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PROBLEM GAMBLING IN VICTORIA: IDENTIFYING LOCAL AREA COMMUNITY AND GAMING INDUSTRY RISK AND PROTECTIVE FACTORS

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
ADIS	Alcohol and Drug Information Service
ARIA	Accessibility Remoteness Index of Australia
CIV	Community Indicators Victoria
EGM	Electronic gaming machine
GIS	Geographic Information System
LGA	Local government area
NESB	Non-English speaking background
PWI	Personal Wellbeing Index
SEIFA	Socio-economic index for areas

EXECUTIVE SUMMARY

Introduction

Gambling is a significant industry in Australia and in the state of Victoria. Between 0.5 and 1.0 per cent of adults experience significant problems with their gambling. Problem gamblers account for a disproportionately high share of total gaming spending, and almost all problem gamblers use electronic gaming machines (EGMs).

The Victorian government has enacted numerous measures to regulate the gaming industry since EGMs began operating in 1992. The government has increased transparency of licensing and accountability of the gaming industry as well as welcomed community input in licensing reviews. It has also implemented measures to curb problem gambling through media awareness campaigns, increased funding for gambling treatment services, reduced 24-hour access to gambling, and imposed caps in areas susceptible to problem gambling.

Local environment and circumstances play a critical role in understanding gambling as a public health issue. Local characteristics create the conditions or context of problem gambling; influence the type, extent and severity of gambling problems; and affect the response capacity of the affected community.

Problem gambling is just one of many problem behaviours that are associated with local area characteristics. Other behaviours include obesity, alcohol-related harm, sexually transmitted infections, and a variety of other health and social behaviours. Local areas with higher availability (i.e., of fast food, alcohol outlets, etc.) and lower socio-economic status tend to have worse health and social outcomes. These community characteristics are mediated by characteristics of the individual where multi-level studies were conducted.

Unsurprisingly then, the density of gaming machines is strongly correlated with gaming machine expenditure. This is true at the state, LGA, and census district levels in most research. Socio-economic disadvantage has also been associated with higher machine density and higher per capita gaming expenditure. This relationship is consistent at the LGA level in Victoria; however, the relationship breaks down at a more refined area unit. For example, research that examined three Victorian LGAs at the census district unit level found that both higher and lower socio-economically disadvantaged areas within LGAs contained elevated per capita expenditure on gaming machines.

It is difficult to measure prevalence of problem gambling at the local area level across a large area like Victoria by surveying individuals, due to the very large sample sizes that would be required. The net expenditure on EGMs is automatically collected by gaming venues and is available at the LGA level in Victoria. Gaming machine expenditure has, therefore, been used as a proxy measure of gambling harm in local area research. Problems with using expenditure as a measure of problem gambling include not knowing whether the number of people gambling has increased or if same number are losing more money, and the extent to which gaming expenditure in a specific local area arises from local residents or guests who reside outside that area.

Measuring the rates of help-seeking for gambling problems is another way of approximating gambling-related harm at the local area level. Help-seeking rates will underestimate most gambling harm

because only eight to 15 per cent of problem gamblers seek help. Problem gamblers are most likely to seek help after a crisis, and thus there may be a delay between the start of problems and the crisis that precipitates treatment. The proportion of the problem gambling population receiving treatment also depends upon the availability and accessibility of treatment facilities in that local area. Exposure to promotion of services may be uneven throughout the community as well.

The aim of this project is to determine local government area characteristics that are associated with self-identified problem gambling as assessed through call volume to Gambler's Helpline and clients using Gambler's Help. The direct impact of gaming industry characteristics is investigated to determine how venue location and offerings contribute to, or are protective of, problem gambling. Variables associated with community resilience or disadvantage are investigated to determine how these factors influence the impact of the gaming industry variables on problem gambling. Finally, the models are used to rank LGAs based on their vulnerability to problem gambling.

Methods

We used a cross-sectional ecological design to explore the extent to which area-level factors predict help-seeking for problem gambling across Victoria. Data were analysed at the LGA level. The data period was 2006 to 2007.

There were two outcome measures: rates of calls to Gambler's Helpline in Victoria and rates of clients provided with face-to-face counselling for their own gambling through the Gambler's Help Service.

Predictor variables included gaming industry indicators and demographic, social and economic local characteristics. Gaming industry indicators included the density of EGMs, the density of gaming venues, EGM expenditure per capita, and the average number of machines per gaming venue. Demographic, social and economic indicators included measures of: remoteness, age, gender, education, household income, financial stress, housing affordability, socio-economic advantage, non-English speaking background, unemployment and labour market participation, average personal wellbeing, community satisfaction, social support, perceptions of safety, self-reported health, assaults, domestic violence, drug crime, property crime, alcohol and other drug treatment episodes, and liquor licence density (by on-premise, packaged and general licences).

Statistical analyses were conducted in R using the 'spdep' package for all spatial analyses that assessed the data for evidence of spatial autocorrelation. The number of predictor variables was reduced by assessing variables for multicollinearity.

Results

Gaming machine density independently predicted rates of calls to Gambler's Helpline and clients using Gambler's Help, after controlling for a large range of demographic, social and economic indicators. Areas with greater numbers of EGMs per 1,000 residents also had higher rates of help seeking for problem gambling.

Remoteness of an LGA was a significant factor in predicting rates of calls to Gambler's Helpline, but was not relevant to predicting rates of Gambler's Help clients. Urban areas were more likely to have higher rates of calls to Gambler's Helpline compared with rural and remote areas.

Socio-economic status was not a significant predictor of rates of help seeking for problem gambling after controlling for other variables. In univariate analyses, the rate of calls to Gambler's Helpline was positively associated with median income, education, financial stress, non English speaking background, labour force participation, property crime rates and unemployment. The latter two variables plus assaults, domestic violence, drug related crime and alcohol related episodes of care rates were significantly related to the rate of Gambler's Help clients. There were also some divergent trends with positive associations evident for Gamblers Helpline callers and negative for Gamblers Help clients.

The two measures of problem gambling help-seeking were only weakly positively correlated. Face-to-face and telephone counselling may be accessing different populations of problem gamblers. It is also likely that knowledge of specific services, and the attraction of telephone or face-to-face counselling, varies across localities. Either of these reasons may explain why urban areas were much more likely to utilise telephone counselling services, as well as why socio-economic status and related variables did not predict rates of help-seeking consistently.

The relationships between machine density, expenditure and rates of self-identified problem gamblers were all positive and medium-to-large in size. No evidence of non-linear relationships was found. These results support the exposure model of gambling problems, which predicts that increased access results in increased problems.

Using both models, Victorian LGAs were ranked according to their underlying propensity for problem gambling. The models predicted that Maribyrnong, Greater Dandenong, Hume, Darebin, and Ballarat were at the highest risk for gambling problems in 2006–07. The differences between the actual and predicted rates of help-seeking for problem gambling were also calculated. One of the five Victorian areas where EGM density limits have been in place since 2001 (Maribyrnong) was also an area where the model predicted a higher rate of counselling than the actual counselling rates.

Discussion

This study is the first to use help seeking as an outcome measure for a local area analysis of problem gambling in Victoria. Gaming machine density predicted two types of help-seeking for problem gambling in Victorian LGAs. Lower socio-economic status was significantly associated with higher rates of clients using Gamblers Help, while higher rates of property crime and violence were associated with increased rates of callers to Gamblers Helpline and clients of Gamblers Help, respectively. This study supports previous research which has found a strong link between gaming machine density and problem gambling using gaming machine expenditure as a proxy measure of harm. We build on previous work by confirming that this relationship exists when gambling harm is measured through two types of help seeking.

The ranking of Victorian LGAs by their risk of problem gambling, according to the large range of predictor variables included in our regression models, may assist government agencies when crafting locally-specific policies. For example, LGAs where actual rates of help seeking were lower than predicted by the models may need increased access to, or promotion of, treatment services. Another way to interpret this situation is that the LGA is particularly resilient to problem gambling despite risky local area characteristics. The appropriateness of these interpretations depends on the relationship between rates of help seeking and prevalence of problem gambling, which could not be measured in this study.

This study was a cross-sectional local area analysis. As such, causality cannot be determined. It is likely that the relationships between variables measured in this study are multi-directional and complex. Cross-sectional studies are unable to tease out these relationships. Better access to more refined data across periods of time would enable time series analyses, which would be better able to detect temporal associations.

This study was also restricted to LGAs as the unit of analysis. Multi-level analysis, in which local area factors are included alongside data about the habits and practices of individual problem gamblers, has the potential to produce a more accurate picture of a complex situation. It may also be important to use smaller local units to enable local organisations to use the findings in specific localities. Applying understandings based on aggregate data to local situations can be misleading when variation within LGAs is large.

INTRODUCTION

The Victorian Government has introduced measures to address problem gambling, such as increasing transparency of licensing and accountability of the gaming industry as well as welcoming community input in licensing reviews. It has also implemented measures to curb problem gambling through media awareness campaigns, increased funding for gambling treatment services, reduced 24-hour access to gambling, and imposed caps in areas susceptible to problem gambling. Measures such as these strive to address problem gambling at both the state and community level. Despite these efforts, it was recently estimated that approximately 0.7 per cent of the Victorian adult resident population was affected by problem gambling with an additional 2.4 per cent engaged in moderate-risk gambling (Hare, 2009).

This report identifies Victorian local areas impacted by an increased prevalence of problem gambling. Turning Point Alcohol and Drug Centre has specialised access to data regarding problem gambling through its management of the Gambler's Helpline and has obtained data from Gambler's Help face-to-face counselling. These resources facilitate access to self-identified problem gamblers state-wide.

This report is unique in its use of telephone helpline and counselling data to approximate problem gambling in the Victorian community. Identifying problem gamblers through prevalence surveys can be difficult due to low prevalence in the general population, necessitating large sample sizes to identify problem users. Furthermore, the use of per-capita gambling expenditure as a proxy measure of problem gambling is problematic, as there is no way to disaggregate the contributions of moderate risk and problem gamblers to total expenditure. While service use measures also have their limitations, they do provide an additional way of measuring a hidden community problem.

The aim of this project is to determine local government area (LGA) characteristics that are associated with self-identified problem gambling as assessed through call volume to Gambler's Helpline and clients using Gambler's Help. The analyses proceed in three phases:

- The direct impact of gaming industry characteristics is investigated to determine how venue location and offerings contribute to, or are protective of, problem gambling.
- Variables associated with community resilience or disadvantage are investigated to determine how these factors influence the impact of the gaming industry variables on problem gambling.
- The variables in the final model are used to rank LGAs based on their vulnerability to problem gambling.

This report begins with a background literature review, which outlines the Victorian gambling context, theoretical approaches to gambling research, problem gambling and its measurement, and a review of the predictors of problem gambling at the local area level. The report then proceeds to methods, results and discussion sections.

BACKGROUND

Context

Gambling is a significant industry in Australia. Nearly three per cent of household disposable income in Australia was spent on gambling in 2005–06, totally \$17.6 billion, and majority of this money was spent playing electronic gaming machines (EGMs, Office of Economic and Statistical Research, 2007, cited in Storer, Abbott, & Stubbs, 2009). While there are difficulties estimating the prevalence of problem gambling, the Productivity Commission (2009) has estimated that between 0.5 and 1.0 per cent of Australian adults experience significant problems, and between 1.4 and 2.1 per cent are at moderate risk of experiencing problems from their gambling in any year. The Productivity Commission estimates that about 15 per cent of Australian adults gamble regularly, excluding Lotto and scratch tickets, and that about five per cent of adults play EGMs weekly or more often. While problem gamblers clearly make up a small proportion of all adults who gamble, they disproportionately account for a high share of total gaming spending (about 40 per cent, estimates range from 20 to 60 per cent, Productivity Commission, 2009).

In 2008, the largest prevalence study of problem gambling was conducted in Victoria in which a probability sample of 15,000 adults completed computer-assisted telephone interviews (response rate 44 to 53 per cent, Hare, 2009). Using this data, the Victorian adult population is estimated to contain 0.7 per cent problem gamblers, 2.4 per cent moderate-risk gamblers, 5.7 per cent low-risk gamblers, 64.3 per cent non-problem gamblers, and 26.9 per cent non-gamblers. A Productivity Commission (2009) re-analysis of these data found that the average gambling expenditure per annum for Victorian problem gamblers was \$12,356, compared to \$2,676 for moderate-risk, \$1,078 for low-risk, and \$322 for non-problem gamblers. In the Victorian prevalence study, it was also found that 91 per cent of problem gamblers had played EGMs in the last 12 months, compared to only 21 per cent of the total adult population (Hare, 2009).

As a consequence of the risk profile of EGMs, they have become the focus of most research and policy responses in the area of gambling in Australia. In Victoria, the first legal EGMs began operating in July 1992. In 1995, the Victorian Government made a decision to limit the total number of EGMs to 27,500 excluding Crown Casino (Marshall & Baker, 2002). EGMs are distributed to clubs (13,750), hotels (13,750) and Crown Casino (2,500). No club or hotel can operate more than 105 machines on their premises and a four-hour shut-down period is mandated for all venues. In 2001, the density of EGMs was capped at 10 EGMs per 1,000 adults in regions of Victoria identified as the most vulnerable to problem gambling. These areas included the cities of Maribyrnong, Greater Dandenong, Darebin, and the Latrobe and Bass Coast Shires, and some parts of adjacent local government areas (Victoria Government Gazette, 2001). In 2006, the EGM density cap of 10 per 1,000 adults or no more than existing numbers in an LGA was extended to include 19 regions of the state of Victoria (Victoria Government Gazette, 2006), and in 2009, density caps applicable to each region were introduced, resulting in the removal of some machines (Victoria Government Gazette, 2009). By 2010, the maximum gaming machine density for all local government areas (except the City of Melbourne) will be 10 machines per 1,000 adults.

While less than one in one hundred Victorian adults is estimated to be a problem gambler, each of these individuals loses over \$10,000 each year on average, most of which is lost through playing EGMs. This income loss is significant in the creation of problems for the individual, their family and

their community. This report adds to knowledge about the local distribution of problem gambling in the Victorian community. This aim is achieved through adopting a public health framework and employing a local area analysis, as described below.

Theoretical approach

As outlined by the Productivity Commission (2009, Figure 3.3, p. 3.15), there are three main theoretical approaches to gambling and gambling policy: the medical model, the consumer focus and the public health approach. Under the medical model, in 1997, pathological gambling was included in the International Classification of Diseases coding, and thus seen as a legitimate psychiatric disorder (Wheeler, Rigby, & Huriwai, 2006). The medical model, with its focus upon pathogens within the individual person, does not adequately address environmental factors in the development of a range of public health concerns (e.g., gambling, alcohol and drug use, obesity, etc.). Much of the research that exists about gambling follows this model and is thus focused on internal processes within the individual (see Gilliland & Ross, 2005; Young & Tyler, 2008), for example, psychological and neurological explanations for problem gambling (see Wheeler et al., 2006).

While the medical model is focused upon problem gambling as a pathological behaviour requiring treatment, both the consumer and public health models focus more widely upon gambling-related behaviours *and* the wider context within which gambling occurs. While the consumer model is focused upon gamblers (problematic or not), the public health model incorporates a whole-of-community approach to reducing gambling-related harm, which is seen as affecting not only the gambler but his or her family, workplace and wider community. Although conceptualising gambling as a public health issue is a recent development (Korn & Shaffer, 1999; Shaffer & Korn, 2002), it has rapidly become the preferred framework for understanding gambling in Australia and New Zealand (e.g., Adams, Raeburn, & de Silva, 2009a; Hare, 2009; Marshall, 2009; Productivity Commission, 2009). As Marshall (2009) notes, this development is important because research only concerned with individual risk factors leads to policies based only on individual treatment or behaviour change. Structural change in local communities is much more likely to result from research framed within public health that includes or focuses upon the influence of the gambling environment.

Marshall (2009) argues for the critical role of local environment for understanding gambling as a public health issue. He outlines three mechanisms by which local circumstances can influence the public health outcomes of gambling (*italics in original*):

“They create the conditions in which the problem can first emerge (e.g., presence and type of gambling opportunities and how they are regulated).

They influence the gambling activity and behaviour in the area and thus the type, extent, and severity of gambling-related problems.

They affect the response capability with which the community can/does deal with emergent problems.”

A public health approach to understanding gambling using a local area analysis may fall across a continuum from micro- to macro-level environmental factors. For example, research has been conducted at a micro level regarding factors of the immediate vicinity of gambling (e.g., Marshall, McMillen, Niemeyer, & Doran, 2004) and examining aspects of the gaming machine technology itself

(e.g., Delfabbro, Falzon, & Ingram, 2005). Local area analysis tends to be at a large area unit level, for example, LGAs (e.g., Delfabbro, 2002; Diamond, 2009; Doughney, 2002) and suburbs (e.g., Marshall, 2005), although some techniques to apply local area analysis to smaller units have been conducted using a Geographic Information System (GIS, e.g., Gilliland & Ross, 2005; Pearce, Mason, Hiscock, & Day, 2008; Robitaille & Herjean, 2008; Rush, Veldhuizen, & Adlaf, 2007) and Australian Bureau of Statistics (ABS) Mesh blocks (e.g., Doran & Young, 2010). Macro-level analysis in this area has been conducted using Australian states as the unit of analysis (Productivity Commission, 1999). While all of the above types of research address environmental factors that may affect gambling, changing the size of the local area of analysis has been shown to influence relationships between variables due to individual effects being masked through aggregation (McMillen & Doran, 2006; Young & Tyler, 2008).

One of the most commonly measured associations at the local level is between gambling expenditure and the density of EGMs. At a crude level, it is to be expected that profit from EGMs would be positively associated with their presence in a community, although the nature of this relationship is likely to be two-way and multi-causal (Productivity Commission, 2009). There are two competing theories that may explain the nature of this relationship: exposure and social adaptation (LaPlante & Shaffer, 2007; Shaffer, LaBrie, & LaPlante, 2004; Storer et al., 2009). As described by these authors, the exposure theory is borrowed from explanations for public health epidemics, such as infectious diseases that spread across populations through exposure to a contaminant. The prevalence of gambling problems is perceived as directly related to the availability of opportunities to gamble and it predicts that the more gambling opportunities available to a person, the more likely they are to develop a problem with gambling (mediated by their propensity or vulnerability to develop such problems). In contrast, the social adaptation model predicts that after an initial exposure to gambling opportunities which is linked with gambling problems, people change their behaviour in response to the exposure as they adapt to its presence over time. The exposure model predicts a linear relationship between the density of EGMs and problem gambling, whereas the adaptation model predicts that after a certain saturation of gambling opportunities, the relationship between density and problems would ease, plateau or even decrease due to social adaptation. These two predictions are tested within this report.

Defining and measuring ‘problem gambling’

Defining and measuring problem gambling is complex, especially within local area gambling research. From a public health perspective, the focus is on the harms people experience as a consequence of gambling behaviour. A more formal definition has been adopted by many Australian institutes and researchers: “Problem gambling is characterised by difficulties in limiting money and/or time spent on gambling which leads to adverse consequences for the gambler, others, or for the community” (Neal, Delfabbro, & O’Neil, 2005, p. i). In individual-level research, the Canadian Problem Gambling Index is considered to be the preferred instrument for measuring problem gambling (Neal et al., 2005). In local area research, prevalence surveys of problem gamblers are impractical. In order to get an adequate estimate of problem gambling at the LGA level, very large sample sizes would be required. For example, in a probability sample of 15,000 with a prevalence of 0.7 per cent problem gambling (e.g., in Victoria, Hare, 2009), only 105 people would have been identified as problem gamblers. It would not be statistically viable nor methodologically correct, to divide this small sub-sample into their residential areas for a local area analysis at the LGA level.

As very large population samples would be required to conduct a local area analysis using individual level data, proxy measures of problem gambling have been used. The net expenditure on EGMs is

automatically collected by gaming venues and is available at the LGA level in Victoria and other parts of Australia. Gaming machine expenditure has been used as a proxy measure of gambling harm in local area research (e.g., Marshall et al., 2004; McMillen & Doran, 2006). However, higher expenditure does not necessarily result in higher problems within a specific local area (Marshall et al., 2004; McMillen & Doran, 2006). An increase in expenditure may indicate a larger number of people are gambling in a non-problematic way equally it may indicate a smaller number of people are gambling in a more problematic way. Aggregate expenditure cannot tease out this relationship. Furthermore, venue expenditure may not arise from local residents. The majority of gamblers play EGMs within five kilometres from their residence (Delfabbro, 2008; Hare, 2009). However, many do travel long distances to gamble as location is one of many gaming characteristics that attract consumers. Other characteristics include the types and combinations of machines, presence of other community facilities and venue marketing strategies (Marshall et al., 2004). Despite these problems with using expenditure as a proxy for gambling harm, the recent Victorian prevalence survey found that the risk of problem gambling was consistently related to three EGM spend bands across Victorian LGAs. The odds of problem gambling were significantly higher in medium and high EGM spend bands compared to lower EGM spend band areas, although expenditure did not reliably differentiate between risk of problem gambling between medium and high spend bands (Hare, 2009).

Lack of access to alternative measures of problem gambling at a local area level is commonly mentioned as a limitation of studies in this area (Marshall et al., 2004; McMillen & Doran, 2006). Data from people who seek help for their own gambling have rarely been used in these kinds of analyses. One exception is the work by Delfabbro (2002) in South Australia. Delfabbro reported a moderate positive correlation between the density of problem gambling services clients and EGM densities when analysed at the statistical local area level ($r = 0.49$) and a larger positive correlation when analysed at the LGA level ($r = 0.78$). No similar analyses using gambling helpline data were found. While service use does approximate gambling harm, it is likely to vastly underestimate the prevalence of problem gambling. The Productivity Commission (2009) reports that around 13,500 people attended gambling counselling and treatment services for their own gambling in 2007-08, or between eight and 15 per cent of problem gamblers in Australia. Rates of treatment seeking are similarly low internationally (Slutske, 2006; Suurvali, Cordingley, Hodgins, & Cunningham, 2009). Rates of treatment may indicate different levels of treatment access as well as the underlying prevalence of problem gambling in a local area.

This report is unique in its use of telephone helpline and counselling data, rather than gambling expenditure, to approximate the distribution of problem gambling in the Victorian community. While service use measures also have their limitations, they do provide an additional way of measuring a hidden community problem.

Predictors of problem gambling

Problem gambling is just one of many problem behaviours that are associated with local area characteristics. Other behaviours that have been investigated in this way include obesity (e.g., King, Kavanagh, Jolley, Turrell, & Crawford, 2006), alcohol-related harm (e.g., Livingston, Laslett, & Dietze, 2008), sexually transmitted infections (e.g., Cohen et al., 2000), and a variety of other health and social behaviours (e.g., see Adams et al., 2009b). The main findings from this body of work are that local areas with higher availability (i.e., of fast food, alcohol outlets, etc.) and lower socio-economic status tend to have worse health and social outcomes. These community characteristics are mediated

by characteristics of the individual where multi-level studies were conducted (e.g., Adams et al., 2009b; Livingston et al., 2008).

As previously discussed, the density of gaming machines is strongly correlated with gaming machine expenditure. This is true at the state (Productivity Commission, 2009), LGA (Delfabbro, 2002; Diamond, 2009; Stubbs & Storer, 2003) and census district levels (Marshall et al., 2004), although detailed census-district-level research in Victoria failed to replicate these findings (McMillen & Doran, 2006). At the macro level, using Australian states as geographical units, the Productivity Commission found that the number of EGMs per adult accounted for 69 per cent of the variance in EGM expenditure in 1998–99 and 60 per cent in 2006–07 (Productivity Commission, 2009). In support of the adaptation theory, Abbott (2006) reanalysed these data to find a non-linear relationship such that the link between machine density and expenditure weakened after reaching a threshold between six and ten machines per 1,000 adults. In contrast, the adaptation theory was refuted in a recent meta-analysis of 34 surveys of problem gambling from Australia and New Zealand which supported a linear relationship between machine density and prevalence of problem gambling, consistent with the exposure theory (Storer et al., 2009). Unfortunately, due to the problems already discussed regarding the local measurement of problem gambling, most of the studies reviewed by Storer and colleagues used large area units, usually states or regions. The present study adds to this body of research through using two different measures of local rates of self-identified problem gamblers, available at the LGA level.

Socio-economic disadvantage has also been associated with higher machine density and higher per capita gaming expenditure. This relationship is consistent at the LGA level in Victoria (Diamond, 2009; Doughney, 2002; Livingstone, 2001; Marshall & Baker, 2002) and the Canadian province of Montreal (Gilliland & Ross, 2005; Robitaille & Herjean, 2008), although similar research in New South Wales found only weak correlations between gaming machine density and socio-economic disadvantage (Stubbs & Storer, 2003). While socio-economic disadvantage at the LGA level may predict gaming intensity in a community, the relationship breaks down at a more refined area unit (Doran & Young, 2010; McMillen & Doran, 2006; Young & Tyler, 2008). In McMillen and Doran's Victorian research that examined three Victorian LGAs using GIS methods to map relationships at the census district unit level, both higher and lower socio-economically disadvantaged areas within LGAs contained elevated per capita expenditure on gaming machines. Australian research has found that the extent of the venue catchment influences its impact on residents that live near it (Doran & Young, 2010). Once the unit of analysis is reduced to the census district, venue catchment variation plays a larger role in determining the relationship between local area characteristics and expenditure (Doran & Young, 2010; McMillen & Doran, 2006; Young & Tyler, 2008). While this body of research has moved towards focused on a finer-grained local area unit, the present study is the first to determine to what extent rates of self-identified problem gamblers are associated with socio-economic disadvantage at the LGA level.

Project aims

The aim of this project is to determine LGA characteristics that are associated with self-identified problem gambling as assessed through call volume to Gambler's Helpline and the number of clients using Gambler's Help. The analyses proceed in three phases:

- The direct impact of gaming industry characteristics is investigated to determine how venue location and offerings contribute to, or are protective of, problem gambling.
- Variables associated with community resilience or disadvantage are investigated to determine how these factors influence the impact of the gaming industry variables on problem gambling.
- The variables in the final model are used to rank LGAs based on their vulnerability to problem gambling.

METHODOLOGY

We used a cross-sectional ecological design to explore the extent to which area-level factors predict help-seeking for problem gambling across Victoria. A description of measured employed, their limitations, and details of data analysis techniques are outlined below.

Measures

Geographic units

Data were analysed at the LGA level. We chose LGA as the geographic unit because the smallest level of government in Victoria is organised around LGA boundaries, and these local governments are also the most likely to develop and implement community interventions and policies to respond to local issues like problem gambling (Dietze et al., 2009; McMillen & Doran, 2006). Furthermore, many of the variables available for use as outcome and predictor variables were already aggregated to the LGA level. Using LGA level data also enabled the construction of a ranking system for gambling-related help-seeking which would be more useful for local government use in their policy planning.

The final models used 70 LGAs and combined LGAs from 79 possible LGAs. Some gaming industry variables were only available merged across LGAs for confidentiality reasons. Specifically, 12 regional and rural LGAs (Ararat, Central Goldfields, Corangamite, Hepburn, Mansfield, Moira, Mt Alexander, Murrindindi, Queenscliffe, Southern Grampians, Strathbogie, and Towong) were merged into 5 combined LGAs. The LGAs of Melbourne and Indigo were also omitted from the regression analyses. The Melbourne LGA, which includes the main commercial, tourist and entertainment precinct of Victoria, was excluded because this area is qualitatively different from other LGAs in this dataset with much of the activity in the CBD arising from non-residents, leading to inflated rate values. For example, the density of EGMs (if Crown Casino is included), on-premises and off-premises alcohol licences, and crime were extremely high in the CBD area. While there is indeed a large number of gaming and drinking facilities and crime in this locality, these elevated rates are also a function of *residential* population estimates being used to calculate rate values. The Shire of Indigo was also excluded when it was found to have one of the highest rates of gambling service clients in Victoria, yet no gaming venues appeared to be licensed within the LGA. Indigo is located on the border of Victoria and New South Wales, thus we assumed that residents of Indigo travelled across the border to access gaming venues and machines. Data from both omitted LGAs is included alongside all other data in Appendix A.

Estimated residential adult population

All rates were calculated using the estimated residential population aged 18 and over at June 30, 2006. These estimates are based on the results of the 2006 Census of Population and Housing (Australian Bureau of Statistics, 2007b). Estimates were available in five year brackets. The population aged 18 and over was estimated by adding 40 per cent of the 15–19 year old estimate to the sum of the population aged 20 and over.

Outcome variables

Gambler's Helpline: Turning Point Alcohol and Drug Centre has operated the Victorian Gambler's Helpline since 2001. Around two thirds of the calls are received from a gambler and one third from a concerned family member or relative. There were 2,001 counselling calls to Gambler's Helpline in Victoria in 2007, excluding calls from people residing interstate or with no known postcode and from family members or relatives. The calls were collated at postcode level and were then aggregated into LGAs using the ABS 2006 concordance data (Australian Bureau of Statistics, 2007a). After Melbourne and Indigo were removed, the final number of calls was reduced to 1,908. Rates were calculated by dividing the number of calls to Gambler's Helpline by the estimated residential adult population and multiplying by 1,000. Individual clients may have made more than one call to Gambler's Helpline over the study period.

Gambler's Help: Gambler's Help provides face-to-face personal and financial counselling services to problem gamblers and their families from approximately 100 sites across the state of Victoria. Gambler's Help agencies regularly submit information to the Victorian Department of Justice. These data were provided by the Department of Justice for clients who received treatment for their own gambling, aggregated to LGA level. Significant others presenting for treatment were excluded. There were 3,741 clients of Gambler's Help in Victoria between July 1 2006 and June 30 2007. After excluding non-Victorian clients and those with missing location information and residents of the LGAs of Melbourne and Indigo, the final number of clients of Victorian gambling services was reduced to 3,529. Rates were calculated by dividing the number of clients of Gambler's Help by the estimated residential adult population and multiplying by 1,000.

Predictor variables

Gaming industry indicators

Gaming machines: Data on the number of Electronic Gaming Machines (EGMs) in each LGA for 2006–07 were sourced from the Victorian Commission for Gambling Regulation, which provides annual data on venues, machines and expenditure on EGMs in Victoria at the LGA level. These data exclude Crown Casino which is licensed to operate 2,500 EGMs. Rates were calculated by dividing the number of EGMs by the estimated residential adult population and multiplying by 1,000.

Gaming venues: Data on the number of venues with EGMs in each LGA for 2006–07 were sourced from the Victorian Commission for Gambling Regulation, which provides annual data on venues, machines and expenditure on EGMs in Victoria at the LGA level. Rates were calculated by dividing the number of gaming venues by the estimated residential adult population and multiplying by 1,000.

Average number of machines per gaming venue: The number of gaming machines per LGA was divided by the number of gaming venues in that LGA to measure the extent to which LGAs have large venues with many machines or small venues with lower numbers of EGMs. Any one Victorian licensed venue can legally operate up to 105 machines (McMillen & Doran, 2006). LGAs with no gaming machines or venues were assigned a value of zero for this variable.

EGM expenditure: Data on EGM expenditure in each LGA for 2006–07 were sourced from the Victorian Commission for Gambling Regulation, which provides annual data on venues, machines and expenditure on EGMs in Victoria at the LGA level. Expenditure was defined as the net amount lost through using EGMs; that is, the amount spent minus any winnings. EGM expenditure in Victoria is

recorded through a centralised monitoring system at each licensed venue (McMillen & Doran, 2006). Per capita expenditure was calculated by dividing total gaming expenditure by the estimated residential adult population.

Demographic, social and economic indicators

Remoteness: The remoteness measure was based on the Accessibility Remoteness Index of Australia (ARIA, Australian Bureau of Statistics, 2005). ARIA values are based on road distances to various service centres. Remoteness values for populated localities are derived from the road distance to service centres and then interpolated to a one kilometre grid representing the whole of Australia. LGAs were divided into three categories: major city (ARIA between 0 and 0.2), inner-regional (ARIA between 0.2 and 2.4) and regional and remote (ARIA greater than 2.4).

Age: The median age of the population of each LGA was extracted from 2006 census data (Australian Bureau of Statistics, 2008b).

Gender: The percentage of males in each LGA was extracted from 2006 census data (Australian Bureau of Statistics, 2008b).

Education: The measure of education level used was the proportion of the population of each LGA aged 25 or over who have obtained at least one non-school qualification, including university degrees, TAFE, and trade certificates. These data were extracted from the 2006 census (Australian Bureau of Statistics, 2008b).

Household income: The median equivalised household incomes for each LGA were extracted from the 2006 census. Equivalised income is defined as household income adjusted for the size and composition of households to produce a measure comparable between households (see Australian Bureau of Statistics, 2006).

Financial stress: The measure of financial stress used was the proportion of adults in each LGA who could not definitely raise \$2,000 in two days in an emergency. The data for this measure came from the Community Indicators Victoria (CIV) survey undertaken in 2007. This Victorian population survey sampled 23,700 people aged 18 with a response rate of 40%. Data were weighted at the LGA level by age and sex to ensure representativeness of the results.

Housing affordability: The measure of affordability used was the proportion of households in each LGA with housing costs equal to 30 per cent or more of their gross household income. These data were extracted from the 2006 census (Australian Bureau of Statistics, 2008b).

Socio-economic advantage: The ABS socio-economic index for areas (SEIFA) was used to measure the relative disadvantage of the LGAs in the study (Australian Bureau of Statistics, 2008a). LGAs were assigned scores based on the deciles of the SEIFA index of relative disadvantage. These deciles divide Victoria's LGAs into ten groups of roughly equal population sizes based on characteristics of census collection districts, such as income level, education level and the unemployment rate. LGA SEIFA scores are population weighted averages of the scores of the collection districts within them. LGAs in the lower deciles have higher levels of disadvantage. These data were extracted from the 2006 census (Australian Bureau of Statistics, 2008b).

Non-English speaking background: The percentage of people living in each LGA who speak a language other than English at home was extracted from the 2006 census (Australian Bureau of Statistics, 2008b).

Unemployment: The unemployment rate for each LGA was extracted from the 2006 census (Australian Bureau of Statistics, 2008b).

Labour force participation: The percentage of the population in each LGA that were in the labour force was extracted from 2006 census (Australian Bureau of Statistics, 2008b).

Personal Wellbeing Index: The Personal Wellbeing Index (PWI) is a well-validated measure of subjective wellbeing (Cummins, Eckersley, Pallant, van Vugt, & Misajon, 2003; Cummins et al., 2008).¹ The PWI is a seven item scale, which produces a score between zero (lowest wellbeing) and 100 (highest wellbeing). The data for this study were average PWI scores for each of the LGAs provided by Community Indicators Victoria (CIV), from a state-wide survey of 23,700 people aged 18 and over undertaken in 2007, with a response rate of 40 per cent. Data were weighted at the LGA level by age and sex to ensure representativeness of the results.

Community satisfaction: Community satisfaction was assessed by asking respondents of the CIV survey 1 'How satisfied are you with feeling part of your community?'. The average response per LGA (0-100) was used.

Social Support: Social support was measured using an indicator that assesses how easily people in each LGA can get help quickly. The measure used in the study was the proportion of the adult population in each LGA who said that they could 'definitely' get help from friends, family or neighbours when needed. The data were collected as part of a survey conducted by the Department of Planning and Community Development between 2004 and 2006. The survey methodology was the same as the CIV survey 1, although response rates were not reported.

Perceptions of safety: This measure was based on the percentage of people in each LGA who felt safe or very safe when walking alone in their local area at night. The data came from the CIV survey 1 described above.

Self-reported health: An estimate of the health of each LGA was derived from responses to a question on general health in the CIV survey 1. The measure used for the study was the percentage of people in each LGA who reported their health as excellent or very good.

Assaults: Data on assaults were sourced from the Victoria Police law enforcement assistance program (LEAP) database, which captures information on crime reported to police. Information is available across various crime categories including reported assault and family incidents and drug-related crime such as drug-related arrests. Assaults are recorded by victim, offender and incident. Assault incidents that occurred within Victoria during 2006–07 were aggregated by postcode. Postcode-level data were converted into LGA totals using the 2006 ABS concordance data and rates per 1,000 adults were calculated.

Domestic violence: Data on domestic violence were sourced from the Victoria Police law enforcement assistance program (LEAP) database, which captures information on crime reported to police as

¹ <http://www.communityindicators.net.au/>

described above. Family incidents that occurred within Victoria during 2006–07 were aggregated by postcode. Postcode-level data were converted into LGA totals using the 2006 ABS concordance data and rates per 1,000 adults were calculated.

Drug crime: Data on the number of drug-related offences (including possession, manufacturing, cultivating, trafficking, use) during 2006–07 were provided by Victoria Police at the postcode level. These data were aggregated to LGAs using the 2006 ABS concordance data. Drug crime rates were calculated per 1,000 adults.

Property crime: Data on the number of burglary and related offences (including burglary (aggravated), burglary (residential), burglary (other), theft from motor vehicle, shop-steal, theft of motor vehicle, theft (bicycle) and theft (other)) during 2006–07 were provided by Victoria Police at the postcode level. These data were aggregated to LGAs using the 2006 ABS concordance. Property crime rates were calculated per 1,000 adults.

Alcohol treatment episodes: Courses of treatment where alcohol was identified as the primary drug of concern during 2006–07 were extracted from the Alcohol and Drug Information System (ADIS), a mandated database maintained by the Victorian Department of Health and contributed to by alcohol and drug treatment services. Postcode-level data were converted to LGA-level using the 2006 concordance data. Rates of alcohol-related treatment provision were calculated by dividing the number of courses of treatment by the estimated residential adult population and multiplying by 1,000. Individual clients may have received more than one course of treatment in any one year.

Other drug treatment episodes: Courses of treatment, where drugs other than alcohol were identified as the primary drug of concern, were extracted from ADIS using the same processes just described.

On-premise liquor licences: The numbers of on-premise liquor licences in each postcode in 2006 were provided by Responsible Alcohol Victoria. On-premise liquor licences encompass all outlets that sell alcohol for on-premise consumption only (e.g., nightclubs, bars, cafes, restaurants). These data were aggregated to the LGA-level using the 2006 ABS concordance data. On-premise liquor licence density was calculated as a rate per 1,000 adults.

Packaged liquor licences: The numbers of packaged liquor licences in each postcode in 2006 were provided by Responsible Alcohol Victoria. Packaged liquor licences allow the sale of alcohol for off-premise consumption (e.g., bottle shops). These data were aggregated to LGA-level using the 2006 ABS concordance data. Packaged liquor licence density was calculated as a rate per 1,000 adults.

General liquor licences: The numbers of general liquor licences in each postcode in 2006 were provided by Responsible Alcohol Victoria. General liquor licences are for hotels and taverns and allow alcohol to be sold both for on- and off-premise consumption. These data were aggregated to LGA-level using the 2006 ABS concordance data. General liquor licence density was calculated as a rate per 1,000 adults.

Limitations

Using treatment data as an indirect measure of trends in problem gambling has some limitations. Most importantly, treatment data does not include the hidden or out-of-treatment population of problem gamblers, and most problem gamblers do not seek treatment (Productivity Commission, 2009). Problem gamblers are most likely to seek treatment after a crisis (Evans & Delfabbro, 2005), and thus

there is likely to be a delay of perhaps years between the start of problems and the crisis that precipitates treatment. The proportion of the problem gambling population receiving treatment at any one time also depends upon the availability and accessibility of treatment facilities in that local area. Exposure to promotion of services may be uneven throughout the community as well. The ADIS dataset used to estimate alcohol and other drug related treatment rates is also subject to some of these limitations.

A limitation of all administrative data sources is that they were not specifically collected for the purposes of research. For instance, the health and welfare of a client would be prioritised over the collection of valid data in treatment datasets. In another example, police administrative data is driven by both the willingness of victims of crime to report incidents and the procedures and priorities of police themselves. These factors may influence crime rates differently across local areas.

Furthermore, several data sources were provided as aggregated tables to the LGA or postcode level. This was due to concerns and reporting restrictions of some data custodians regarding privacy and confidentiality of individuals.

Analysis

All statistical analyses were undertaken using the R software package. R is an open-source statistical package based on the S programming language (R Development Core Team, 2006). The 'spdep' package was used for all the spatial analyses (Bivand, 2006). Geographic data specifying the neighbour relationships between the LGAs in the study were produced using Geoda, an open-source spatial statistics program (Anselin, 2003).

The inclusion of highly-correlated independent variables in a linear regression model results in problems with multicollinearity. This can lead to models failing to find significant effects for variables that are highly correlated with the dependent variable and poorly estimated regression coefficients (StataCorp, 2005). Initial descriptive analyses were undertaken to assess the correlations between independent variables to minimise the problems associated with multicollinearity. This analysis resulted in a number of the above independent variables being excluded from the regression analyses due to high correlations (of 0.75 and above or -0.75 and below) with other independent variables.

Once the final independent variable list was selected, a series of multiple regression models were run, with separate models developed for each of the two outcome measures. The initial models examined the impact that gambling accessibility and locality remoteness had on rates of problem gambling, without controlling for possible confounders. These models were then expanded to incorporate economic, demographic and social variables. Each of these models was examined for evidence of spatial autocorrelation² using the Lagrange Multiplier diagnostics for spatial dependence in linear models (see Anselin, Bera, Florax, & Yoon, 1996). Spatial autocorrelation was marginally significant for the model of calls to Gamblers Helpline. A corrected model was run; however, because the corrected model was only marginally different to the standard linear regression model, only the standard model is shown. All variables included in the extended models were assessed for

² Spatial autocorrelation refers to the correlation of a variable with itself through space: that is, where there is systematic patterning in the spatial distribution of a variable. Positive spatial autocorrelation refers to those nearby or neighbouring areas that are more alike, while negative autocorrelation refers to patterns where nearby areas are unlike (Griffith, 2009).

multicollinearity using the Variance Inflation Factor (VIF) diagnostic.³ Visual diagnostic checks were also undertaken (see Appendix B). The two final models were used to develop a ranking system for predicted problem gambling rates for Victorian LGAs.

³ None of the predictors in the extended models had VIFs above 6. The occurrence of VIFs above 10 indicates severe multicollinearity (Neter, Kutner, Nachtsheim, & Wasserman, 1996).

RESULTS

Initial analyses

Table 1 presents descriptive statistics for each continuous variable used in this report, including problem gambling, gaming industry, demographic, social and economic indicators. Data for each of the 70 LGAs or combined LGAs are reproduced in Appendix A, alongside data for the two excluded LGAs of Melbourne and Indigo.

Table 1: Descriptive statistics (N = 70)

Variable / indicator	Mean (SD)	Median	Range
Problem gambling indicators			
Gambler's Helpline, rate	0.369 (0.231)	0.370	(0.000 – 0.858)
Gambler's Help, rate	0.828 (0.459)	0.824	(0.000 – 2.318)
Gaming industry indicators			
Electronic Gaming Machines, rate	6.177 (3.149)	6.756	(0.000 – 12.602)
Gaming venues, rate	0.145 (0.087)	0.128	(0.000 – 0.321)
Average number of EGMs per venue	41.358 (21.113)	41.084	(0.000 – 79.143)
Gaming expenditure per capita (\$)	504.48 (295.49)	524.03	(0.00 – 1,110.21)
Demographic, social and economic indicators			
Age (median)	38.479 (3.771)	38.000	(31.000 – 45.677)
Male (%)	49.283 (0.875)	49.417	(47.083 – 51.503)
Education (% with post-school qualification)	46.972 (9.411)	45.950	(32.300 – 71.600)
Equivalised household income (median, \$)	572.45 (129.25)	542.79	(389.00 – 959.00)
Financial stress (%)	23.101 (5.077)	22.867	(12.100 – 37.100)
Financial housing stress (%)	15.433 (4.357)	15.450	(3.800 – 24.500)
Socio-economic advantage (SEIFA)	5.443 (2.927)	5.000	(10.000 – 1.000)
Non-English speaking background (%)	12.733 (14.140)	4.924	(1.127 – 54.932)
Unemployment (%)	5.253 (1.404)	5.125	(2.720 – 9.470)
Participation in labour force (%)	60.174 (4.638)	60.400	(46.760 – 73.630)
Personal Wellbeing Index	77.505 (2.078)	77.700	(72.400 – 81.349)
Community	73.650 (4.823)	74.000	(64.500 – 84.000)
Social Support (%)	93.224 (2.132)	93.400	(87.400 – 96.400)
Perceptions of safety (%)	72.567 (11.545)	72.150	(47.400 – 94.500)
Self-rated health (%)	54.436 (4.256)	54.050	(43.000 – 62.800)
Assaults, rate	6.863 (2.780)	6.466	(1.946 – 16.112)
Domestic violence, rate	7.402 (3.237)	7.072	(2.693 – 15.393)
Drug-related crime, rate	3.498 (2.128)	2.969	(0.673 – 10.435)
Property crime, rate	39.319 (18.647)	36.341	(10.164 – 122.258)
Alcohol-related episodes of care, rate	1.302 (1.106)	1.038	(0.159 – 7.407)
Other drug-related episodes of care, rate	0.559 (0.282)	0.483	(0.193 – 1.698)
On-premises liquor licences, rate	0.805 (0.702)	0.694	(0.042 – 2.953)
Packaged liquor licences, rate	6.033 (3.142)	5.215	(2.214 – 16.604)

General liquor licences, rate	7.150 (4.377)	6.238	(2.131 – 25.727)
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Note. All rates per 1,000 adult residents.

About one third of the 70 LGAs were classified as major city ($n = 24$), over one third were classified as inner-regional ($n = 27$) and the remainder were classified as regional and remote ($n = 19$).

Problem gambling variables

The two problem gambling indicators were weakly positively correlated ($r = 0.276$, $CI = 0.044 - 0.480$, $p = 0.021$). The lack of a strong positive correlation between these two help-seeking measures could be the result of accessibility of services, knowledge of specific types of service, as well as preference for specific types of service. Table 2 displays correlation co-efficients for both problem gambling indicators for each independent variable.

Table 2: Simple bivariate correlations with problem gambling indicators

Variable / indicator	Gambler's Helpline calls	Gambler's Help clients
Gaming industry indicators		
Electronic Gaming Machines, rate	0.462 **	0.701 **
Gaming venues, rate	0.037	0.587 **
Average number of EGMs per venue	0.699 **	0.408 **
Gaming expenditure per capita (\$)	0.705 **	0.651 **
Demographic, social and economic indicators		
ARIA	-0.683 **	-0.197
Age (median)	-0.603 **	-0.407 **
Male (%)	-0.355 **	-0.193
Education (% with post-school qualification)	0.365 **	-0.012
Equivalised household income (median, \$)	0.445 **	-0.008
Financial stress (%)	0.380 **	0.232
Financial housing stress (%)	0.694 **	0.447 **
Socio-economic advantage (SEIFA)	0.223	-0.145
Non-English speaking background (%)	0.731 **	0.216
Unemployment (%)	0.371 **	0.366 **
Participation in labour force (%)	0.159 *	-0.034
Personal Wellbeing Index	-0.772 **	-0.349 **
Community	-0.789 **	-0.322 **
Social Support (%)	-0.505 **	-0.122
Perceptions of safety (%)	-0.719 **	-0.487 **
Self-rated health (%)	-0.157	-0.213
Assaults, rate	0.120	0.614 **
Domestic violence, rate	0.141	0.536 **
Drug-related crime, rate	0.220	0.427 **
Property crime, rate	0.664 **	0.366 **
Alcohol-related episodes of care, rate	-0.133	0.392 **
Other drug-related episodes of care, rate	0.131	0.181
On-premises liquor licences, rate	-0.007	0.053

Packaged liquor licences, rate	-0.521 **	-0.275 *
General liquor licences, rate	-0.607 **	-0.417 **

Note. Pearson's product moment correlation co-efficient. * $p < .05$, ** $p < .01$

A range of the factors under consideration were related to rates of problem gambling. General trends across both variables include a strong positive relationship between gaming industry penetration and problem gambling rates, positive relationships between both financial housing stress, unemployment rates and rates of crime with problem gambling rates, negative relationships between median age, community, safety and personal wellbeing indicators and problem gambling rates, and negative relationships between off-premises liquor licensing rates and problem gambling. LGAs with larger gambling venues (with a higher average number of machines) were more likely to seek help and treatment for gambling problems, especially using Gambler's Helpline.

Stronger relationships were found between the majority of demographic, social and economic variables and rates of calls to Gambler's Helpline compared with the rate of Gambler's Help services. Mostly, the rate of Gambler's Help clients was more weakly correlated to independent variables than the rate of calls to the Helpline, while demonstrating the same kind of relationship. The exceptions to this was unemployment, and rates for assault, domestic violence, drug related crime and alcohol related episodes of care rate where gambler's help clients showed stronger correlations. The rate of calls to Gambler's Helpline was positively associated with education, median income, labour force participation. These three variables were not significantly related to the rate of Gambler's Help clients, and in fact showed negative trends. The percentage of LGA from a non-English speaking background was strongly positively correlated with the rate of calls to Gambler's Helpline, and unrelated to the rate of Gamblers Help clients. Also, the rate of alcohol-related treatment episodes was positively associated with the rate of Gambler's Help clients, but unrelated to the rate of calls to Gambler's Helpline. All types of crime rates showed medium-strength positive correlations with rates of clients using Gambler's Help services, whereas property crime rate was the only crime variable strongly correlated with rate of calls to Gambler's Helpline.

The bi-variate relationships between all gaming industry variables and both measures of problem gambling were explored further using scatterplots. Figure 1 plots gaming industry variables against the rate of calls to Gambler's Helpline and Figure 2 plots gaming industry variables against the rate of Gambler's Help clients. There does not appear to be any evidence of non-linear relationships between problem gambling measures and gaming industry measures. Quadratic and cubic terms were, therefore, not included in the subsequent regression models.

Figure 1: Relationships between rate of Gambler's Helpline calls and gaming industry variables

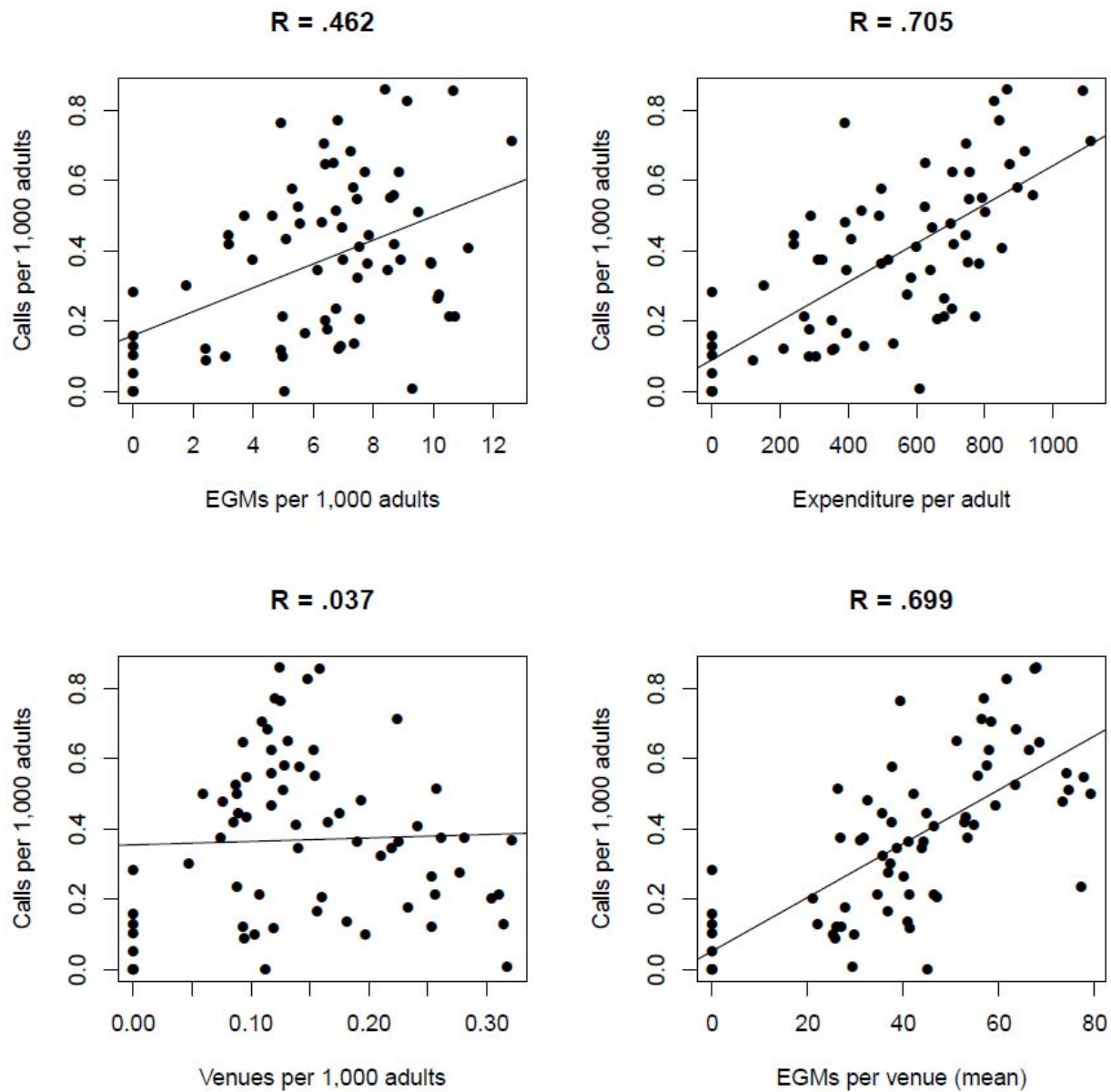
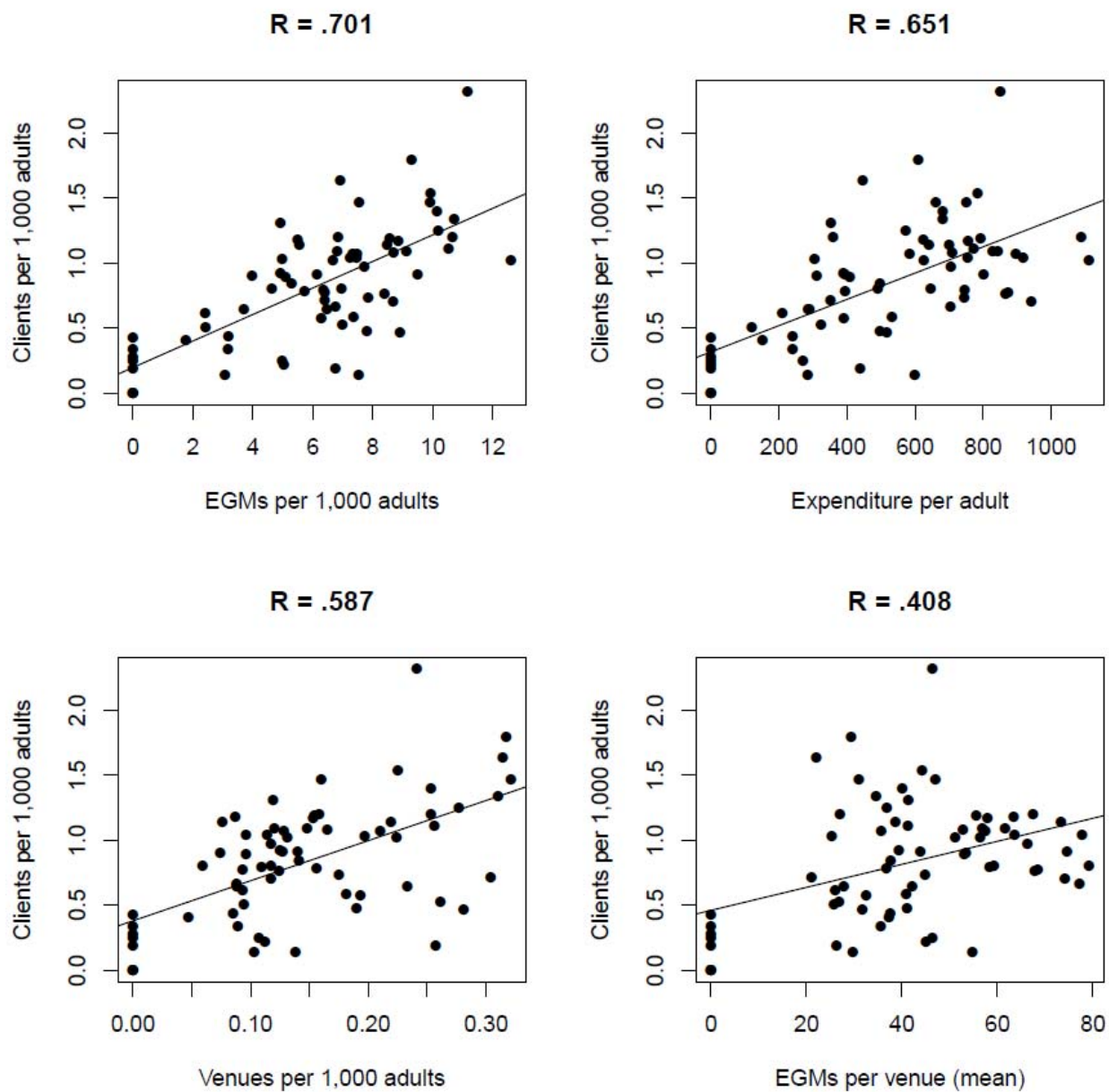


Figure 2: Relationships between rate of Gambler's Help clients and gaming industry variables



Reducing the number of predictor variables

Initial descriptive statistics were used to assess the suitability of variables for inclusion in the models. This assessment focused upon the relationships between independent variables, with the aim to remove variables highly correlated with other variables to keep the models as simple as possible. This step is crucial, as it is widely recommended that linear regression models should include roughly 10 times as many cases as independent variables. As our models are based on just 70 cases, it would be preferable to include seven or fewer independent variables. Therefore, the variables were assessed to determine which should be excluded.

Table 3 displays the relationships between gaming industry indicators. As expected, the rate of EGMs and gaming venues were highly correlated. Since rates of EGMs provide a better measure of availability and are used in most studies, the rate of gambling venues was dropped from the analysis. Unsurprisingly, per capita gaming expenditure and all other gaming industry variables were also highly correlated. Furthermore, per capita gaming expenditure has often been used as a proxy measure of gambling related harm. Indeed, both measures of gambling problems in this study showed high correlations with per capita expenditure. In multivariate analyses, it is important to ensure that predictor variables are not so similar to the dependent variable as to explain almost all of its variance. Thus, per capita expenditure was dropped from the analysis. The positive association between density of EGMs and the average number of EGMs per venue was medium-to-high. Strong negative associations were also found between EGMs per venue and measures of community and safety, as well as rates of off-premise liquor licences. Due to this collinearity, EGMs per venue was also omitted from the regression analyses.

Table 3: Relationships between gaming industry indicators

Variable / indicator	Electronic Gaming Machines, rate	Gaming venues, rate	Average number of EGMs per venue	Gaming expenditure per capita (\$)
Electronic Gaming Machines, rate	1.000	0.777 ***	0.606 ***	0.868 ***
Gaming venues, rate	-	1.000	0.103	0.451 ***
Average number of EGMs per venue	-	-	1.000	0.783 ***
Gaming expenditure per capita (\$)	-	-	-	1.000

Note. Pearson's product moment correlation co-efficient. * $p < .05$, ** $p < .01$, *** $p < .001$

Correlations between the remaining 25 demographic, social and economic variables were inspected to identify variables that were highly correlated with each other and would be good candidates to drop from the regression analyses. Variables with correlation co-efficients of 0.75 or above (or -0.75 and below) were considered highly correlated.

Perceptions of community and safety were highly correlated with the Personal Wellbeing Index (PWI), and proportion of NESB residents was strongly negatively correlated with the PWI. As the PWI is a well-established scale, it is likely to be more reliable than single item measures, so the PWI was retained and the community, safety and NESB measures were removed. Income, education and socio-economic status were also all highly correlated. The SEIFA index, which is based upon income and education among other measures, was retained, and income and education were omitted. Financial housing stress was highly correlated with median age, such that areas with an older median

age were less likely to experience housing stress. Financial housing stress was also negatively related to community and safety measures, and was also removed from the regression analyses. Rates of assaults and domestic violence were highly correlated. As these two rates measured similar constructs, they were combined into an aggregate measure of violence. Packaged liquor and general licence rates were also highly correlated, so they were combined into a measure of off-premises liquor licences. Of the 29 predictor variables, 13 were rejected, 16 were retained and 2 composite variables were added, giving a total of 18 predictor variables remaining (see Table 4).

Table 4: Summary of included, excluded and aggregated variables

Variable / indicator	Status
Gaming industry indicators	
Electronic Gaming Machines, rate	Include
Gaming venues, rate	Exclude
Average number of EGMs per venue	Exclude
Gaming expenditure per capita (\$)	Exclude
Demographic, social and economic indicators	
ARIA	Include
Age (median)	Include
Male (%)	Include
Education (% with post-school qualification)	Exclude
Equivalised household income (median, \$)	Exclude
Financial stress (%)	Include
Financial housing stress (%)	Exclude
Socio-economic advantage (SEIFA)	Include
Non-English speaking background (%)	Exclude
Unemployment (%)	Include
Participation in labour force (%)	Include
Personal Wellbeing Index (PWI)	Include
Community	Exclude
Social Support (%)	Include
Perceptions of safety (%)	Exclude
Self-rated health (%)	Include
Assaults, rate	Exclude
Domestic violence, rate	Exclude
Drug-related crime, rate	Include
Property crime, rate	Include
Alcohol-related episodes of care, rate	Include
Other drug-related episodes of care, rate	Include
On-premises liquor licences, rate	Include
Packaged liquor licences, rate	Exclude
General liquor licences, rate	Exclude
Violence, rate	Aggregate
Off-premises liquor licences, rate	Aggregate

While this still leaves an excess of independent variables, there were no obvious reasons to remove any of the other variables. Therefore, the rest of the variables were included in a stepwise linear regression, with the final model selected using the Akaike Information Criteria, which is based both on goodness of fit and parsimony.

Gambler's Helpline model

The first model was constructed to test which local area variables predicted the rate of telephone counselling conducted through the Gambler's Helpline.

Initial model

The initial linear model included only the rate of EGMs and the remoteness measure as predictors of the rate of Gambler's Helpline counselling calls in Victorian LGAs (see Table 5). Regression diagnostics were checked and are included in Appendix B.

Table 5: Initial model predicting rate of Gambler's Helpline calls in Victorian LGAs

Variable / indicator	Estimate	Confidence interval
Intercept	0.418 ***	(0.315 – 0.521)
EGMs (rate)	0.023 ***	(0.011 – 0.035)
Remoteness (reference – urban)		
Regional	-0.252 ***	(-0.336 – -0.167)
Remote	-0.350 ***	(-0.445 – -0.256)
Adjusted R-squared = 0.568		

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

The model estimates that for each extra machine per 1,000 adult residents in an LGA, the rate of calls to Gambler's Helpline will increase by 0.023 per 1,000 adult residents. The initial model also finds that the further from Melbourne an LGA is, the lower the rate of calls to Gambler's Helpline. This may represent a reduced level of problem gambling, but it may also relate to gamblers' knowledge of the service or preference to use it.

Expanded model

An expanded model was created by incorporating the 18 independent variables identified in Table 4. Stepwise regression using the Akaike Information Criteria produced a final model with nine independent variables. This model is presented in Table 6. Regression diagnostics were checked and are included in Appendix B.

Table 6: Expanded model predicting rate of Gambler's Helpline calls in Victorian LGAs

Variable / indicator	Estimate	Confidence interval
Intercept	2.716 **	(0.744 – 4.688)
EGMs (rate)	0.023 ***	(0.010 – 0.036)
Personal Wellbeing Index (PWI)	-0.035 **	(-0.059 – -0.012)
Socio-economic advantage (SEIFA)	0.013	(-0.004 – 0.030)
Unemployment (%)	0.031	(-0.008 – 0.071)
Drug-related crime, rate	-0.023 *	(-0.044 – -0.002)
Property crime, rate	0.005 ***	(0.002 – 0.008)
Alcohol-related episodes of care, rate	-0.016 *	(-0.027 – -0.004)
Adjusted R-squared = 0.716		

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

According to this model, the rate of EGMs in a local area still independently predicts the rate of calls to Gambler's Helpline, despite the inclusion of many other local area social indicators. Three social indicators predicted unique variance in the rate of calls to Gambler's Helpline at a statistically significant level while adjusting for all other factors. Higher rates of calls to Gambler's Helpline were associated with higher rates of property crime. Lower rates of calls to Gambler's Helpline were associated with higher levels of personal wellbeing, higher rates of drug-related crime and alcohol-related episodes of care. The expanded linear model explained 72 per cent of the variance in rate of calls to Gambler's Helpline. The explanatory power of the expanded model increased by 15 per cent compared to the initial model.

Gambler's Help model

The second model tested which local area variables predicted the rate of clients receiving problem gambling counselling.

Initial model

The initial linear model included only the rate of EGMs and the remoteness measure as predictors of the rate of Gambler's Help clients in Victorian LGAs (see Table 7). Regression diagnostics were checked and are included in Appendix B.

Table 7: Initial model predicting rate of Gambler's Help clients in Victorian LGAs

Variable / indicator	Estimate	Confidence interval
Intercept	0.178	(-0.044 – 0.400)
EGMs (rate)	0.101 ***	(0.076 – 0.126)
Remoteness (reference – urban)		
Regional	0.105	(-0.082 – 0.283)
Remote	-0.047	(-0.251 – 0.156)
Adjusted R-squared = 0.487		

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

The model estimates that for each extra machine per 1,000 adult residents in an LGA, the rate of clients using Gambler's Help will increase by 0.101 per 1,000 adult residents. The initial model found no relationship between remoteness of the LGA and rate of problem gambling clients.

Expanded model

An expanded model was created by incorporating the 18 independent variables identified in Table 4. Stepwise regression using the Akaike Information Criteria produced a final model with seven independent variables. This model is presented in Table 8. Regression diagnostics were checked and are included in Appendix B.

Table 8: Expanded model predicting rate of Gambler's Help clients in Victorian LGAs

Variable / indicator	Estimate	Confidence interval
Intercept	1.911 *	(0.313 – 3.509)
EGMs (rate)	0.084 ***	(0.054 – 0.114)
Socio-economic advantage (SEIFA)	-0.060 *	(-0.113 – -0.007)
Remoteness (reference – urban)		
Regional	0.001	(-0.177 – 0.180)
Remote	-0.292	(-0.593 – 0.008)
Unemployment (%)	-0.109 *	(-0.209 – -0.010)
Age (median)	-0.023	(-0.051 – 0.005)
Violence, rate	0.026 **	(0.008 – 0.045)
Other drug-related episodes of care, rate	-0.017	(-0.035 – 0.001)
Adjusted R-squared = 0.605		

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

According to this model, the rate of EGMs in a local area still independently predicts the rate of clients using Gambler's Help, despite the inclusion of many other local area social indicators. Three social indicators predicted unique variance in the rate of problem gambling clients at a statistically significant level controlling for all other factors. Higher rates of clients using Gambler's Help were associated with higher rates of violence, but were also associated with lower rates of unemployment. Higher rates of clients using Gambler's Help were also associated with socio-economic disadvantage as measured by SEIFA. The expanded linear model explained 61 per cent of the variance in rate of clients using Gambler's Help. The explanatory power of the expanded model increased by 12 per cent compared to the initial model.

LGA rankings

Insofar as the models developed in the previous section are measuring an underlying propensity for problem gambling at a local area level, such models can be used to predict rates of problem gambling at the LGA level. While not all variance can be explained, the extended models do account for 72 per cent of the variance in rates of calls to Gambler's Helpline and 61 per cent of the variance in rates of clients using Gambler's Help. The models' predictions can assist with understanding which local areas may require more assistance and interventions to strengthen themselves against vulnerability to gambling-related harm.

Table 9 shows all 70 LGAs and LGA groupings included in these analyses ordered by ranks of the predicted problem gambling values. The models predict that Maribyrnong, Greater Dandenong, Hume, Darebin and Ballarat are at the highest risk for gambling problems.

Table 9: Ranks of problem gambling using predicted values of the extended linear models

LGA	Gambler's Helpline calls	Gambler's Help clients	Mean rank	Rank of mean rank
Maribyrnong *#	2	3	2.5	1
Greater Dandenong *#	1	11	6.0	2
Hume #	10	4	7.0	3
Darebin *#	5	12	8.5	4
Ballarat #	15	6	10.5	5
Frankston	6	21	13.5	6
Latrobe *#	29	1	15.0	7
Whittlesea #	14	16	15.0	7
Wyndham	4	26	15.0	7
Brimbank #	8	23	15.5	10
Hobsons Bay #	13	18	15.5	10
Maroondah	19	14	16.5	12
Moonee Valley #	11	28	19.5	13
Casey #	23	19	21.0	14
Kingston	18	24	21.0	14
Horsham	34	9	21.5	16
Knox	20	25	22.5	17
Moreland #	12	33	22.5	17
Cardinia	27	20	23.5	19
Greater Shepparton	40	7	23.5	19
Greater Geelong #	22	27	24.5	21
Mildura	36	13	24.5	21
Mitchell	42	10	26.0	23
Monash #	7	46	26.5	24
Yarra	3	50	26.5	24
Glen Eira	16	39	27.5	26
Warrnambool #	54	2	28.0	27
Melton	25	32	28.5	28
Bass Coast *#	43	17	30.0	29
Mornington Peninsula	24	36	30.0	29
Port Phillip	9	51	30.0	29
Banyule #	21	40	30.5	32
Wodonga	47	15	31.0	33
Northern Grampians	58	8	33.0	34
Swan Hill	62	5	33.5	35
Colac-Otway	41	29	35.0	36
Stonnington	17	53	35.0	36

Wellington	35	37	36.0	38
East Gippsland	51	22	36.5	39
Moorabool	31	42	36.5	39
Greater Bendigo	38	38	38.0	41
Surf Coast	32	44	38.0	41
Baw Baw	48	30	39.0	43
Manningham	28	52	40.0	44
Yarra Ranges	33	48	40.5	45
Whitehorse	26	56	41.0	46
Central Goldfields + Hepburn	39	45	42.0	47
Ararat + Southern Grampians	55	31	43.0	48
Campaspe	46	41	43.5	49
Wangaratta	52	35	43.5	49
Benalla	57	52	45.0	50
Boroondara	30	62	46.0	52
Corangamite + Queenscliffe #	50	43	46.5	53
Bayside	37	59	48.0	54
Alpine	49	49	49.0	55
Nillumbik	45	54	49.5	56
Glenelg	44	58	51.0	57
South Gippsland	59	47	53.0	58
Macedon Ranges	56	55	55.5	59
Golden Plains	53	67	60.0	60
Mansfield + Moira + Towong	61	61	61.0	61
Murrindindi + Mt Alexander + Strathbogie	65	57	61.0	61
Gannawarra	63	60	61.5	63
Pyrenees	60	65	62.5	64
Yarriambiack	67	63	65.0	65
Buloke	68	64	66.0	66
Loddon	64	70	67.0	67
Hindmarsh	66	69	67.5	68
West Wimmera	70	66	68.0	69
Moyne	69	68	68.5	70

Note. * Denotes area that has been subject to regional EGM density caps from 2001 (Victoria Government Gazette, 2001).

Denotes area that has been fully or partially subject to regional EGM density caps from 2006 (Victoria Government Gazette, 2006).

Actual and predicted rates

Examining the differences between actual and predicted rates also provides additional information about the local distribution of gambling-related harm. Table 10 shows the top and bottom ten LGAs with the greatest difference between actual and predicted rates of calls to Gambler's Helpline.

Table 10: Top and bottom 10 LGAs with the greatest difference between actual and predicted rates of calls to Gambler's Helpline

LGA	Actual	Predicted	Difference
<i>Actual rates were higher than predicted by the model:</i>			
West Wimmera	0.283	0.000	-0.283
Wangaratta	0.482	0.216	-0.266
Glenelg	0.515	0.259	-0.256
Moonee Valley #	0.858	0.611	-0.247
Nillumbik	0.446	0.256	-0.190
Benalla	0.375	0.187	-0.188
Corangamite + Queenscliffe #	0.375	0.221	-0.154
Port Phillip	0.762	0.616	-0.146
Darebin * #	0.825	0.679	-0.146
Bass Coast * #	0.367	0.260	-0.107
Middle 50 LGAs not shown			
<i>Actual rates were lower than predicted by the model:</i>			
Greater Shepparton	0.206	0.329	0.123
Wodonga	0.119	0.243	0.124
Gannawarra	0	0.133	0.133
Yarra	0.576	0.722	0.146
Northern Grampians	0.006	0.183	0.177
Colac-Otway	0.129	0.311	0.182
Manningham	0.237	0.425	0.188
Ballarat #	0.363	0.572	0.209
Surf Coast	0.175	0.386	0.211
Moorabool	0.164	0.387	0.223

Note. * Denotes area that has been subject to regional EGM density caps from 2001 (Victoria Government Gazette, 2001).

Denotes area that has been fully or partially subject to regional EGM density caps from 2006 (Victoria Government Gazette, 2006).

Table 11 shows the same results using rate of clients using Gambler's Help as the outcome variable.

Table 11: Top and bottom 10 LGAs with the greatest difference between actual and predicted rates of clients using Gambler's Help

LGA	Actual	Predicted	Difference
<i>Actual rates were higher than predicted by the model:</i>			
Latrobe * #	2.318	1.580	-0.738
Colac-Otway	1.634	0.987	-0.647
Northern Grampians	1.796	1.256	-0.540
Wellington	1.394	0.899	-0.495
Bass Coast * #	1.467	1.104	-0.363
Moyne	0.424	0.108	-0.316
South Gippsland	1.033	0.722	-0.311
Port Phillip	0.925	0.631	-0.294
Whitehorse	0.803	0.520	-0.283
Ballarat #	1.542	1.265	-0.277
Middle 50 LGAs not shown			
<i>Actual rates were lower than predicted by the model:</i>			
Glenelg	0.193	0.500	0.307
Wangaratta	0.579	0.906	0.327
Maribyrnong * #	1.027	1.366	0.339
Whittlesea #	0.779	1.119	0.340
Ararat + Southern Grampians	0.587	0.943	0.356
Warrnambool #	1.107	1.483	0.376
Macedon Ranges	0.138	0.533	0.395
Benalla	0.469	0.910	0.441
Campaspe	0.25	0.801	0.551
Greater Bendigo	0.138	0.840	0.702

Note. * Denotes area that has been subject to regional EGM density caps from 2001 (Victoria Government Gazette, 2001).

Denotes area that has been fully or partially subject to regional EGM density caps from 2006 (Victoria Government Gazette, 2006).

These differences could be explained by variables that were not included in the model or they may be accounted for by individual differences unrelated to local area analysis. There may also be differences across localities in the propensity to gamble outside of one's residential area. Individual campaigns promoting access to services may explain increased rates of help-seeking in the top ten LGAs, whereas the bottom 10 LGAs may be less exposed to advertising and promotion associated with each type of service. Cultural differences in local areas regarding when gambling is considered a problem and the acceptability of accessing help services are also likely to influence the rates of calls and clients.

DISCUSSION

EGM density independently predicted rates of calls to Gambler's Helpline and clients using Gambler's Help, after controlling for a large range of demographic, social and economic indicators. Lower socio-economic status was significantly associated with higher rates of clients using Gamblers Help, while higher rates of property crime and violence were associated with increased rates of callers to Gamblers Helpline and clients of Gamblers Help, respectively.

The only common significant variable for both forms of problem gambling help seeking was the EGM rates. There was some overlap in factors included in both the final linear models in addition to EGM rates, however these did not match on achieving statistical significance nor direction of association. Although achieving statistical significance varied substantially in the bivariate correlations, the direction of association was consistent for the majority of factors.

The relationships between machine density, expenditure and rates of self-identified problem gamblers were all positive and medium-to-large in size. No evidence of non-linear relationships was found. These results support the exposure model of gambling problems, which predicts that increased access results in increased problems.

Two measures of problem gambling help-seeking were only weakly positively correlated. Face-to-face and telephone counselling may be accessing different populations of problem gamblers. It is also likely that knowledge of specific services, and the attraction of telephone or face-to-face counselling, varies across localities. Either of these reasons may explain why urban areas were much more likely to utilise telephone counselling services. These differences may also be partially accounted for by Gamblers Helpline data representing call numbers whereas Gamblers Help data were based on actual clients. It is feasible for clients of Gamblers Helpline to make multiple calls. This discrepancy regarding how the outcome variables were measured is a limitation of this analysis of secondary data.

Using both models, Victoria LGAs were ranked according to the underlying propensity for problem gambling. The models predicted that Maribyrnong, Greater Dandenong, Hume, Darebin, and Ballarat were at the highest risk for gambling problems in 2006–07. The differences between the actual and predicted rates of help-seeking for problem gambling were also calculated. One of the five Victorian areas where EGM density limits have been in place since 2001 (Maribyrnong) was also an area where the model predicted a higher rate of counselling than the actual counselling rates.

This study was a cross-sectional local area analysis. As such, causality cannot be determined. It is likely that the relationships between variables measured in this study are multi-directional and complex. For example, while property crime rates and problem gambling rates were positively correlated in bivariate analyses, this relationship could potentially indicate three causal mechanisms: (1) problem gamblers commit more property crime, (2) victims of property crime may be more likely to gamble, or (3) property crime may indirectly produce more problem gamblers through other mechanisms, for example, by reducing the safety and amenities of a community. In all likelihood, all three of these mechanisms may be operating to produce this association. Cross-sectional studies are unable to tease out these relationships. Better access to more refined data across periods of time

would enable time series analyses, which would be better able to detect temporal associations and causal pathways.

This study was also restricted to LGAs as the unit of analysis. As described in the introduction, there are many reasons why people choose to gamble at specific venues. The current analysis only considered EGM density aggregated across LGA. Multi-level analysis, in which local area factors are included alongside data about the habits and practices of individual problem gamblers, has the potential to produce a more accurate picture of a complex situation. It may also be important to use smaller local units to enable local organisations to use the findings in specific localities. Applying understandings based on aggregate data to local situations can miss the mark when variation within LGAs is large.

APPENDIX A

Table 12: Data by LGA 1

Variable / indicator	Alpine	Ararat + Southern Grampians	Ballarat	Banyule	Bass Coast	Baw Baw
LGA row number (use with Appendix B)	1	2	3	4	5	6
Problem gambling indicators						
Gambler's Helpline, rate	0.202	0.136	0.363	0.465	0.367	0.345
Gambler's Help, rate	1.218	1.671	3.085	1.986	2.567	1.857
Gaming industry indicators						
Electronic Gaming Machines, rate	6.393	7.360	9.928	6.952	9.902	6.133
Gaming venues, rate	0.304	0.181	0.225	0.117	0.321	0.140
Average number of EGMs per venue	21	40.8	44.2	59.2	30.9	43.8
Gaming expenditure per capita (\$)	351.19	531.46	783.27	645.05	750.61	394.34
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	3	2	1	2	2
Age (median)	41	42	36	38	45	38
Male (%)	49.9	50.36	48.03	48.50	48.35	48.65
Education (% with post-school qualification)	46.8	41.78	48.00	57.00	45.40	47.20
Equivalised household income (median, \$)	477	486	523	689	436	528
Financial stress (%)	14.2	18.68	25.40	27.70	25.00	19.50
Financial housing stress (%)	13.3	9.66	17.20	14.70	16.70	14.40
Socio-economic advantage (SEIFA)	5	4	4	9	4	6
Non-English speaking background (%)	8.445	1.82	3.29	17.00	3.87	2.99
Unemployment (%)	4.23	5.03	6.52	4.22	6.26	4.95
Participation in labour force (%)	60.45	56.20	58.75	62.10	46.76	61.12
Personal Wellbeing Index	79.4	79.6	76.7	76.0	79.0	78.9
Community satisfaction	78.5	78.0	71.7	69.7	78.6	75.1
Social Support (%)	93.4	95.8	94.0	93.7	94.6	93.2
Perceptions of safety (%)	87.8	81.4	61.1	67.8	77.9	74.4
Self-rated health (%)	57.1	54.2	54.5	61.2	50.1	52.3
Assaults, rate	3.764	9.469	9.531	5.182	10.144	7.758
Domestic violence, rate	5.321	9.856	8.803	5.660	7.335	7.038
Drug-related crime, rate	3.027	4.896	2.864	2.124	3.896	2.902
Property crime, rate	16.889	25.979	58.748	38.523	35.544	31.694
Alcohol-related episodes of care, rate	2.537	5.418	8.865	4.784	14.166	9.251
Other drug-related episodes of care, rate	2.131	3.206	11.305	5.671	8.848	6.063
On-premises liquor licences, rate	7.407	0.858	1.078	0.715	2.796	1.086
Packaged liquor licences, rate	1.421	0.497	0.359	0.342	0.871	0.385
General liquor licences, rate	2.029	1.219	0.854	0.096	0.688	0.666

Note. All rates per 1,000 adult residents.

Table 13: Data by LGA 2

Variable / indicator	Bayside	Benalla	Boroondara	Brimbank	Buloke	Campaspe
LGA row number (use with Appendix B)	7	8	9	10	11	12
Problem gambling indicators						
Gambler's Helpline, rate	0.684	0.375	0.302	0.683	0	0.215
Gambler's Help, rate	0.439	0.469	0.403	1.04	0	0.25
Gaming industry indicators						
Electronic Gaming Machines, rate	3.184	8.903	1.762	7.233	0.000	4.970
Gaming venues, rate	0.085	0.281	0.047	0.114	0.000	0.107
Average number of EGMs per venue	37.5	31.7	37.2	63.5	0.0	46.3
Gaming expenditure per capita (\$)	239.51	516.59	150.96	916.97	0.00	269.72
Demographic, social and economic indicators						
Remoteness (ARIA category)	1	3	1	1	3	2
Age (median)	41	43	37	34	45	40
Male (%)	47.08	48.65	47.69	49.57	50.39	49.91
Education (% with post-school qualification)	65.60	43.30	71.60	36.20	34.50	38.90
Equivalised household income (median, \$)	886	490	934	506	396	498
Financial stress (%)	12.10	19.40	18.70	33.80	22.40	23.70
Financial housing stress (%)	15.00	14.20	14.90	19.70	5.90	15.10
Socio-economic advantage (SEIFA)	10	3	10	1	3	4
Non-English speaking background (%)	12.15	2.48	20.56	53.65	1.42	2.24
Unemployment (%)	3.29	5.83	3.94	8.94	3.04	4.78
Participation in labour force (%)	61.17	57.69	62.65	57.95	58.72	59.48
Personal Wellbeing Index	78.5	80.1	77.8	75.7	79.9	79.2
Community satisfaction	74.4	78.3	71.4	69.3	84.0	76.5
Social Support (%)	91.2	93.2	92.9	91.5	96.2	95.3
Perceptions of safety (%)	80.1	79.2	76.0	47.7	92.7	77.2
Self-rated health (%)	62.8	60.4	58.5	50.8	53.9	51.9
Assaults, rate	4.017	9.596	2.851	7.523	4.173	4.418
Domestic violence, rate	4.260	7.327	3.243	10.693	4.931	4.856
Drug-related crime, rate	1.579	7.600	1.399	4.387	1.533	3.034
Property crime, rate	37.097	30.623	41.676	57.538	22.363	35.265
Alcohol-related episodes of care, rate	3.057	6.186	2.560	4.007	2.214	5.006
Other drug-related episodes of care, rate	4.316	6.092	3.610	9.290	2.953	5.756
On-premises liquor licences, rate	1.854	1.312	0.972	0.425	0.554	1.573
Packaged liquor licences, rate	0.467	0.656	0.427	0.326	1.292	0.751
General liquor licences, rate	0.170	1.031	0.142	0.106	2.953	0.930

Note. All rates per 1,000 adult residents.

Table 14: Data by LGA 3

Variable / indicator	Cardinia	Casey	Central Gold-fields + Hepburn	Colac-Otway	Corang-amite + Queens-cliffe	Darebin
LGA row number (use with Appendix B)	13	14	15	16	17	18
Problem gambling indicators						
Gambler's Helpline, rate	0.432	0.476	0.365	0.129	0.375	0.825
Gambler's Help, rate	0.889	1.141	0.476	1.634	0.522	1.091
Gaming industry indicators						
Electronic Gaming Machines, rate	5.091	5.544	7.799	6.912	6.975	9.117
Gaming venues, rate	0.096	0.076	0.190	0.314	0.261	0.148
Average number of EGMs per venue	53.0	73.3	41.0	22.0	26.8	61.6
Gaming expenditure per capita (\$)	407.26	700.13	495.61	446.16	323.27	826.77
Demographic, social and economic indicators						
Remoteness (ARIA category)	2	1	2	2	2	1
Age (median)	34	32	44	40	46	36
Male (%)	49.58	49.55	49.09	49.57	48.76	48.55
Education (% with post-school qualification)	47.40	45.20	41.88	41.00	40.42	48.80
Equivalised household income (median, \$)	606	610	411	499	544	559
Financial stress (%)	24.60	31.90	23.30	19.30	16.91	35.40
Financial housing stress (%)	20.50	22.60	14.79	13.40	10.44	19.30
Socio-economic advantage (SEIFA)	8	7	2	3	7	3
Non-English speaking background (%)	4.71	23.79	3.60	2.42	2.45	38.79
Unemployment (%)	4.26	5.40	8.52	4.60	3.64	6.64
Participation in labour force (%)	66.33	67.16	49.41	59.38	54.85	55.38
Personal Wellbeing Index	77.3	76.8	77.4	78.2	81.3	74.5
Community satisfaction	69.6	68.0	75.1	74.9	80.6	67.8
Social Support (%)	94.1	92.8	92.1	96.2	96.3	88.1
Perceptions of safety (%)	62.8	60.5	79.5	80.0	86.9	61.7
Self-rated health (%)	58.3	54.6	58.5	55.7	56.5	53.3
Assaults, rate	8.681	7.814	7.166	6.458	2.811	6.449
Domestic violence, rate	10.967	12.318	7.459	5.177	4.630	7.448
Drug-related crime, rate	2.141	2.662	3.334	3.174	1.730	3.591
Property crime, rate	43.612	41.484	28.802	36.420	22.475	64.453
Alcohol-related episodes of care, rate	3.410	3.614	11.888	5.467	3.325	5.973
Other drug-related episodes of care, rate	3.386	4.951	8.512	12.882	2.673	8.867
On-premises liquor licences, rate	0.720	0.385	2.330	1.948	1.499	1.045
Packaged liquor licences, rate	0.480	0.259	0.476	0.628	0.847	0.453
General liquor licences, rate	0.360	0.057	1.807	0.880	1.304	0.185

Note. All rates per 1,000 adult residents.

Table 15: Data by LGA 4

Variable / indicator	East Gipps-land	Frankston	Gannawarra	Glen Eira	Glenelg	Golden Plains
LGA row number (use with Appendix B)	19	20	21	22	23	24
Problem gambling indicators						
Gambler's Helpline, rate	0.214	0.704	0	0.625	0.515	0.127
Gambler's Help, rate	1.335	0.794	0.224	0.971	0.193	0.244
Gaming industry indicators						
Electronic Gaming Machines, rate	10.707	6.344	5.034	7.713	6.757	0.000
Gaming venues, rate	0.310	0.109	0.112	0.117	0.257	0.000
Average number of EGMs per venue	34.5	58.3	45.0	66.2	26.3	0.0
Gaming expenditure per capita (\$)	680.18	744.73	0.00	705.31	437.95	0.00
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	1	3	1	3	2
Age (median)	44	36	43	37	40	37
Male (%)	49.20	48.62	49.83	48.46	50.34	50.64
Education (% with post-school qualification)	43.00	46.70	35.50	63.40	38.60	47.40
Equivalised household income (median, \$)	442	574	463	728	522	566
Financial stress (%)	24.30	25.60	22.10	18.50	14.30	21.20
Financial housing stress (%)	13.80	20.60	9.70	18.00	11.00	13.10
Socio-economic advantage (SEIFA)	2	6	3	10	2	8
Non-English speaking background (%)	2.99	8.26	1.70	25.94	1.75	2.80
Unemployment (%)	6.27	6.05	4.13	4.15	6.33	5.15
Participation in labour force (%)	52.34	62.31	58.40	61.47	60.05	62.78
Personal Wellbeing Index	79.1	73.1	78.5	75.7	79.5	78.1
Community satisfaction	77.4	65.7	78.7	69.6	79.5	72.7
Social Support (%)	89.0	93.8	94.9	90.7	96.1	95.0
Perceptions of safety (%)	83.7	55.3	87.9	71.0	80.9	83.2
Self-rated health (%)	52.6	50.0	52.1	56.6	51.1	59.5
Assaults, rate	11.838	10.325	5.369	3.819	8.368	1.946
Domestic violence, rate	7.928	14.082	8.054	5.242	8.160	3.033
Drug-related crime, rate	3.771	2.999	1.007	1.906	1.929	0.673
Property crime, rate	36.261	60.950	17.785	34.538	35.463	13.946
Alcohol-related episodes of care, rate	16.604	7.889	9.732	2.817	9.846	3.330
Other drug-related episodes of care, rate	9.031	10.011	25.727	4.614	23.747	2.518
On-premises liquor licences, rate	1.583	0.816	0.336	1.030	1.287	0.162
Packaged liquor licences, rate	0.807	0.392	0.783	0.359	0.450	0.487
General liquor licences, rate	1.179	0.131	1.342	0.097	0.965	0.975

Note. All rates per 1,000 adult residents.

Table 16: Data by LGA 5

Variable / indicator	Greater Bendigo	Greater Dandenong	Greater Geelong	Greater Shepparton	Hindmarsh	Hobsons Bay
LGA row number (use with Appendix B)	25	26	27	28	29	30
Problem gambling indicators						
Gambler's Helpline, rate	0.413	0.857	0.418	0.206	0	0.625
Gambler's Help, rate	0.138	1.196	1.083	1.466	0	1.175
Gaming industry indicators						
Electronic Gaming Machines, rate	7.523	10.657	8.684	7.536	0.000	8.839
Gaming venues, rate	0.138	0.158	0.165	0.160	0.000	0.153
Average number of EGMs per venue	54.7	67.4	52.7	47.0	0.0	57.9
Gaming expenditure per capita (\$)	597.97	1087.90	708.94	660.17	0.00	754.74
Demographic, social and economic indicators						
Remoteness (ARIA category)	2	1	2	2	3	1
Age (median)	37	36	38	36	45	37
Male (%)	48.17	49.99	48.57	49.55	49.63	49.05
Education (% with post-school qualification)	47.20	35.80	47.80	39.00	32.30	47.70
Equivalised household income (median, \$)	513	461	542	528	431	616
Financial stress (%)	25.30	37.10	20.70	23.20	22.10	22.80
Financial housing stress (%)	16.90	21.60	16.30	18.00	6.00	16.70
Socio-economic advantage (SEIFA)	5	1	5	3	2	6
Non-English speaking background (%)	2.27	54.93	9.28	10.02	1.93	28.13
Unemployment (%)	6.59	9.47	6.37	6.08	5.24	5.90
Participation in labour force (%)	58.07	54.02	57.56	62.28	55.11	59.24
Personal Wellbeing Index	78.9	72.4	77.1	78.6	80.5	75.1
Community satisfaction	74.6	67.3	72.9	77.0	82.1	70.1
Social Support (%)	92.7	89.8	93.3	92.1	95.8	90.5
Perceptions of safety (%)	69.8	47.4	65.7	59.6	91.5	65.3
Self-rated health (%)	58.7	43.0	59.8	51.6	53.4	54.1
Assaults, rate	7.127	9.050	5.962	8.705	5.590	6.537
Domestic violence, rate	5.824	7.272	7.533	10.256	4.348	8.169
Drug-related crime, rate	4.775	5.183	2.193	4.631	2.070	2.506
Property crime, rate	39.441	60.323	41.277	45.747	27.329	44.400
Alcohol-related episodes of care, rate	7.440	5.843	7.417	8.177	3.313	5.679
Other drug-related episodes of care, rate	10.755	8.176	7.994	6.849	3.934	6.091
On-premises liquor licences, rate	0.963	0.672	1.134	1.260	0.207	1.069
Packaged liquor licences, rate	0.344	0.395	0.424	0.550	1.035	0.351
General liquor licences, rate	1.045	0.109	0.424	0.504	2.070	0.336

Note. All rates per 1,000 adult residents.

Table 17: Data by LGA 6

Variable / indicator	Horsham	Hume	Indigo	Kingston	Knox	Latrobe
LGA row number (use with Appendix B)	31	32	NA	33	34	35
Problem gambling indicators						
Gambler's Helpline, rate	0.277	0.581	0.087	0.55	0.547	0.406
Gambler's Help, rate	1.247	1.068	2.602	1.187	1.038	2.318
Gaming industry indicators						
Electronic Gaming Machines, rate	10.181	7.331	0.000	8.553	7.456	11.162
Gaming venues, rate	0.277	0.128	0.000	0.154	0.096	0.241
Average number of EGMs per venue	36.8	57.4	0.0	55.5	77.7	46.3
Gaming expenditure per capita (\$)	571.95	895.65	0.00	792.20	753.42	850.51
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	1	2	1	1	2
Age (median)	39	32	41	38	36	37
Male (%)	48.90	49.50	49.07	48.61	48.83	48.66
Education (% with post-school qualification)	42.70	38.90	52.60	51.30	51.30	44.50
Equivalised household income (median, \$)	521	553	558	635	665	499
Financial stress (%)	20.70	31.00	17.40	21.60	21.60	23.10
Financial housing stress (%)	13.40	23.40	13.30	17.70	16.30	13.70
Socio-economic advantage (SEIFA)	5	2	7	8	9	1
Non-English speaking background (%)	2.27	36.17	2.26	22.97	17.75	6.00
Unemployment (%)	5.14	7.08	3.65	4.57	4.25	8.49
Participation in labour force (%)	61.85	60.93	60.58	61.75	68.06	56.61
Personal Wellbeing Index	78.8	74.0	78.2	75.9	76.1	77.6
Community satisfaction	77.1	67.1	78.7	70.1	68.6	73.5
Social Support (%)	95.4	94.3	93.3	91.4	93.9	95.3
Perceptions of safety (%)	81.0	58.4	85.2	66.5	62.9	67.9
Self-rated health (%)	58.3	53.3	53.6	53.9	55.5	50.0
Assaults, rate	10.771	7.893	4.674	5.458	6.339	16.112
Domestic violence, rate	15.198	13.047	5.266	6.908	8.914	14.061
Drug-related crime, rate	3.363	4.415	1.404	2.036	2.827	6.578
Property crime, rate	41.278	53.979	12.573	36.188	39.706	52.938
Alcohol-related episodes of care, rate	9.489	4.318	4.511	4.494	4.613	13.295
Other drug-related episodes of care, rate	9.143	6.628	2.863	4.884	5.703	13.888
On-premises liquor licences, rate	1.247	0.511	1.995	0.752	0.750	1.020
Packaged liquor licences, rate	0.485	0.283	0.607	0.444	0.314	0.408
General liquor licences, rate	0.762	0.301	1.475	0.127	0.105	0.426

Note. All rates per 1,000 adult residents.

Table 18: Data by LGA 7

Variable / indicator	Loddon	Macedon Ranges	Manning-ham	Mans-field + Moira + Towong	Maribyr-nong	Maroon-dah
LGA row number (use with Appendix B)	36	37	38	39	40	41
Problem gambling indicators						
Gambler's Helpline, rate	0.159	0.099	0.237	0.087	0.711	0.511
Gambler's Help, rate	0	0.138	0.668	0.504	1.027	0.918
Gaming industry indicators						
Electronic Gaming Machines, rate	0.000	3.061	6.755	2.425	12.602	9.494
Gaming venues, rate	0.000	0.103	0.088	0.094	0.224	0.127
Average number of EGMs per venue	0.0	29.7	77.1	25.7	56.3	74.5
Gaming expenditure per capita (\$)	0.00	284.41	703.20	119.65	1110.21	801.39
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	2	1	3	1	1
Age (median)	45	38	40	42	34	37
Male (%)	50.99	49.33	48.39	50.00	50.35	48.14
Education (% with post-school qualification)	33.90	54.40	57.70	41.11	50.20	53.30
Equivalised household income (median, \$)	389	641	719	485	577	655
Financial stress (%)	26.40	19.50	23.00	20.25	31.00	28.20
Financial housing stress (%)	7.60	15.50	13.60	13.73	22.10	16.20
Socio-economic advantage (SEIFA)	1	9	10	5	1	9
Non-English speaking background (%)	1.52	3.84	35.85	2.93	42.70	9.18
Unemployment (%)	5.81	3.79	4.25	4.51	8.62	3.94
Participation in labour force (%)	54.12	64.30	62.77	59.89	54.16	66.07
Personal Wellbeing Index	79.1	78.5	76.7	80.1	73.1	76.1
Community satisfaction	78.5	75.4	69.0	79.7	64.5	68.2
Social Support (%)	92.3	93.6	91.4	95.6	91.3	93.1
Perceptions of safety (%)	88.2	80.9	72.2	88.6	55.6	55.3
Self-rated health (%)	48.7	61.4	57.6	56.6	48.6	51.6
Assaults, rate	4.241	5.700	2.303	6.028	7.288	6.007
Domestic violence, rate	3.542	4.351	3.582	4.804	7.533	7.105
Drug-related crime, rate	2.657	2.571	1.592	3.068	9.817	2.682
Property crime, rate	21.340	24.720	21.127	28.025	74.929	42.059
Alcohol-related episodes of care, rate	3.668	6.880	3.854	3.464	6.945	6.397
Other drug-related episodes of care, rate	10.526	4.781	3.405	3.936	12.807	6.588
On-premises liquor licences, rate	0.159	1.204	0.799	1.228	1.438	0.930
Packaged liquor licences, rate	0.957	0.619	0.307	0.882	0.653	0.382
General liquor licences, rate	2.233	0.757	0.109	1.637	0.429	0.115

Note. All rates per 1,000 adult residents.

Table 19: Data by LGA 8

Variable / indicator	Mel- bourne	Melton	Mildura	Mitchell	Monash	Moonee Valley
LGA row number (use with Appendix B)	NA	42	43	44	45	46
Problem gambling indicators						
Gambler's Helpline, rate	1.361	0.526	0.325	0.345	0.559	0.858
Gambler's Help, rate	1.648	1.177	1.075	1.141	0.702	0.765
Gaming industry indicators						
Electronic Gaming Machines, rate	12.226 ^a	5.487	7.473	8.466	8.666	8.392
Gaming venues, rate	0.206 ^a	0.087	0.210	0.219	0.117	0.124
Average number of EGMs per venue	59.4 ^a	63.4	35.6	38.6	74.1	67.8
Gaming expenditure per capita (\$)	1061.35 ^a	624.25	583.83	640.22	941.09	864.62
Demographic, social and economic indicators						
Remoteness (ARIA category)	1	2	3	2	1	1
Age (median)	29	31	37	35	38	37
Male (%)	51.26	49.83	49.08	50.79	49.29	48.27
Education (% with post-school qualification)	74.80	44.90	37.00	43.60	58.30	52.40
Equivalised household income (median, \$)	810	637	490	563	654	666
Financial stress (%)	26.10	29.20	26.60	27.00	29.20	26.00
Financial housing stress (%)	36.30	24.50	17.50	18.60	15.70	16.10
Socio-economic advantage (SEIFA)	9	7	2	6	9	7
Non-English speaking background (%)	26.54	24.37	8.27	5.02	38.32	29.15
Unemployment (%)	6.58	5.96	5.73	4.72	5.63	5.13
Participation in labour force (%)	56.88	67.54	60.06	61.44	60.08	60.41
Personal Wellbeing Index	74.8	76.5	78.2	77.0	75.2	76.1
Community satisfaction	65.1	68.3	78.0	74.1	67.7	69.5
Social Support (%)	89.8	89.9	93.2	94.2	90.0	94.2
Perceptions of safety (%)	66.8	63.3	52.1	73.9	68.5	69.0
Self-rated health (%)	58.6	57.7	50.4	51.2	50.9	54.0
Assaults, rate	26.866	7.939	10.297	8.505	3.544	6.473
Domestic violence, rate	6.979	9.320	14.442	8.675	3.593	5.824
Drug-related crime, rate	20.201	4.572	4.281	6.655	1.579	3.901
Property crime, rate	230.985	42.526	46.084	28.719	35.241	60.853
Alcohol-related episodes of care, rate	6.267	3.081	6.503	8.203	2.326	4.297
Other drug-related episodes of care, rate	9.328	6.855	10.253	10.835	3.137	7.042
On-premises liquor licences, rate	12.285	0.346	0.944	0.921	0.907	1.485
Packaged liquor licences, rate	1.089	0.242	0.629	0.570	0.344	0.495
General liquor licences, rate	4.517	0.104	0.577	0.790	0.102	0.270

Note. All rates per 1,000 adult residents.

^a Excludes Crown Casino. When Crown Casino's 2,500 EGMs are included, the rate is 36.781 per 1,000 adult residents. The gaming expenditure at Crown Casino is also unknown.

Table 20: Data by LGA 9

Variable / indicator	Moora-bool	Moreland	Morning-ton Penin-sula	Moyne	Murrind-indi + Mt Alexand-er + Strath-bogie	Nillum-bik
LGA row number (use with Appendix B)	47	48	49	50	51	52
Problem gambling indicators						
Gambler's Helpline, rate	0.164	0.651	0.444	0.102	0.123	0.446
Gambler's Help, rate	0.78	1.018	0.736	0.424	0.618	0.334
Gaming industry indicators						
Electronic Gaming Machines, rate	5.719	6.665	7.835	0.000	2.411	3.161
Gaming venues, rate	0.156	0.131	0.175	0.000	0.093	0.089
Average number of EGMs per venue	36.7	51.1	44.8	0.0	26.0	35.5
Gaming expenditure per capita (\$)	394.26	625.10	743.41	0.00	208.76	240.06
Demographic, social and economic indicators						
Remoteness (ARIA category)	2	1	1	3	2	2
Age (median)	37	36	41	40	44	36
Male (%)	49.50	48.51	48.58	49.98	49.74	49.41
Education (% with post-school qualification)	46.10	49.00	51.20	41.70	49.34	62.90
Equivalised household income (median, \$)	575	569	560	530	472	797
Financial stress (%)	24.20	28.10	22.80	19.60	22.93	13.90
Financial housing stress (%)	15.40	18.40	17.60	11.10	15.61	13.70
Socio-economic advantage (SEIFA)	7	5	8	7	4	10
Non-English speaking background (%)	3.81	39.41	4.47	1.13	2.62	7.48
Unemployment (%)	5.29	6.04	4.69	3.37	5.12	3.06
Participation in labour force (%)	63.10	55.29	56.22	64.01	56.43	73.63
Personal Wellbeing Index	76.9	73.9	77.3	81.1	78.2	78.8
Community satisfaction	73.9	68.8	72.5	81.0	75.5	72.5
Social Support (%)	93.4	87.4	94.4	94.4	92.5	96.4
Perceptions of safety (%)	70.9	58.7	69.0	85.0	83.4	76.5
Self-rated health (%)	49.9	48.9	57.9	59.7	53.3	57.3
Assaults, rate	5.332	5.824	6.150	4.494	6.455	3.399
Domestic violence, rate	6.803	7.564	6.661	4.847	6.075	3.688
Drug-related crime, rate	2.619	4.263	1.635	1.430	4.677	1.369
Property crime, rate	29.098	52.547	36.923	18.211	26.134	21.325
Alcohol-related episodes of care, rate	4.939	4.263	5.435	4.663	9.180	2.627
Other drug-related episodes of care, rate	4.315	7.396	4.534	3.307	7.418	3.094
On-premises liquor licences, rate	0.624	0.853	1.609	1.696	1.947	1.024
Packaged liquor licences, rate	0.312	0.409	0.478	0.509	0.835	0.223
General liquor licences, rate	0.780	0.287	0.267	1.865	1.762	0.134

Note. All rates per 1,000 adult residents.

Table 21: Data by LGA 10

Variable / indicator	Northern Grampians	Port Phillip	Pyrenees	South Gippsland	Stonnington	Surf Coast
LGA row number (use with Appendix B)	53	54	55	56	57	58
Problem gambling indicators						
Gambler's Helpline, rate	0.006	0.762	0.051	0.098	0.499	0.175
Gambler's Help, rate	1.796	0.925	0.188	1.033	0.65	0.641
Gaming industry indicators						
Electronic Gaming Machines, rate	9.295	4.912	0.000	4.967	3.690	6.470
Gaming venues, rate	0.317	0.125	0.000	0.197	0.088	0.233
Average number of EGMs per venue	29.3	39.3	0.0	25.3	42.1	27.8
Gaming expenditure per capita (\$)	608.08	389.03	0.00	303.90	288.71	285.12
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	1	2	2	1	2
Age (median)	42	35	45	42	36	38
Male (%)	49.60	49.78	51.50	49.29	48.00	49.71
Education (% with post-school qualification)	38.20	68.80	37.50	43.70	69.70	59.60
Equivalised household income (median, \$)	463	953	403	490	959	615
Financial stress (%)	19.30	16.30	28.80	22.80	18.50	14.90
Financial housing stress (%)	9.80	22.40	9.80	13.50	19.90	15.40
Socio-economic advantage (SEIFA)	1	10	1	6	10	10
Non-English speaking background (%)	1.77	17.21	1.83	3.28	19.42	3.16
Unemployment (%)	5.04	4.41	7.18	3.99	4.15	3.84
Participation in labour force (%)	57.14	66.96	51.63	58.49	64.43	62.48
Personal Wellbeing Index	79.6	74.7	78.1	79.8	77.3	79.4
Community satisfaction	77.6	67.4	76.6	77.4	67.7	74.8
Social Support (%)	95.7	95.6	92.6	95.9	89.6	94.1
Perceptions of safety (%)	85.3	66.3	83.6	85.6	72.1	79.4
Self-rated health (%)	54.7	57.1	49.7	59.2	62.1	62.3
Assaults, rate	10.003	8.561	4.211	5.336	6.891	5.512
Domestic violence, rate	8.125	5.076	4.627	4.494	4.691	3.957
Drug-related crime, rate	8.574	8.248	1.706	2.053	5.525	1.996
Property crime, rate	33.381	86.936	20.189	22.554	82.068	37.838
Alcohol-related episodes of care, rate	4.331	5.012	5.839	6.197	3.377	3.730
Other drug-related episodes of care, rate	2.958	10.249	3.202	6.639	4.816	2.623
On-premises liquor licences, rate	1.796	3.762	1.319	0.984	3.077	3.497
Packaged liquor licences, rate	0.739	0.562	0.565	0.787	0.450	0.583
General liquor licences, rate	1.796	1.300	1.319	0.885	0.763	0.699

Note. All rates per 1,000 adult residents.

Table 22: Data by LGA 11

Variable / indicator	Swan Hill	Wangaratta	Warrnambool	Wellington	West Wimmera	Whitehorse
LGA row number (use with Appendix B)	59	60	61	62	63	64
Problem gambling indicators						
Gambler's Helpline, rate	0.123	0.482	0.213	0.265	0.283	0.498
Gambler's Help, rate	1.202	0.579	1.107	1.394	0.283	0.803
Gaming industry indicators						
Electronic Gaming Machines, rate	6.831	6.272	10.521	10.138	0.000	4.631
Gaming venues, rate	0.253	0.193	0.256	0.253	0.000	0.059
Average number of EGMs per venue	27.0	32.5	41.2	40.0	0.0	79.1
Gaming expenditure per capita (\$)	358.28	389.52	771.44	680.10	0.00	490.39
Demographic, social and economic indicators						
Remoteness (ARIA category)	3	3	2	3	3	1
Age (median)	38	40	36	40	43	38
Male (%)	50.73	48.66	48.30	50.21	50.71	47.56
Education (% with post-school qualification)	35.10	44.70	45.80	43.50	33.10	60.00
Equivalised household income (median, \$)	485	508	530	492	481	676
Financial stress (%)	18.80	21.20	20.00	23.40	19.10	19.90
Financial housing stress (%)	13.00	13.90	16.30	13.30	3.80	14.80
Socio-economic advantage (SEIFA)	2	5	6	4	4	9
Non-English speaking background (%)	9.15	4.83	2.15	2.74	1.52	25.24
Unemployment (%)	4.70	4.66	5.23	5.92	2.72	4.60
Participation in labour force (%)	60.10	60.39	60.53	56.22	62.71	60.59
Personal Wellbeing Index	77.3	79.0	79.4	78.4	81.0	76.1
Community satisfaction	78.2	75.9	77.8	77.3	81.6	70.8
Social Support (%)	95.2	93.0	95.4	94.6	93.4	92.6
Perceptions of safety (%)	73.4	81.5	70.1	82.0	94.5	66.1
Self-rated health (%)	54.2	59.0	48.7	51.2	50.4	47.7
Assaults, rate	14.128	11.174	10.734	7.113	2.383	3.417
Domestic violence, rate	15.393	12.053	12.890	6.076	2.693	4.396
Drug-related crime, rate	6.370	2.939	7.523	3.418	1.453	1.127
Property crime, rate	36.966	31.564	36.473	29.666	10.164	30.960
Alcohol-related episodes of care, rate	12.902	9.359	11.586	7.350	2.547	3.837
Other drug-related episodes of care, rate	9.550	7.767	10.904	6.970	2.264	4.514
On-premises liquor licences, rate	1.138	1.496	1.576	1.236	0.566	0.803
Packaged liquor licences, rate	0.822	0.193	0.426	0.697	1.698	0.309
General liquor licences, rate	0.759	1.158	0.596	1.014	1.981	0.042

Note. All rates per 1,000 adult residents.

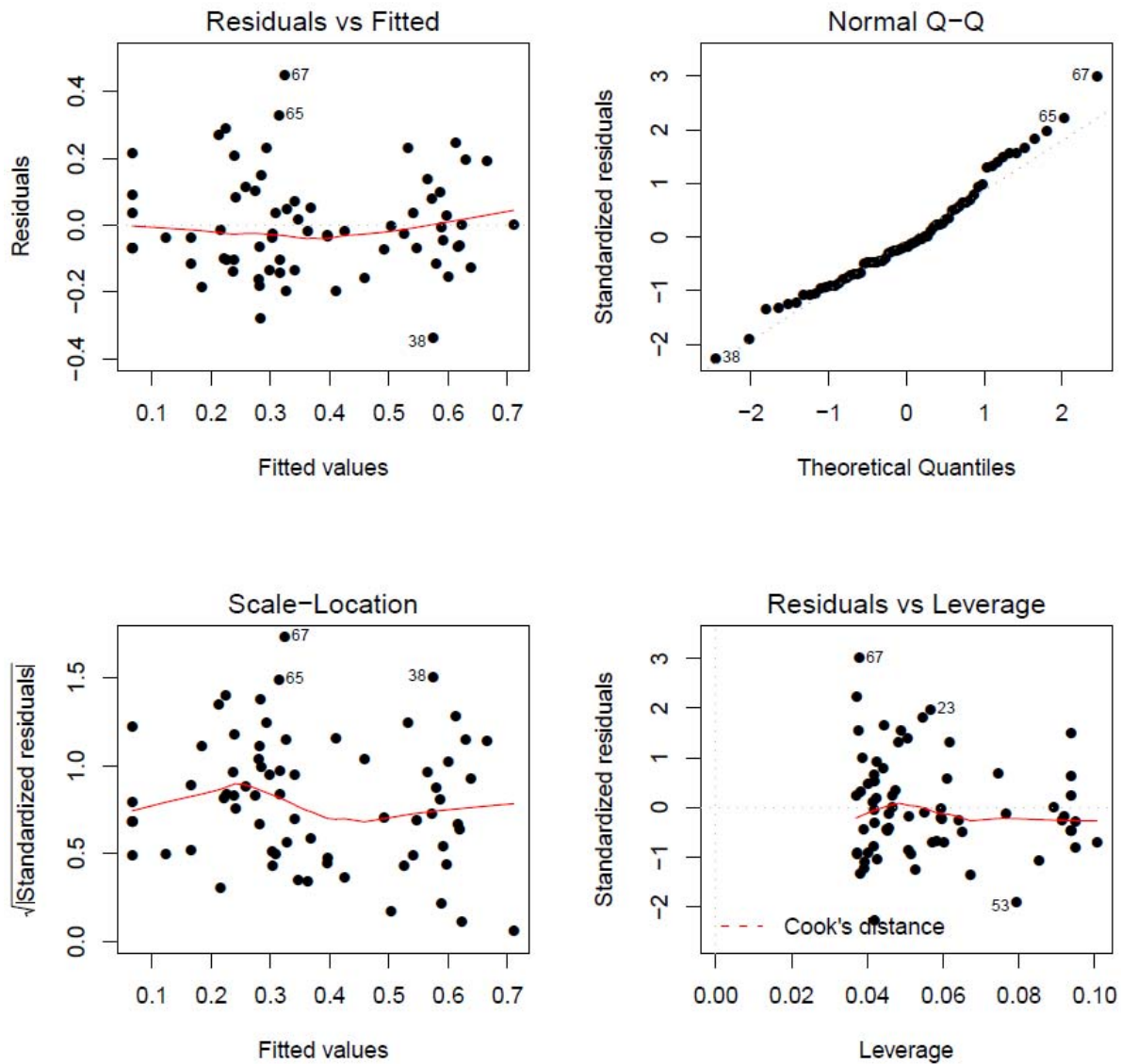
Table 23: Data by LGA 12

Variable / indicator	Whittle- sea	Wodon- ga	Wynd- ham	Yarra	Yarra Ranges	Yarriam- black
LGA row number (use with Appendix B)	65	66	67	68	69	70
Problem gambling indicators						
Gambler's Helpline, rate	0.645	0.119	0.772	0.576	0.374	0
Gambler's Help, rate	0.779	1.309	1.092	0.845	0.902	0.334
Gaming industry indicators						
Electronic Gaming Machines, rate	6.395	4.918	6.815	5.291	3.970	0.000
Gaming venues, rate	0.093	0.119	0.120	0.141	0.074	0.000
Average number of EGMs per venue	68.4	41.3	56.8	37.6	53.4	0.0
Gaming expenditure per capita (\$)	872.38	352.34	842.77	496.37	310.30	0.00
Demographic, social and economic indicators						
Remoteness (ARIA category)	2	2	2	1	2	3
Age (median)	34	33	32	33	36	45
Male (%)	49.48	49.71	49.76	49.00	49.42	49.47
Education (% with post-school qualification)	38.30	48.80	46.90	67.20	52.10	33.90
Equivalised household income (median, \$)	554	577	662	875	611	421
Financial stress (%)	29.70	23.70	27.40	18.20	23.40	26.60
Financial housing stress (%)	19.70	18.90	20.80	21.40	17.10	5.60
Socio-economic advantage (SEIFA)	4	5	8	8	8	2
Non-English speaking background (%)	43.03	4.18	20.97	23.12	5.27	1.59
Unemployment (%)	5.87	5.24	5.48	5.18	4.17	4.29
Participation in labour force (%)	61.41	64.55	66.17	66.19	66.90	57.37
Personal Wellbeing Index	74.3	77.3	75.2	74.6	75.8	80.0
Community satisfaction	67.7	73.1	67.4	67.7	70.6	83.3
Social Support (%)	91.6	93.0	91.7	88.5	92.9	94.5
Perceptions of safety (%)	60.0	58.2	57.2	66.4	66.2	87.8
Self-rated health (%)	50.1	55.6	50.8	61.8	51.9	50.3
Assaults, rate	6.861	9.024	7.829	8.706	4.486	5.037
Domestic violence, rate	8.948	13.546	8.538	5.403	6.036	7.405
Drug-related crime, rate	4.379	4.666	3.230	10.435	1.789	1.351
Property crime, rate	49.027	37.490	71.751	122.258	27.744	24.723
Alcohol-related episodes of care, rate	2.419	10.035	3.924	6.966	5.644	4.504
Other drug-related episodes of care, rate	5.315	10.471	6.383	16.201	5.727	3.503
On-premises liquor licences, rate	0.426	0.754	0.588	4.790	1.199	0.667
Packaged liquor licences, rate	0.228	0.516	0.264	0.720	0.502	1.001
General liquor licences, rate	0.125	0.357	0.120	2.129	0.232	2.502

Note. All rates per 1,000 adult residents.

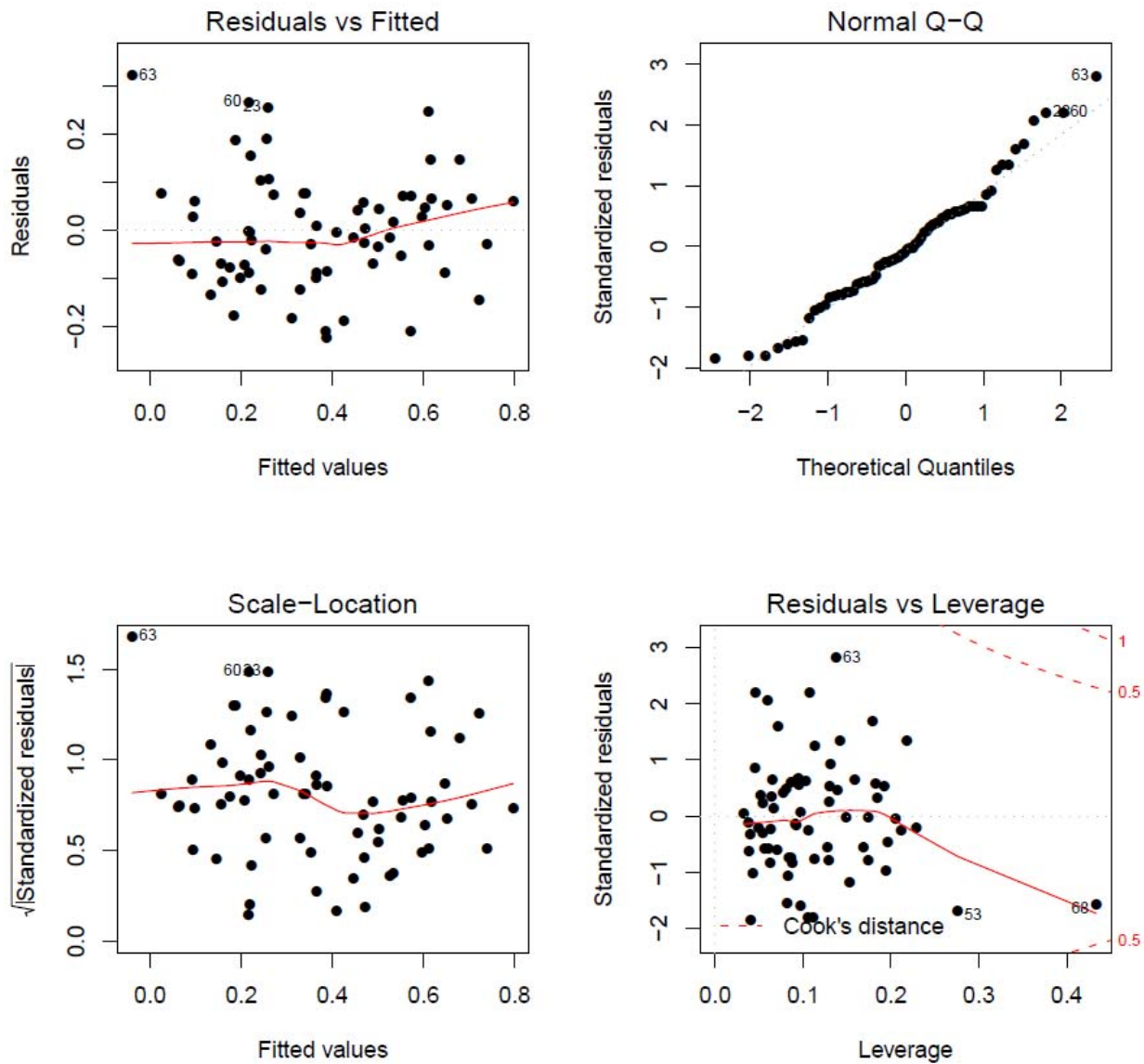
APPENDIX B

Figure 3: Regression diagnostics for initial Gambler's Helpline model



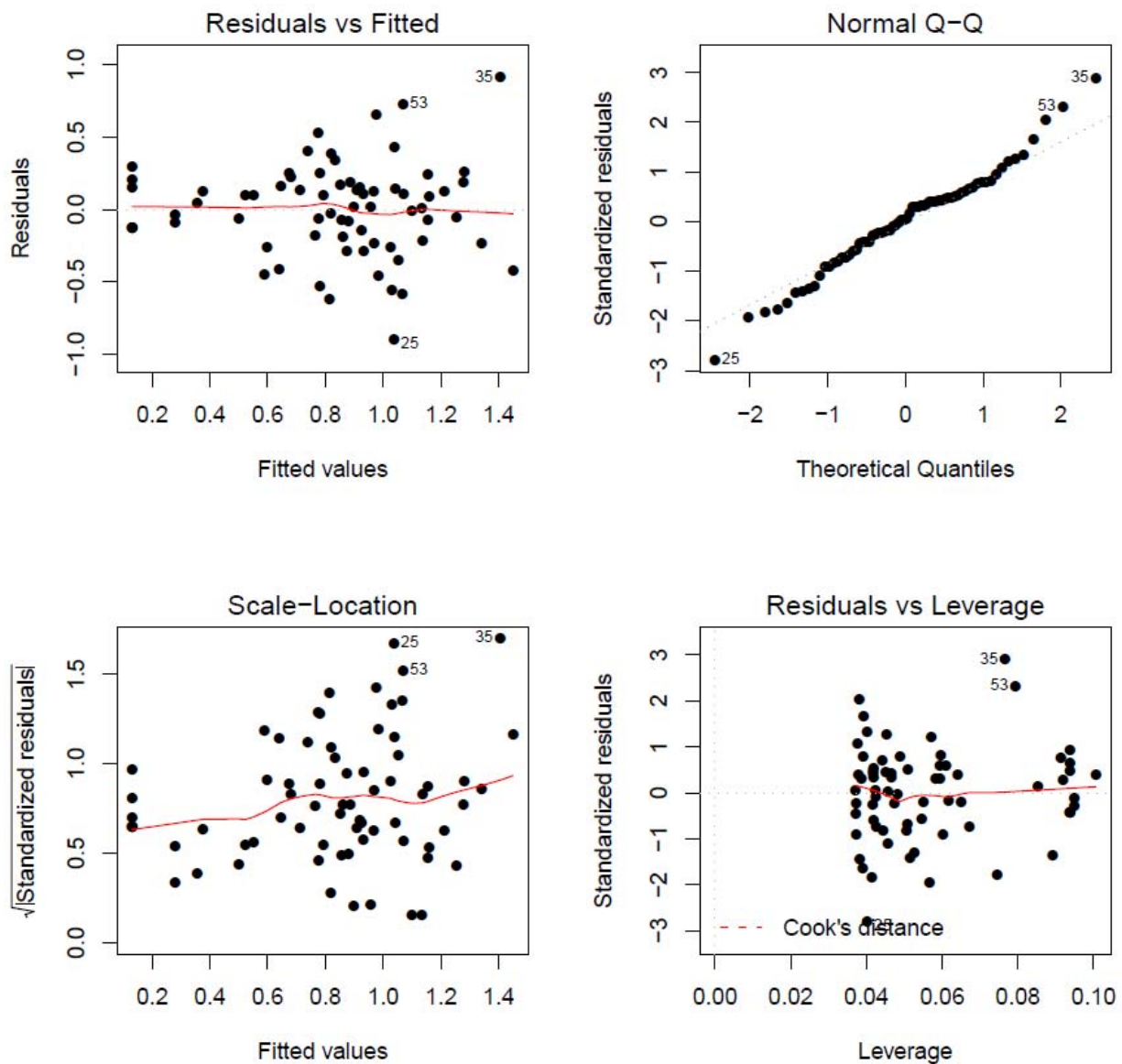
Note. Refer to Appendix A to identify LGAs indicated by row number in this figure.

Figure 4: Regression diagnostics for expanded Gambler's Helpline model



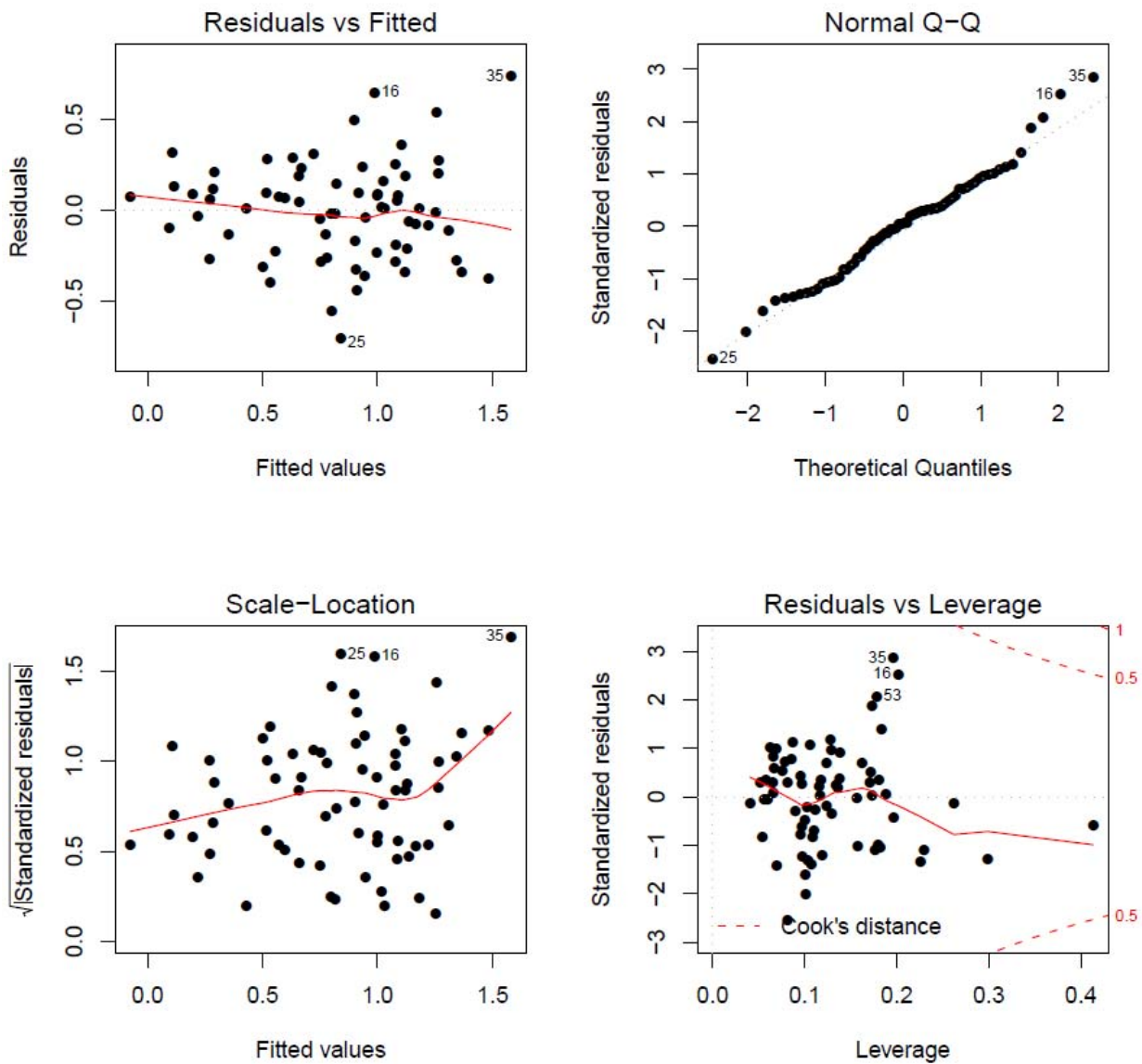
Note. Refer to Appendix A to identify LGAs indicated by row number in this figure.

Figure 5: Regression diagnostics for initial Gambler's Help model



Note. Refer to Appendix A to identify LGAs indicated by row number in this figure.

Figure 6: Regression diagnostics for expanded Gambler's Help model



Note. Refer to Appendix A to identify LGAs indicated by row number in this figure.

REFERENCES

- Abbott, M. (2006). Do EGMs and problem gambling go together like a horse and carriage? *Gambling Research*, 18(1), 7-38.
- Adams, P. J., Raeburn, J., & de Silva, K. (2009a). A question of balance: Prioritizing public health responses to harm from gambling. *Addiction*, 104(5), 688-691.
- Adams, R. J., Howard, N., Tucker, G., Appleton, S., Taylor, A. W., Chittleborough, C., et al. (2009b). Effects of area deprivation on health risks and outcomes: A multilevel, cross-sectional, Australian population study. *International Journal of Public Health*, 54(3), 183-192.
- Anselin, L. (2003). *Geoda 0.9 user's guide*. Urbana-Champaign, IL: Spatial Analysis Laboratory, University of Illinois.
- Anselin, L., Bera, A. K., Florax, R., & Yoon, M. J. (1996). Simple diagnostic tests for spatial dependence. *Regional Science and Urban Economics*, 26, 77-104.
- Australian Bureau of Statistics. (2005). *Australian Bureau of Statistics Catalogue no. 1216.0. Australian Standard Geographical Classification (ASGC)*. Canberra, Australia.
- Australian Bureau of Statistics. (2006). *Australian Bureau of Statistics Catalogue no. 2901.0 - Census dictionary 2006*. Canberra, Australia.
- Australian Bureau of Statistics. (2007a). *Australian Bureau of Statistics Catalogue no. 2905.0.55.001. Postal area concordances 2006*. Canberra, Australia.
- Australian Bureau of Statistics. (2007b). *Australian Bureau of Statistics Catalogue no. 3235.0 Population by age and sex, Australia*. Canberra: ABS.
- Australian Bureau of Statistics. (2008a). *Australian Bureau of Statistics Catalogue no. 2039.0 - Information paper: An introduction to socio-economic indexes for areas (SEIFA), 2006*. Canberra, Australia.
- Australian Bureau of Statistics. (2008b). *Australian Bureau of Statistics Catalogue no. 3105.0.65.001 Australian historical population statistics, 2008*. Canberra, Australia.
- Bivand, R. (2006). Spdep: Spatial dependence: Weighting schemes, statistics and models. R package version 0.3-31.
- Cohen, D., Spear, S., Scribner, R., Kissinger, P., Mason, K., & Wildgen, J. (2000). "Broken windows" and the risk of gonorrhoea. *American Journal of Public Health*, 90(2), 230-236.
- Cummins, R., Eckersley, R., Pallant, J., van Vugt, J., & Misajon, R. (2003). Developing a national index of subjective wellbeing: The Australian unity wellbeing index. *Social Indicators Research*, 64(2), 159-190.
- Cummins, R., Woerner, J., Gibson, A., Lai, L., Weinberg, M., & Collard, J. (2008). *Australian unity wellbeing index survey 19: The wellbeing of Australians – links with exercise, nicotine and alcohol*. Melbourne: Deakin University and Australian Unity.
- Delfabbro, P. (2008). Evaluating the effectiveness of a limited reduction in electronic gaming machine availability on perceived gambling behaviour and objective expenditure. *International Gambling Studies*, 8(2), 151-165.
- Delfabbro, P., Falzon, K., & Ingram, T. (2005). The effects of parameter variations in electronic gambling simulations: Results of a laboratory-based pilot investigation. *Gambling Research*, 17(1), 7-25.
- Delfabbro, P. H. (2002). *The distribution of electronic gaming machines (EGMs) and gambling-related harm in metropolitan Adelaide*. Report commissioned by the Independent Gambling Authority of South Australia.
- Diamond, N. (2009). *Development of an indices-based approach for forecasting gambling expenditure at a local government area level*. Melbourne: Department of Econometrics and Business Statistics Consulting Service, Monash University.
- Dietze, P. M., Jolley, D. J., Chikritzhs, T. N., Clemens, S., Catalano, P., & Stockwell, T. (2009). Income inequality and alcohol attributable harm in Australia. *BMC Public Health*, 9, 70.

- Doran, B., & Young, M. (2010). Predicting the spatial distribution of gambling vulnerability: An application of gravity modelling using ABS Mesh Blocks. *Applied Geography*, 30(1), 141-152.
- Doughney, J. R. (2002). Socioeconomic banditry: Poker machines and income redistribution in Victoria. In T. Eardley & B. Bradbury (Eds.), *Competing visions: Refereed proceedings of the National Social Policy Conference 2001* (pp. 136-154). Sydney: Social Policy Research Centre, University of New South Wales.
- Evans, L., & Delfabbro, P. H. (2005). Motivators for change and barriers to help-seeking in Australian problem gamblers. *Journal of Gambling Studies*, 21(2), 133-155.
- Gilliland, J. A., & Ross, N. A. (2005). Opportunities for video lottery terminal gambling in Montreal: An environmental analysis. *Canadian Journal of Public Health*, 96(1), 55-59.
- Griffith, D. A. (2009). *Spatial autocorrelation*. Amsterdam: Elsevier.
- Hare, S. (2009). *A study of gambling in Victoria - problem gambling from a public health perspective*. Melbourne: Department of Justice.
- King, T., Kavanagh, A. M., Jolley, D., Turrell, G., & Crawford, D. (2006). Weight and place: A multilevel cross-sectional survey of area-level social disadvantage and overweight/obesity in Australia. *International Journal of Obesity*, 30(2), 281-287.
- Korn, D. A., & Shaffer, H. J. (1999). Gambling and the health of the public: Adopting a public health perspective. *Journal of Gambling Studies*, 15(4), 289-365.
- LaPlante, D. A., & Shaffer, H. J. (2007). Understanding the influence of gambling opportunities: Expanding exposure models to include adaptation. *American Journal of Orthopsychiatry*, 77(4), 616-623.
- Livingston, M., Laslett, A. M., & Dietze, P. (2008). Individual and community correlates of young people's high-risk drinking in Victoria, Australia. *Drug and Alcohol Dependence*, 98(3), 241-248.
- Livingstone, C. (2001). The social economy of poker machine gambling in Victoria. *International Gambling Studies*, 1(1), 46-65.
- Marshall, D. (2005). The gambling environment and gambler behaviour: Evidence from Richmond-Tweed, Australia. *International Gambling Studies*, 5(1), 63-83.
- Marshall, D. (2009). Gambling as a public health issue: The critical role of the local environment. *Journal of Gambling Issues*, 23, <http://www.camh.net/egambling/issue23/pdfs/05marshall.pdf>.
- Marshall, D., McMillen, J., Niemeyer, S., & Doran, B. (2004). *Gaming machine accessibility and use in suburban Canberra: A detailed analysis of the Tuggeranong valley*. Canberra: ACT Gambling and Racing Commission.
- Marshall, D. C., & Baker, R. G. V. (2002). The evolving market structures of gambling: Case studies modelling the socioeconomic assignment of gaming machines in Melbourne and Sydney, Australia. *Journal of Gambling Studies*, 18(3), 273-291.
- McMillen, J., & Doran, B. (2006). Problem gambling and gaming machine density: Socio-spatial analysis of three Victorian localities. *International Gambling Studies*, 6(1), 5-29.
- Neal, P., Delfabbro, P., & O'Neil, M. (2005). *Problem gambling and harm: Towards a national definition*. Melbourne: Ministerial Council on Gambling.
- Neter, J., Kutner, M. H., Nachtsheim, C. J., & Wasserman, W. (1996). *Applied linear statistical models* (4th ed.). Chicago: Irwin.
- Pearce, J., Mason, K., Hiscock, R., & Day, P. (2008). A national study of neighbourhood access to gambling opportunities and individual gambling behaviour. *Journal of Epidemiology and Community Health*, 62(10), 862-868.
- Productivity Commission. (1999). *Australia's gambling industries*. Canberra: Commonwealth of Australia.
- Productivity Commission. (2009). *Gambling. Draft report*. Canberra: Commonwealth of Australia.
- R Development Core Team. (2006). *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.
- Robitaille, E., & Herjean, P. (2008). An analysis of the accessibility of video lottery terminals: The case of Montreal. *International Journal of Health Geographics*, 7, 2.

- Rush, B., Veldhuizen, S., & Adlaf, E. (2007). Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to gambling venues. *Journal of Gambling Issues*, 20, <http://www.camh.net/egambling/issue20/pdfs/05rush.pdf>
- Shaffer, H. J., & Korn, D. A. (2002). Gambling and related mental disorders: A public health analysis. *Annual Review of Public Health*, 23(1), 171-212.
- Shaffer, H. J., LaBrie, R. A., & LaPlante, D. (2004). Laying the foundation for quantifying regional exposure to social phenomena: Considering the case of legalized gambling as a public health toxin. *Psychology of Addictive Behaviors*, 18(1), 40-48.
- Slutske, W. S. (2006). Natural recovery and treatment-seeking in pathological gambling: Results of two U.S. national surveys. *American Journal of Psychiatry*, 163(2), 297-302.
- StataCorp. (2005). Stata statistical software (Version 9.2). College Station, Texas: Stata Press Publication.
- Storer, J., Abbott, M., & Stubbs, J. (2009). Access or adaptation? A meta-analysis of surveys of problem gambling prevalence in Australia and New Zealand with respect to concentration of electronic gaming machines. *International Gambling Studies*, 9(3), 225-244.
- Stubbs, J., & Storer, J. (2003). *Gaming prevalence as an indicator of gaming harm in local communities: Some policy implications for gaming harm minimisation in NSW*. Sydney, NSW: Author.
- Suurvali, H., Cordingley, J., Hodgins, D. C., & Cunningham, J. (2009). Barriers to seeking help for gambling problems: A review of the empirical literature. *Journal of Gambling Studies*, 25(3), 407-424.
- Victoria Government Gazette. (2001, 15 February). Gaming Machine Control Act 1991. Order under section 12aa(1), G7, 218.
- Victoria Government Gazette. (2006, 12 October). Gambling Regulation Act 2003. Order under section 3.2.4(1), S270.
- Victoria Government Gazette. (2009, 21 October). Gambling Regulation Act 2003. Section 3.2.4, S364.
- Wheeler, B. W., Rigby, J. E., & Huriwai, T. (2006). Pokies and poverty: Problem gambling risk factor geography in New Zealand. *Health and Place*, 12(1), 86-96.
- Young, M., & Tyler, W. (2008). Mediating markets: Gambling venues, communities and social harm. *Gambling Research*, 20(1), 50-65.