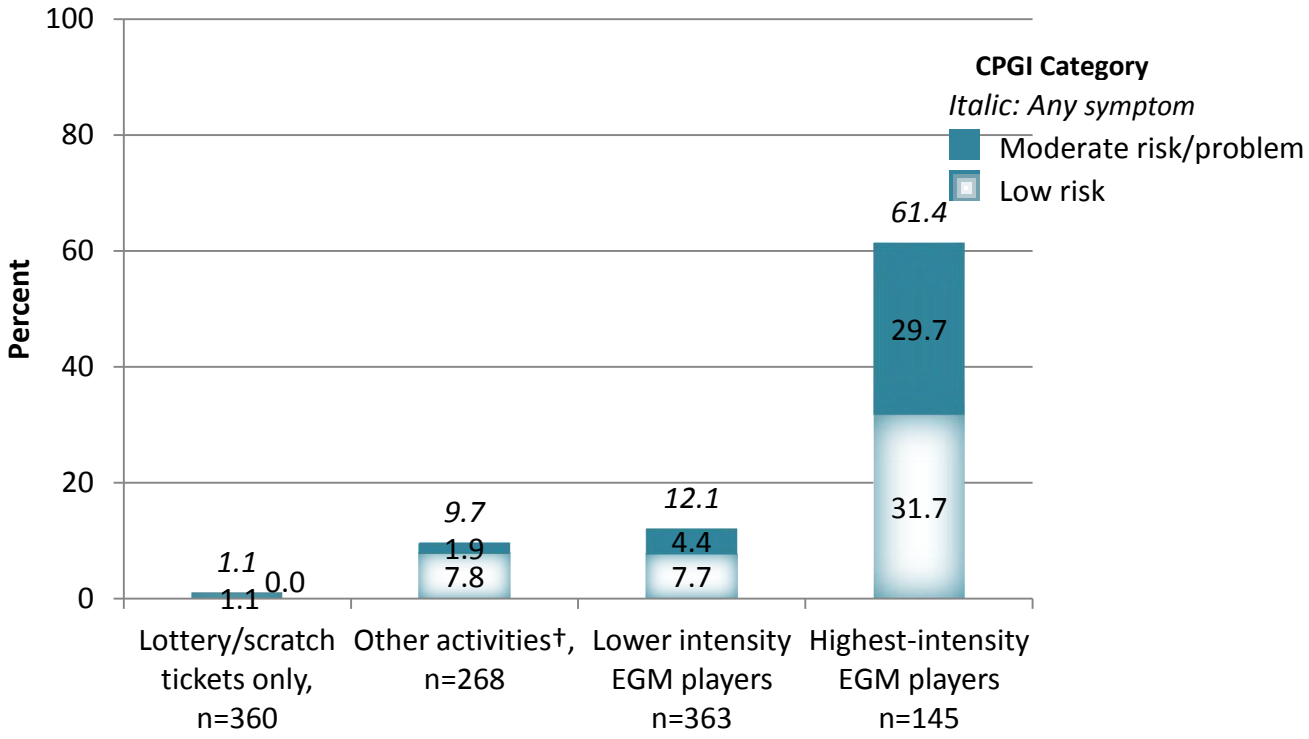


Figure 5.11: Prevalence of low risk and moderate risk/problem gambling amongst (i) people who only buy lottery or scratch tickets, (ii) †people who gamble on activities other than EGMs, lottery or scratch tickets, (iii) lower intensity EGM players and (iv) the highest-intensity (top 10%) EGM players, across all EGM measures.

5.8 Are activities other than EGMs important in terms of problem gambling?

This section explores whether other specific gambling activities are associated with CPGI symptoms after intensity of EGM participation is taken into account. We first examined whether activities other than EGMs, **as a whole**, contributed to gambling problems after adjusting for intensity of playing EGMs. The multiple linear regression model used to predict CPGI score from frequency of gambling on EGMs, financial losses on EGMs, and EGM session duration was extended by adding variables representing activity across all forms of gambling other than playing EGMs. These were: (i) frequency of engaging in other types of activity; (ii) financial losses summed across all other activities; and (iii) number of other activities. Detailed results are shown in models 2 to 4 of Table 9.5 (Appendix 2). Two main findings emerged from these analyses. First, between 42% and 44% of the variance in the CPGI was explained by these models, indicating that the measures of other (non-EGM) activity improved the prediction of CPGI scores by comparison with using measures of EGM activity alone (40%). Second, frequency, losses per week across other activities, and the number of other activities were each associated with CPGI score after adjusting for EGM intensity ($p<.001$).

The next step of the analysis was to determine which specific activities were associated with CPGI score after taking account of intensity of EGM participation. A series of linear regression models investigated whether each specific activity (yes/no) in turn was associated with CPGI score after taking account of EGM participation. Playing keno ($p=.031$), betting on table games at a casino ($p=.003$), playing private games like cards for money ($p=.025$), betting on sports or special events ($p=.001$) and casino type games on the internet ($p=.012$) were significantly associated with CPGI score across these models (see Table 9.6 of Appendix 2 for detailed results). However, it is not necessarily the case that all of these activities were important for the same reason as discussed previously, i.e. many people report multiple activities. Further modelling was required to refine which non-EGM activities were associated with CPGI score after taking into account all possible activities. A final series of multiple linear regression models determined that only betting on sports or special events ($p=.024$), casino type games on the internet ($p=.037$), and betting on table games at a casino ($p=.041$) were associated with CPGI score after taking account of the other activities including the measures of intensity of EGM playing.

5.9 Gambling using the internet and gambling problems

Some types of betting involve using the internet, and this has been highlighted by some research as having particular significance for gambling problems. For instance, in the 2009 ACT Prevalence Survey, 6.2% gamblers had used the internet to gamble on sports or other special events, casino type games or horses in the last 12 months. A relatively large proportion of people who gambled using the internet were moderate risk/problem gamblers (10.7%), with more than a third (34.1%) reporting some symptoms. These proportions were much higher than those reported for other gamblers (2.3% and 6.1% respectively). Using the internet to gamble was significantly associated with CPGI score after taking account of intensity of playing EGMs ($p<.001$; Table 9.7 of Appendix 2). It is possible that the method of gambling, rather than the activity, underlies the associations of betting on sports or special events and casino type games on the internet with CPGI score.

5.10 Are any other activities important, after taking account of EGMs and gambling using the internet

We then tested the significance of other gambling activities after taking account of both intensity of playing EGMs and using the internet to gamble. Only betting on table games at a casino was associated with CPGI score ($p=.030$, Table 9.7 of Appendix 2) after taking account of EGMs and gambling using the internet. A final 'catch all' analysis included financial losses summed across all activities other than EGMs, casino or all internet activities, in addition to the measures already modelled (Table 9.8 of Appendix 2). Total losses on other activities were significantly associated with gambling problems in this final model ($p=.015$). This means there was a small effect of money lost on other activities, which was not accounted for by EGM intensity, playing table games at a casino and betting using the internet. This final model explained 45% of the variance in CPGI score.

Overall, the models in this chapter have demonstrated the particular importance of intensity of gambling on EGMs in contributing to gambling problems. However, gambling using the internet, playing table games at a casino, and financial losses on other activities were also indicators of gambling symptoms, above and beyond other activities. While these measures were statistically significant, it was not possible to further explore their specific contribution

to gambling problems, above and beyond all other activities, because (i) they are not particularly common, and (ii) they almost never occur in isolation. To demonstrate, Figure 5.12 shows how common these activities are amongst all gamblers. Summing across all the percentages in the circles gives the total proportion of gamblers using EGMs, the internet to gamble or playing table games at a casino. Figure 5.12 shows that amongst all gamblers, using the internet to gamble (6.2%) or playing table games at a casino (11.2%) are much less common than playing EGMs (39.7%). Furthermore, only a very small proportion of people playing table games at a casino (4.8%) or using the internet (2.9%) **had not** gambled using EGMs.

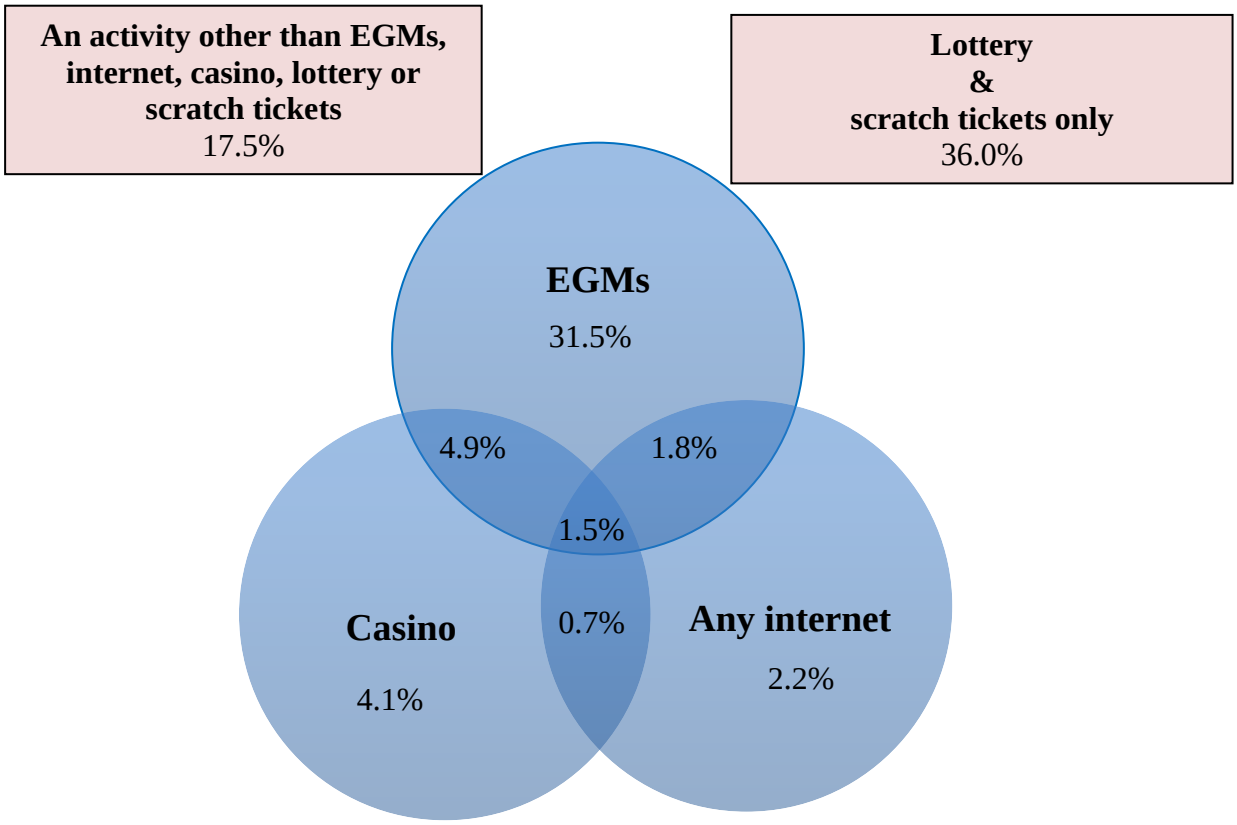


Figure 5.12: The prevalence and co-occurrence of the three forms of gambling identified as having independent risk for gambling problems amongst gamblers, n=1193.
Totals: EGMs =39.7%, Any internet=6.2%, Table games at a casino=11.2%. Any risk activity=46.7%

Further to Figure 5.12, nearly everyone who played table games at a casino or who had used the internet to gamble gambled on an activity other than scratch tickets or lottery (92.1% and 99.7% respectively). In contrast, nearly a third (31.5%) of people who used EGMs did not

gamble using the internet or on table games at a casino and 71.9% had gambled on another activity (other than casino or internet gambling).

Overall the findings suggest that high-intensity EGM gambling is of primary concern in terms of gambling problems. The contribution of other less common activities to gambling problems in the population, specifically gambling using the internet and playing table games at a casino, whilst statistically significant was relatively small. This reflects the comparatively low number of people who gambled using the internet or on table games at a casino. The likelihood of gambling problems for these people was high, but the absolute numbers were small.

5.11 Key findings

(1) When considering gambling intensity across all activities, financial losses best accounted for gambling problems, followed by frequency of gambling. While number of gambling activities was associated with symptoms in isolation, the association was not significant after accounting for financial losses and frequency of gambling.

(2) We identified the highest-intensity gamblers based on all activities, reflecting approximately 10% of the adult population. A large proportion of this group reported gambling symptoms (55%) with 27% meeting the criteria for moderate risk/problem gambling.

(3) Intensity of playing EGMs better accounted for gambling problems than intensity of gambling across all activities.

(4) While gambling on EGMs was most strongly associated with problems, other activities were also important, namely gambling using the internet and playing table games at a casino. The likelihood of problems for people gambling on these activities was high. However, they are not as common in the community and almost never occur in isolation. From a *population health* perspective, they contributed less to gambling problems in the community than did EGMs.

(5) Amongst the highest-intensity (top 10%) EGM players, 61% reported symptoms, and 30% were moderate risk/problem gamblers.

6. Discussion

6.0 Summary of main findings

Demographic and socioeconomic distribution of problem gambling

The findings relating the presence of CPGI symptoms with demographic and socioeconomic factors confirmed and elaborated on the earlier results in the prevalence survey main report (Davidson and Rodgers, 2010b). What the present report adds is a better understanding of the importance of combinations of factors in identifying groups within the general population that have particularly high risk of symptoms of problem gambling. This was illustrated even with the relatively simple description that incorporated variables representing sex and age group. At one extreme, amongst women aged 25 to 44 the prevalence of moderate risk/problem gambling was 0.5%, with 2.0% reporting any CPGI symptoms. By contrast, young men aged 18 to 24 were ten times more likely to be moderate risk/problem gamblers (5.1%) and seven times more likely to report any CPGI symptoms (13.9%).

Beyond sex and age, other important factors were education, never having been married and ever having been divorced. Several factors that showed significant associations with CPGI symptoms when examined in isolation were no longer useful when examined in conjunction with the five characteristics listed above, indicating that the original (bivariate) associations were really a reflection of those other main underlying factors. When all important factors were considered in combination, the statistical modelling indicated considerable disparities between different parts of the population in the prevalence of problem gambling. Women aged 25 to 44 who have a tertiary education and who have married, but never separated or divorced, were estimated to have a prevalence of just 0.8% for any CPGI symptom, whereas younger men (18 to 44) with lower levels of education who have never married have a much higher prevalence (up to 18%). This degree of disparity (26-fold) is not revealed by the type of two-way tables that are typically used to report the findings of prevalence surveys.

Participation and problem gambling

Whilst demographic and socioeconomic factors can be useful for indicating how problem gambling is distributed across sub-groups in the general population, measures of gambling participation provide valuable insight into gambling behaviours that are particularly risky in terms of problem gambling. With just a single measure (financial losses from all types of gambling over the past 12 months) it was possible to identify people with a 50% probability

of any CPGI symptoms and a 20% probability of being classified as moderate risk/problem gamblers, specifically those who lose $100 per week (Figure 5.2). By combining measures of participation, greater accuracy was achieved in predicting problem gambling. A model using financial losses, frequency of gambling and number of activities in the past 12 months was able to identify a sub-group of high-intensity gamblers with a 26% probability of being classified as moderate risk/problem gamblers and a 55% probability of having any CPGI symptoms. Whilst this group was, by definition, extreme in behaviour it was not trivial in number and 143 such individuals were identified in the Prevalence Survey sample. Importantly, this group encapsulated a large proportion of all moderate risk gamblers (56%) and problem gamblers (69%) in the survey.

In addition to the utility of a model that identifies high-intensity participation with a greatly increased likelihood of problem gambling, the findings also revealed which aspects of participation were the most pertinent to problem gambling. As indicated above, financial losses provided the most useful way of predicting symptoms but frequency of gambling also contributed significantly to the association with CPGI score. Although number of activities reported was significantly associated with CPGI symptoms when examined in isolation (Figure 5.3), it did not add to the accuracy of prediction once financial losses and frequency of gambling were already taken into account (model 1, Table 9.2 of Appendix 2).

Whilst a model using two or three measures of overall participation was very useful, it proved possible to achieve significantly better prediction of problem gambling by taking account of type of activities reported. The development of a final statistical model using all the available measures of participation to predict CPGI score was a complex and careful process but the major milestones on that route are more easily recognised with hindsight. First, EGM playing stood out as the activity with the most specific connection to symptoms of problem gambling (Table 9.2 of Appendix 2). Second, a model using measures of EGM participation in the past 12 months (Table 9.5 of Appendix 2) was markedly better at predicting CPGI score than was the model outlined above based on overall measures of participation. Interestingly, financial losses again provided the most useful single measure with frequency of EGM playing adding significantly to the model after taking account of losses from EGM playing. Third, relatively few activities were important in predicting CPGI score once measures of EGM playing were taken into account. Only gambling on activities using the internet, and playing table games at a casino, added to the accuracy of our model, in terms of

predicting symptoms. There was some indication that money lost on other activities had an independent effect, but this was of borderline significance.

The importance of taking types of activity into account when predicting CPGI score can also be demonstrated when identifying high-intensity gamblers. The model based solely on EGM participation identified a sub-group who were high-intensity players of EGMs (n=145) based predominantly on their financial losses playing EGMs and on their frequency of playing EGMs (Figure 5.11). Over 60% of this group had some CPGI symptoms and about 30% had CPGI scores of three or more. Only a minority of people with CPGI symptoms were *not* included in the high-intensity group. For moderate-risk problem gamblers (CPGI score of 3 to 7), about one-third were not identified and only a quarter of problem gamblers (CPGI = 8+) were not identified. Further efforts to identify high-intensity gamblers by taking account of other gambling behaviour (including playing table games at a casino, using the internet to gamble or the amount spent on non-EGM gambling) made little difference to the accuracy of identifying problem gambling.

6.1 Placing the main findings in the context of previous research

The findings relating to the distribution of CPGI symptoms across demographic and socioeconomic groups were not surprising in that the factors implicated have been identified in previous studies, specifically sex, age, education and marital history. Where the results may appear to depart from previous studies, either in Australia or overseas, is in the extent of the differences in predicted prevalence of symptoms (up to 26-fold variation) across population sub-groups. The element of surprise is not an intrinsic feature of the ACT or this particular survey but simply reflects that findings from earlier studies have not been presented in this way. We would expect very similar results from other Australian data sets and from comparable studies in other countries if similar methods of data analysis were employed.

The findings relating to CPGI symptoms and measures of gambling participation require rather more reflection and discussion, as they have several implications for theoretical perspectives on the development of problem gambling and for practical applications of the results within a population health and preventive framework. One important recent debate in

this field has been the contrast between conceptual models based on exposure to types of gambling and approaches drawing on the idea of gambling involvement, particularly as indicated by the number of activities reported by individual gamblers. Certainly researchers have cautioned that number of activities is a crude indicator of involvement (LaPlante *et al.*, 2009, Shaffer and Martin, 2011), and this caution was borne out by our findings. Number of activities did show a bivariate association with CPGI symptoms (Figure 5.3) but this was completely overshadowed by other measures (overall financial losses and frequency of gambling) in multivariate analyses (Table 9.2 of Appendix 2, Model 1). However, even with these additional and very superior indicators of gambling involvement, the particular importance of EGM playing was striking (Table 9.2 of Appendix 2, Model 2). Conversely, when intensity of EGM playing was used to predict CPGI score, the measures of other gambling involvement added little to the accuracy of prediction even when those indicators were statistically significant (Table 9.5, Appendix 2, Models 2 to 4). In short, the data indicated that measures of particular types of gambling activity were the predominant predictors of CPGI score and that attempts to capture the concept of gambling involvement yielded very little by comparison.

6.2 Limitations and strengths of the study

The study had a number of limitations that should be kept in mind when interpreting its findings. First, a very important point to emphasise is that the analyses were all based on cross-sectional data. For this reason, the 'predictions' mentioned throughout the report are not temporal predictions but they refer to the statistical concept of prediction. What this means is that the relationships described cannot be taken to indicate the process of development of problem gambling. The results do not mean that losing a certain amount of money on EGMs or that playing EGMs a certain number of times per week will eventually lead to problem gambling. Only prospective investigations can provide insight into how those problems developed over time. However, the results do tell us what people reporting symptoms of problem gambling are doing now and they do so in a way that maximises the utility of the information for identifying those who currently have problems.

Second, the findings apply to a particular place at a particular time (the ACT in 2009). The associations described for both demographic characteristics and for measures of gambling

participation with symptoms of problem gambling may not be fixed relationships and could be different in different localities or in the same locality at a future point. It would therefore be very important if the findings from the present study could be replicated in other settings but, equally so, that other investigations might reveal different relationships in different contexts. In regard to gambling participation, compared to other countries Australia has a large number of high-intensity EGMs and the ACT reflects this situation. It is possible that individuals who are predisposed (for whatever reason) towards problem gambling will find their own forms of gambling activity from amongst those available to them. The opportunity to contrast areas and jurisdictions with different types of gambling activities is likely to give greater understanding of the reciprocal connections between participation and problems. Meanwhile, however, the findings from the 2009 ACT Prevalence Survey do have local importance in that they provide a means of identifying the sub-groups of a discrete population which have elevated rates of problem gambling and a potential way for targeting people who we have referred to as highest-intensity gamblers. These high-risk sub-groups represent a substantial proportion of the population.

Third, the statistical techniques used in the study have their own weaknesses. It is possible that the success of some of the models is overstated in that the statistical methods seek to maximise predictive power and, so, may not fare so well if applied to a different data set. On the other hand, the study had a reasonable sample size to work with for its purpose and the measures available were typically unsophisticated and dependent on recollection and estimation (e.g. of losses and frequency of gambling). The strength of prediction might be greatly improved if more accurate measures of participation could be obtained.

Fourth, the measures of both participation and of symptoms of problem gambling were all obtained from the same source at the same point in time. This may well lead to a reporting bias that increases the correlation between those self-report measures. It is difficult to judge the extent to which this may be so as almost all gambling research is subject to the same potential bias of self-report. It would certainly be interesting and also very important to investigate problem gambling or other harms associated with gambling by drawing on reports of significant others, such as the spouses of those who gamble. There may be instances when reports from other sources are *more* in line with measures of gambling participation than self-reports from the CPGI or similar instruments.

6.3 Implications

The implications of this study can again be considered in respect of the findings relating to demographic and socioeconomic factors and those pertaining to measures of participation. The implications extend to future research (planned or otherwise) and to the possible application of the findings reported here.

The results in Chapter 4 on demographic and socioeconomic factors are fairly uncontentious. One or two of the specific findings reiterate possibilities that have already been identified in the literature. The most obvious is the decline in prevalence of problem gambling with age (Welte *et al.*, 2010), which was particularly notable in the men in the 2009 ACT Prevalence Survey (Figure 4.1). This raises the question of whether the higher rate of problems in the younger age groups will flow through into the older age range as these people get older themselves (known as a cohort effect) or whether their rates of problem gambling will decline and become like those of the elderly in the sample (known as an age or developmental age effect). There is no simple answer to this and we may just have to wait and see what the outcome is. However, it highlights the relevance of longitudinal studies to complement what can be observed with cross-sectional designs.

A further feature of findings in Chapter 4 is that some characteristics that may be seen as important correlates of problem gambling, notably income, were no longer significant when considered alongside other factors. Something that retains its significance and has been implicated in many studies is education. This is important because much of formal education occurs before gambling is a prominent part of people's lives and educational qualifications would, intuitively, seem less likely to be influenced by problem gambling than other characteristics such as employment, marriage and divorce. The strength of the association is consequently a clue that education is a marker for predisposition or vulnerability to future gambling problems and there does not appear to be notable recognition of its significance in the literature.

The clearest implications of the findings of this report are firstly that preventive messages and strategies, such as educational material, can be guided by knowing which subgroups of the population have the highest rates of problem gambling. Secondly, preventive resources can

be focussed on especially high-risk groups when, otherwise, the cost of such approaches would be prohibitive for use across the general population.

Turning to the findings on gambling participation (Chapter 5), the results reinforce previous arguments that gambling research needs to pay far greater attention to the development of good measures of participation (Blaszczynski *et al.*, 2008, Rodgers *et al.*, 2009). Previous research has found that self-report data about gambling expenditure is inaccurate (Blaszczynski and Lange, 1996) and is increasingly so over longer periods of time (Blaszczynski *et al.*, 2008). Blaszczynski et al. (2008) concluded that data collected on money spent gambling 'must be considered as indicators rather than as the gamblers' actual expenditures' (p103). In the current study, reports of financial losses turned out to be much better indicators of problem gambling than reports of frequency or of number of gambling activities. This is important but it is also somewhat alarming given that the reliability of measures of losses has been questioned to the extent that some gambling surveys have either not collected data on this or only ask about very short time-frame, e.g. the last occasion (Productivity Commission, 2010). To date there has generally been a failure to recognise the distinction between reliability (which is very important if you need to estimate actual financial losses) and predictive validity (which is more relevant if you wish to predict something else, such as problem gambling). Our findings suggest that much would be gained from prioritising the inclusion of items measuring gambling losses in future studies.

As noted earlier, the present study is cross-sectional and so it is important not to jump to conclusions as to the development of problem gambling as a consequence of particular activities. Nevertheless, in the context of a population health approach it is immensely valuable to know what features of participation mark out groups with the greatest likelihood of problem gambling, especially when the level of risk was as high as found for the groups labelled as high-intensity gamblers and high-intensity EGM players. There is no existing means of identifying sections of the population with such extreme levels of risk for problem gambling. For all the statistical models in the present report may appear complex, they can be turned into very simple algorithms for indicating the risk of problem gambling in an individual based on as few as two simple questions on their gambling behaviour (Figure 5.11). This information could be utilised in a form that promoted self-assessment or it could be incorporated into preventive strategies where resources can be focussed on especially

high-risk groups when, otherwise, the cost of such approaches would be prohibitive for use across the general population.

To date, gambling research, both in Australia and abroad, has not placed a high priority on informing prevention and early intervention approaches. This stands in contrast to the developments seen in comparable fields, such as prevention of alcohol-related harms. The findings from the 2009 ACT Prevalence Survey are a strong first step in this direction and the methodology outlined in this report can be refined further through the use of other population samples and through more focussed research designs.

7. References

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8. Appendix 1: Tables for chapter 4

Table 8.1: Proportion and risk† for reporting any symptom and moderate risk/problem gambling by socioeconomic and demographic measures.

	Any symptom (CPGI >0)			Moderate risk/problem (CPGI >2)		
Measure	**%**	**OR (95% CI)**	**P-value**	**%**	**OR (95% CI)**	**P-value**
Country of birth						
Australia	5.6	1			1	
Other	4.0	0.70 (0.40-1.23)		2.2	0.38 (.19-0.76)	**
Marital history				0.8		
Never married	9.8	3.52 (2.12-5.83)	***	2.6	2.0 (0.90-4.54)	
Married, never divorced	3.0	1		1.3	1	
Married, past divorce	5.8	1.99 (1.16-3.42)	*	1.8	1.4 (0.53-3.68)	
Unmarried, past divorce	6.0	2.05 (1.14-3.69)	*	4.0	3.1 (1.39-7.06)	**
Currently widowed	3.9	1.32 (0.43-4.08)		0.8	0.36 (0.05-2.79)	
Having a child less than 18y						
Yes	3.2	0.49 (0.30-0.79)	**	2.2	0.56 (0.27-1.18)	
No	6.3	1		1.3	1	
Employment status						
Employed	5.8	1		2.0	1	
Unemployed looking for work	12.2	2.26 (0.78-6.61)		8.8	4.7 (1.28-17.3)	*
Retired	4.6	0.76 (0.49-1.23)		1.1	0.54 (0.27-1.09)	
Not in paid labour force, home duties	0.6	0.10 (0.02-0.46)	**	0.6	0.31 (0.7-1.40)	
Not in paid labour force, studying	0	-				
Main income source						
Wage/salary	5.7	1		2.0	1	
Government pension, allowance or benefit	7.5	1.35 (0.77-2.34)		3.7	1.90 (0.80-4.48)	
Superannuation, annuity, or investments	3.0	0.52 (0.27-0.99)	*	0.7	0.37 (0.14-0.95)	*
No personal income	2.3	0.38 (0.12-1.78)		1.3	0.66 (0.13-3.27)	
Personal income						
Lowest tertile (<40k)	7.2	2.13 (1.26-3.60)	**	2.8	3.29 (1.51-7.15)	**
Mid tertile (40-69k)	5.3	1.54 (0.89-2.66)		2.1	2.44 (1.13-5.28)	*
Highest tertile (>70k)	3.5	1		0.9	1	
Highest completed education						
Year 12 or less	8.6	3.93 (2.32-6.65)	***	3.7	6.48 (2.73-15.39)	***
Trade certificate or diploma	5.9	2.61 (1.42-4.77)	**	1.7	2.88 (0.96-8.62)	
Bachelor degree or higher	2.3	1		0.6	1	

†[OR: Odds ratio (95% confidence interval)]

*p<.05, **p<.01, ***p<.001

Table 8.2: Multivariate model investigating personal income in relation to any symptom, adjusting for age and sex.

	%+	Any symptom (CPGI >0) OR (95% CI)	P-value
Personal income			
Lowest tertile (<40k)	5.9	2.10 (1.08-4.07)	*
Mid tertile (40-69k)	4.9	1.71 (0.99-2.97)	
Highest tertile (>70k)	2.9	1	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001
+Percents are also adjusted

Table 8.3: Proportion and risk† for reporting any symptom by marital history (combining ever divorced categories), unadjusted, n=2058.

Marital history	%	Any symptom (CPGI >0) OR (95% CI)	P-value
Never married	9.8	3.52 (2.11-5.83)	***
Married, never divorced	3.0	1	
Ever divorced	5.9	2.0 (1.27-3.20)	**
Widowed, never divorced	3.9	1.32 (0.43-4.08)	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001

Table 8.4: Multivariate model investigating marital history, having a child in relation to reporting any symptom, also adjusted for age and sex.

	%+	Any symptom (CPGI >0) OR (95% CI)	P-value
Marital history			
Never married	6.5	2.26 (1.07-4.75)	*
Married, never divorced	3.0	1	
Ever divorced	5.7	2.00 (1.21-3.22)	**
Widowed, never divorced	4.3	1.47 (0.43-5.02)	
Having a child <18			
Yes	3.5	0.68 (0.38-1.21)	
No	4.3	1	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001
+Percents are also adjusted

Table 8.5: Multivariate models investigating highest completed qualification in relation to reporting any symptom, adjusting for age and sex.

		Any symptom (CPGI >0)	
	%+	OR (95% CI)	P-value
Highest completed qualification			
Year 12 or less	7.0	3.46 (2.05-5.84)	***
Trade certificate or diploma	5.4	2.63 (1.40-4.92)	**
Bachelor degree or higher	2.1	1	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001
+Percents are also adjusted

Table 8.6: Multivariate model investigating personal income in relation to any symptom, adjusted for completed qualifications, age and sex.

		Any symptom (CPGI >0)	
	%+	OR (95% CI)	P-value
Personal income			
Lowest tertile (<40k)	4.4	1.41 (0.66-2.99)	
Mid tertile (40-69k)	5.4	1.36 (0.78-2.37)	
Highest tertile (>70k)	3.2	1	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001
+Percents are also adjusted

Table 8.7 Multivariate model including marital history and highest completed qualification in relation to reporting any symptom, after adjusting for age and sex.

Measure		Any symptom (CPGI >0)	
	%+	OR (95% CI)	P-value
Marital history			
Never married	6.6	2.61 (1.23-5.51)	*
Married, never divorced	2.6	1	
Ever divorced	4.8	1.85 (1.14-2.99)	*
Widowed, never divorced	3.6	1.39 (0.41-4.68)	
Highest completed qualification			
Year 12 or less	6.5	3.29 (1.95-5.54)	***
Trade certificate or diploma	5.1	2.52 (1.36-4.67)	**
Bachelor degree or higher	2.1	1	

†[OR: Odds ratio (95% confidence interval)]
*p<.05, **p<.01, ***p<.001
+Percents are also adjusted

9. Appendix 2: Tables for chapter 5

Table 9.1: Univariate models investigating total frequency, financial losses and number of gambling activities on CPGI score (logged).

Gambling measures (across all activities)	**Variance explained**	**Bx**	**se**	**βx**	**P-value Bx**	**Quadratic term (βx^2)**	**P-value of Quadratic (βx^2)**
Total frequency, n=1142	17%	.001	.00014	0.52	<.001	-0.15	.053
Total financial losses p/wk, n=1117	22%	.001	.0002	0.88	<.001	-0.55	<.001
Number of activities, n=1142	9%	.02	.004	0.20	<.001	0.14	.002

B=unstandardised regression coefficient; β=standardised regression coefficient
**p*<.05, ***p*<.01, ****p*<.001

Table 9.2: Multivariate models investigating frequency and expenditure across all activities, number of activities, and type of activity, on CPGI score (logged), n=1117.

Model (Variance explained)	Bx	se	βx	P-value Bx	Quadratic term (βx^2)	p-value of Quadratic (βx^2)
Model 1 (26%)						
Total frequency	.001	.0001	0.25	<.001	-	-
Total financial losses p/wk	.001	.0002	0.62	<.001	-0.39	.003
Number of activities	.005	.004	0.05	.192	0.04	.517
Model 2: EGMs (27%)						
Total frequency	.001	.0001	0.20	<.001	-	-
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Played EGMs (yes/no)	.031	.007	0.11	<.001		
Number of other activities	.002	.005	0.02	.698	-	
Model 3: Races (26%)						
Total frequency	.001	.0001	0.19	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.40	.003
Bet on races (yes/no)	-0.0003	.007	-0.001	.970		
Number of other activities	.009	.005	0.08	.087	-	
Model 4: Lottery / Scratch tickets (27%)						
Total frequency	.001	.0001	0.20	<.001		
Total financial losses p/wk	.001	.0002	0.61	<.001	-0.38	.003
Scratch tickets & lottery (yes/no)	-0.012	.011	-0.04	<.267		
Number of other activities	.013	.005	0.11	.021	-	
Model 5: Keno (27%)						
Total frequency	.001	.0001	0.19	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Keno (yes/no)	.051	.028	0.10	.069		
Number of other activities	.003	.004	0.03	.462	-	
Model 6: Casino (26%)						
Total frequency	.001	.0002	0.19	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Table games at casino (yes/no)	.005	.014	0.01	.732		
Number of other activities	.008	.005	0.07	.093	-	
Model 7: Casino internet games (26%)						
Total frequency	.001	.0001	.19	<.001		
Total financial losses p/wk	.001	.0002	.64	<.001	-0.40	.003
Casino internet games (yes/no)	.032	.037	.04	.383		
Number of other activities	.007	.005	.06	.155		

Table 10.2 continued…

	Bx	se	βx	P-value Bx	Quadratic term (βx^2)	p-value of Quadratic (βx^2)
Model 8:Private games (26%)						
Total frequency	.001	.0001	0.20	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Private games (yes/no)	.023	.021	0.05	.274		
Number of other activities	.006	.004	0.05	.167	-	
Model 9: Bingo (26%)						
Total frequency	.001	.0001	0.19	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Bingo (yes/no)	0.045	.030	0.05	.133		
Number of other activities	.007	.005	0.06	.129	-	
Model 10: Sports/spec events (26%)						
Total frequency	.001	.0001	0.19	<.001		
Total financial losses p/wk	.001	.0002	0.63	<.001	-0.39	.003
Sports & special events (yes/no)	.020	.019	0.04	.273		
Number of other activities	.006	.005	0.05	.192	-	

B=unstandardised regression coefficient; β=standardised regression coefficient

Table 9.3: Univariate models investigating measures of EGM intensity frequency on CPGI score (logged).

EGM intensity	Variance explained	Bx	se	βx	P-value Bx	Quadratic term (βx^2)	p-value of Quadratic (βx^2)
Frequency	28%	.007	.0008	0.78	<.001	-0.34	<.001
Financial losses p/wk, n=1135	38%	.006	.0006	1.12	<.001	-0.65	<.001
Session duration, n=1134	18%	.002	.0002	0.43	<.001	-	.343

B=unstandardised regression coefficient; β=standardised regression coefficient
**p*<.05, ***p*<.01, ****p*<.001

Table 9.4: Univariate models investigating frequency, expenditure and duration of gambling sessions (where appropriate) on CPGI score (logged).

Gambling Measure	Variance explained	Bx	se	βx	P-value Bx	Quadratic term (βx^2)	p-value of Quadratic (βx^2)
Races							
Frequency	7%	.004	.0006	0.52	<.001	-0.36	<.001
Losses p/wk	6%	.002	.0005	0.48	<.001	-0.27	.035
Scratch and lottery tickets							
Frequency	1%	.0004	.0002	0.07	.040	-	.090
Losses p/wk	0.4%	.001	.0003	0.06	.078	-	.057
Keno							
Frequency	8%	.029	.007	0.59	<.001	-0.41	.003
Losses p/wk	3%	.006	.002	0.61	.004	-0.47	.022
Duration	2%	.001	.0004	0.14	.002		.132
Casino							
Frequency	6%	.023	.005	0.37	<.001	-0.19	<.001
Losses p/wk	4%	.006	.001	0.20	<.001	-	.090
Duration	2%	.0007	.0002	0.15	<.001	-	.965
Casino type games on the internet							
Frequency	3%	.001	.001	0.14	.013	0.11	.020
Losses p/wk	2%	.033	.014	0.53	.023	-0.44	.037
Private games							
Frequency	3%	.006	.002	0.16	<.001	-	.058
Losses p/wk	4%	.006	.001	0.19	<.001	-	.233
Bingo							
Frequency	1%	.003	.001	0.12	<.001	-	.683
Losses p/wk	1%	.007	.003	0.10	.008		.227
Duration	1%	.003	.001	0.39	.010	-.31	.028
Sports							
Frequency	7%	.008	.002	0.49	.008	-0.34	<.001
Losses p/wk	4%	.005	.002	0.58	.005	-0.46	.018

B=unstandardised regression coefficient; β=standardised regression coefficient
**p*<.05, ***p*<.01, ****p*<.001

Table 9.5: Multivariate models investigating the association between gambling intensity and CPGI score, using EGM measures as the base model.

Model (variance explained)		Bx	se	βx	P-value Bx	Quadratic term (βx^2)	p-value of Quadratic (βx^2)
Model 1 (40%), n=1127							
EGMS	Frequency	.003	.001	0.29	.014	-0.14	.091
	Financial losses p/wk	.005	.00002	0.84	<.001	-0.48	<.001
	Minutes per session	.0001	.0002	0.03	.544		
Model 2 (42%), n=1127							
EGMS	Frequency	.002	.001	0.25	.035	-0.11	.183
	Financial Losses p/wk	.005	.001	0.83	<.001	-0.47	<.001
	Minutes per session	.0001	.0002	0.03	.574	-	
Other activities Number played		.015	.004	0.13	<.001	-	
Model 3 (44%), n=1127							
EGMS	Frequency	.002	.001	0.28	.024	-0.13	.142
	Financial losses p/wk	.005	.001	0.81	<.001	-0.46	<.001
	Minutes per session	.0001	.0001	0.02	.724	-	
Other activities Frequency		.0004	.0001	0.14	<.001	-	
Model 4 (44%), n=1107							
EGMS	Frequency	.003	.001	0.30	.011	-0.14	.121
	Losses p/wk	.004	.001	0.79	<.001	-0.45	<.001
	Minutes per session	.0001	.0001	0.03	.597	-	
Other activities Financial losses p/wk		.0003	.0001	0.17	<.001	-	

B=unstandardised regression coefficient; *β*=standardised regression coefficient
*p<.05, **p<.01, ***p<.001

Table 9.6: Associations between participating on a gambling activity (yes/no) and CPGI (logged) score after adjusting for EGM frequency, financial losses and session duration.

Activity (variance explained)	Bx	se	βx	P-value
Races **(**41%)	.008	.008	.03	.250
Scratch and lottery tickets **(**40%)	-.0004	.008	-.001	.958
Keno **(**41%)	.050	.022	.09	.031
Table games at a casino **(**41%)	.045	.015	.10	.003
Casino type games on internet **(**42%)	.085	.033	.11	.012
Private games like cards **(**41%)	.043	.019	.09	.025
Bingo **(**41%)	.037	.029	.03	.201
Sports or special events **(**42%)	.051	.016	.11	.001

B=unstandardised regression coefficient; *β*=standardised regression coefficient
*p<.05, **p<.01, ***p<.001

Table 9.7: Multivariate model investigating EGM intensity, internet gambling and playing table games at a casino on CPGI score (logged); variance explained (45%), n=1105

Gambling measures		**Bx**	**se**	**βx**	**P-value Bx**	**Quadratic term (βx^2)**	**p-value of Quadratic (βx^2)**
EGMs	Frequency	.002	.001	0.27	.019	-.12	.142
	Financial losses	.005	.001	0.81	<.001	-.46	<.001
	Minutes per session	.0001	.0002	0.02	.521	-	-
Internet (yes/no)		.08	.023	0.14	<.001	-	-
Table games at a casino (yes/no)		.03	.014	0.07	.030	-	-

B=unstandardised regression coefficient; *β*=standardised regression coefficient
**p*<.05, ***p*<.01, ****p*<.001

Table 9.8: Multivariate model investigating EGM intensity, internet gambling and playing table games at a casino on CPGI score (logged); variance explained (45%), n=1127

Gambling measures		**Bx**	**se**	**βx**	**P-value Bx**	**Quadratic term (βx^2)**	**p-value of Quadratic (βx^2)**
EGMs	Frequency	.003	.001	0.28	.016	-.13	.145
	Financial losses	.004	.001	0.79	<.001	-.45	<.001
	Minutes per session	.0001	.0002	0.02	.536	-	-
Internet (yes/no)		.07	.024	0.14	.003	-	-
Table games at a casino (yes/no)		.02	.014	0.07	.138	-	-
Other activities Financial losses		.0002	.0001	.11	.015	-	-

B=unstandardised regression coefficient; *β*=standardised regression coefficient
**p*<.05, ***p*<.01, ****p*<.001