

DO EGMS AND PROBLEM GAMBLING GO TOGETHER LIKE A HORSE AND CARRIAGE?

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Abstract

It is widely believed that increased gambling exposure, particularly to electronic gaming machines (EGMs) and other 'continuous' forms, leads to a rise in gambling-related harms including problem gambling. Relevant literature, including studies conducted by the author, is critically reviewed to assess the validity of this belief. While jurisdictions with high exposure often have elevated problem gambling prevalence relative to those with low exposure, in others this relationship is attenuating or reversing. In New Zealand and Australia, despite substantial increases in EGM availability and expenditure, current national prevalence estimates are between a third to a half what they were 15 years ago. In Australia there are indications that the relationship between availability and prevalence breaks down somewhere between six to 10 EGMs per 1,000 adults. EGM reductions and the introduction of caps generally appear to have little impact. While regular EGM participation is strongly linked to problem gambling, problems associated with this gambling form appear to be typically of short duration. It is concluded that exposure to the agent gambling is multidimensional and that the effects of exposure are complex. Understanding the drivers of problem gambling requires recognition of this complexity including consideration of the role of individual and environmental risk and protective factors.

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Introduction

“Love and marriage, love and marriage, they go together like a horse and carriage. This I’ll tell you brother – you can’t have one, without the other.”

These lyrics intruded into my thoughts as I was writing this paper, accompanied by childhood memories from the time I first heard them. While yet to discover the disjunction between the realms of ‘ought’ and ‘are’ and the complexities of causal inference, although the tune was captivating, the message seemed suspect.

Looking back from middle adult years it is abundantly clear that connections between love and marriage are far from straightforward. Love sneaks up or erupts in a diversity of situations that may, but generally don’t, lead to matrimony. Many marriages are loveless. Some from the outset; more later. And both ‘love’ and ‘marriage’ come in many forms. In the real world you can have one without the other. As for horses and carriages – they have long since gone their separate ways. The latter morphed into automobiles (initially ‘horse-less carriages’). The former, among other things, retrained to ornament lifestyle blocks and entertain punters and pre-adolescent girls.

This paper is not about love, marriage, horses, or carriages, although there are undoubtedly significant connections between at least some of them and both gambling and problem gambling. Its primary focus is electronic gaming machines (EGMs). Specifically the paper attempts to answer the question “what is the nature of the relationship between EGMs and problem gambling?” How do they go together – if they do? This is an important question. For students of human behaviour it is of inherent interest. It is of fundamental concern to governments and policymakers, the gambling industry, health and social service sectors, as well as to communities, families and individuals. The question has direct bearing on current and future legislative, regulatory and other measures to increase, cap or reduce EGM numbers and accessibility. It is relevant to the development of measures to prevent or reduce gambling-related harms. The answers will also undoubtedly be used, and abused, as props to buttress both pro- and anti-gambling interests.

The importance of the question addressed in this paper is magnified by the dramatic growth in gambling availability, participation and expenditure in many parts of the world. This growth has been particularly strong in jurisdictions where EGMs and large urban casinos have been widely introduced, for example, Australia, New Zealand, South Africa and parts of North America and Europe. It has been argued that this expansion is unprecedented, qualitatively different from anything that has gone before and associated with broad inter-related trends that continue to influence the evolution of commercial gambling internationally. They include the growing legitimacy and acceptance of legal gambling, the intersection of gambling and financial technologies, impacts of the Internet on all forms of gambling, accelerated globalisation and the continued spread of gambling to traditionally non-gambling settings (Abbott & Volberg, 1999).

Participation in gambling activities is a necessary condition for the development of gambling problems, just as alcohol consumption is required for the development of alcohol problems. Consequently, it would seem reasonable to expect that increased gambling availability will lead to increases in gambling involvement and problems. Review of the problem gambling literature (Abbott et al, 2004) indicates that it is widely believed that increased availability leads to an increase in the incidence (new cases) and prevalence (total stock) of problem gambling and related harms. This general belief, expressed in various ways, long pre-dates gambling studies as an academic discipline. It has been articulated by religious groups, social reformers, politicians and others enmeshed in the alternating cycles of gambling liberalisation and restriction that many cultures and societies have experienced over the centuries (Rose, 1991; Grant, 1994; Abbott & Volberg, 1999). There is an account from as early as 13th Century Spain where reduced disruption to the social order was explicitly stated as the reason for gambling regulation (Carpenter, 1988). Carpenter notes that an additional imperative was to ensure the Crown received a significant portion of gambling revenue.

The present writer is among those who have concluded that increased availability of EGMs and some other types of gambling lead to increased participation and more problems. Fifteen years ago, a report on the first national prevalence survey to use a validated problem gambling instrument stated:

...it appears that regular involvement in certain forms of gambling activity, especially betting on horses/dogs, the recently introduced gaming machines and perhaps Instant Kiwi, increase the risk of being a problem or pathological gambler. Longitudinal studies are required to clarify whether or not these associations are causal' (Abbott & Volberg, 1991, p.63).

The report continued:

Given that casinos will shortly be established, and considering the findings of the survey generally in relation to social and economic trends, the researchers anticipate that the prevalence of excessive gambling will increase in the foreseeable future and that the various associated health, social and financial costs will similarly grow steadily (p.64).

Hundreds of articles in the gambling literature, typically in introductory paragraphs, assert the availability-problem link. EGMs are frequently highlighted as the gambling form most strongly implicated in the development of problem gambling. In this regard they have been referred to as the 'crack-cocaine of gambling' (Dowling, Smith & Thomas, 2005). Major reviews (e.g. Shaffer, Hall & Vander Bilt, 1997; Wildman, 1998; Abbott & Volberg, 1999) have, with varying degrees of qualification, concluded that research findings are generally consistent with the view that increased availability leads to more gambling and problem gambling. National official review bodies in Australia (Productivity Commission, 1999), the USA (National Research Council, 1999) and the UK (Gambling Review Body, 2001) have reached the same conclusion.

I have long had nagging doubts about the validity of a number of problem gambling 'sacred cows', availability theory included. This skepticism arose from my prior research and clinical experience in the alcohol field and familiarity with psychiatric epidemiology as a mental health practitioner working within a predominantly public health framework. Later it was fuelled by findings arising from research with gamblers and problem gamblers, my own that that of colleagues in various parts of the world.

From epidemiological research it is evident that mental health and behavioural disorders are not randomly distributed throughout populations. They follow, to varying degrees, extant lines of structural inequality and disadvantage. As with physical disease, patterns of mental disorder are dynamic. New disorders emerge, are identified or constructed. Others increase or decrease in incidence and prevalence. Pathological gambling, as a formal diagnostic entity, was 'constructed' in 1980. In that year it entered the DSM-III along with traumatic stress disorder and a number of other new disorders. At the same time, as a consequence of changing social attitudes, research and political lobbying, homosexuality exited.

In his examination of mental health disorders from a general population perspective, Abbott (1994) concluded that pathological gambling is one of a number of 'sunrise disorders' likely to have increased in recent years. Other disorders placed in this category included major depression among young men, youth suicide, eating disorders and some forms of chronic organic brain syndrome. Changes in incidence are driven by a dynamic inter-play between the agent (exposure to particular substances, biological agents and psychosocial stressors), the host (individual attributes and experiences that increase susceptibility and resistance) and the environment (the wider physical, social and cultural setting). Prevalence is strongly influenced by incidence. Disorder duration is an additional determinant of prevalence. While exposure to a relevant agent or agents may be a necessary condition for the development of a given disorder, it is rarely sufficient.

From the late 1970s, when I first made contact with problem gamblers and the problem gambling literature, I have been uncomfortable with Gamblers Anonymous and subsequent psychiatric conceptualisations of pathological gambling as a chronic or chronically relapsing mental disorder. Doubt extended to the related beliefs that problem gamblers cannot return to non-problematic gambling and that abstinence is the only legitimate treatment goal. Somewhat later, since the mid-1990s, I increasingly thought that availability or exposure theory was over-simplistic and misleading. While no longer regarded as heresy, when I first began to articulate alternative perspectives on these matters the response was sometimes vitriolic. In amplitude and ideological transparency, at times service provider reactions matched gambling industry criticisms of earlier research on the prevalence of problem gambling and its implications for policy and service development.

The validity of the application of availability theory to gambling is becoming a focus of international debate. This is illustrated in the September 2005 edition of the journal *Addiction*. Five researchers (Room, Shaffer, Blaszczynski, Ronnberg and Abbott) provided invited commentaries on an article by Orford (2005a). Orford (2005a)

expressed concern about substantial increases in gambling problems that he anticipated in the wake of new UK gambling legislation.

Abbott agreed that problems are likely to rise in the UK, at least in the short-term, but qualified this by adding:

Most things that go up usually come down. This is also true in epidemiology. Abbott et al (2004) cite research strongly suggesting that problem gambling prevalence will eventually level out and decline, even if accessibility continues to increase (Abbott, 2005, p.1234).

This statement is consistent with Abbott, Williams and Volbergs' (1999) suggestion that as people and societies obtain increased experience with new forms of gambling, adaptations will be made that enable problems to be more readily countered or contained. They considered it likely that increased public awareness of problem gambling and its early warning signs, the development of informal social controls and the expansion of treatment and self-help may play a role. It was proposed that in particular circumstances the relationship between rising gambling exposure and increasing problems will attenuate or reverse.

Shaffer stated:

Observations about gambling-related problems in Nevada provide support for the adaptation hypothesis of addiction. That is, after the novelty of initial exposure, people gradually adapt to the risks and hazards associated with potential objects of addiction (Shaffer, 2005, p.1228).

Shaffer and colleagues had also articulated this 'adaptation hypothesis' previously. However, it was thought that the process would be slow, "perhaps only after decades and generations of social learning" (Shaffer, Hall & Vander Bilt, 1997).

Orford's response to Abbott and Shaffer included the following challenge:

Complex and multifactorial though causation is, the more the product is supplied in accessible form, the greater the volume of consumption and the greater the incidence and harm. I doubt there would be many who would argue with that basic public health law when it comes to the supply of alcohol, tobacco and other drugs of various kinds. It would be very surprising indeed if that general rule was not also true for gambling, and the onus should be upon those who think gambling might be an exception to the general law to prove their case (Orford, 2005b, p.1236).

This article, among other things, takes up this challenge. It is structured around the following hypotheses:

- (1) During exposure to new forms of gambling, particularly EGMs and other continuous forms, previously unexposed individuals, population sectors and societies are at high risk for the development of gambling problems.
- (2) Over time, years rather than decades, adaptation ('host' immunity and protective environmental changes) typically occurs and problem levels reduce, even in the face of increasing exposure.
- (3) Adaptation can be accelerated by regulatory and public health measures.
- (4) While strongly associated with problem development (albeit comparable to some other continuous forms when exposure is held constant) EGMs give rise to more transient problems.

Evaluation of exposure and adaptation theory

Research of various types has relevance to assessing exposure or 'ecological opportunity' (Cornish, 1978) and adaptation theory. Before examining this research, it is probably instructive to recall that while identification of systematic co-variation is an important starting point in scientific investigation, it is not sufficient for the inference of cause-effect relationships. Demonstration of causation requires meeting the following criteria:

- the events or phenomena occur together in time
- the cause must precede the effect
- observed instances of the cause do not occur without the effect
- all other possible influences other than the one being investigated are excluded or controlled
- the relationship can be replicated on other occasions by other investigators.

The agent gambling

While often referred to as a unitary phenomenon, gambling embraces a variety of activities engaged in by different types of people in a diversity of contexts (Walker, 1992; Abbott & Volberg, 1999). Some of these activities, but not others, have strong associations with problem gambling.

Numerous general and special population prevalence studies have found that people with preferences for, frequent involvement in and high expenditure on gambling activities that are continuous in nature and involve an element of skill or perceived skill have a high probability of experiencing gambling problems. For example, in the 1999 New Zealand national survey (Abbott & Volberg, 2000), substantially more problem gamblers than non-problem gamblers reported having preferences for EGM gambling, track betting and casino table games. Typically between a fifth to a third of regular (weekly or more) EGM and track betters have significant gambling problems (Abbott & Volberg, 1999; Productivity Commission, 1999; Schrans, Schellinck & Walsh, 2000).

The association between participation in continuous/skill based forms of gambling and problem gambling found in general population surveys is also evident in clinical presentations. The great majority of gambling helpline callers and clients presenting for treatment in Australia and New Zealand report having problems predominantly with EGMs, track betting and casino table games. In a number of jurisdictions where per capita EGM expenditure has risen markedly relative to expenditure on other gambling forms, substantial proportionate increases have been found in EGM-related problems in help-seeking populations (Productivity Commission, 1999; Abbott, 2001b). For example, when the New Zealand national gambling helpline commenced in 1993, similar numbers of callers reported having problems with EGMs and track betting (Sullivan et al, 1994). Few other gambling activities were mentioned in this regard. By 1999 77% of callers had EGM-related problems; increasing to 91% in 2004 (Ministry of Health, 2005). Track betting problems reduced to 14% in 1999 and 4% in 2004. Casinos were introduced from 1995 onwards. Four percent mentioned problems with table games in both 1999 and 2004. Comparable proportionate changes from 1994 to 2004 were evident for new clients receiving specialist treatment for problem gambling (Ministry of Health, 2005).

While much has been written about the various attributes of EGMs that make them particularly 'addictive' (Walker, 1992; Griffiths, 1995), it is only recently that regular players have been tracked over time, in real-life gambling settings, to identify factors associated with problem development. A recent landmark study by Dickerson, Haw and Shepherd (2003) is of particular note. It examined factors considered likely on the basis of prior research and theory to contribute to impaired control – indexed by subjective feelings of loss of control, inability to limit expenditure and chasing losses. Impaired control is considered to be of fundamental importance in the escalation of gambling-related problems in various life domains. Rather than being atypical, they found most regular EGM participants lose control over session spend and frequency of venue visits on at least some occasions. They concluded:

The erosion of self-control arises from the player's current number of hours spent gambling per week, the strength of emotion they experience during play, made worse by any mild depressed or negative mood they 'bring' with them to the venue and by a more impulsive personality (Dickerson, Haw & Shepherd, 2003, p.22).

While some individual characteristics (non-productive coping, depression and impulsivity) contributed to impaired control, collectively they accounted for only a quarter of the outcome variance. The authors concluded that impaired control and subsequent problem development are an understandable and 'natural' consequence of regular, high intensity EGM play rather than something confined to a small minority of constitutionally predisposed or mentally disordered problem gamblers. It appears from this research that most regular EGM participants need to use active and planned strategies to remain within their preferred time involvement and budget. However, even when they do, it appears that about half still lose control at least occasionally.

The foregoing findings are consistent with the view that there are strong associations between particular forms of gambling, particularly EGMs, and problem gambling. They suggest, but do not establish, that the relationship is causal in nature with regular participation frequently leading to loss of control and problem development. These findings further suggest substantial increases in the availability of and expenditure on these forms will generate elevations in problem gambling incidence and prevalence.

Prevalence studies

The first general population survey of problem gambling was undertaken in the United States during the mid-1970s (Kallick et al, 1976), prior to formal recognition of pathological gambling as a mental health disorder. Although the method used to measure “probable compulsive gambling” in this early study had shortcomings (e.g. Nadler, 1985), it was an extensive investigation that provided useful information. At the time there was limited access to legalised gambling in most parts of the United States. Nevada was the notable exception. In the present context, it is of interest that the problem gambling estimate for Nevada (2.5%) was three times higher than that for the country as a whole (0.8%). The authors concluded “the data tend to support the contention that the widespread legalization of gambling in the nation may result in a significant increase in the incidence of compulsive gambling” (Kallick et al, 1976, p.xiii).

Although over 20 years before another national survey of problem gambling was undertaken in the US, a large number of sub-national surveys were conducted. Shaffer, Hall and Vander Bilt (1997) reviewed North American state and provincial surveys carried out between 1975 and 1996, a period during which gambling availability increased markedly. Using a variety of analytic procedures, the study team concluded that the prevalence of problem gambling had increased significantly over time among adults in the general population. Past year rates for surveys prior to 1993 averaged 0.8% whereas those post 1993 averaged 1.3%. Although this increase was statistically significant, the authors noted that total prevalence variability explained by time was relatively modest and that it was unclear what other factors explain changing rates. Changes were not evident for youth, students and institutional populations. Contrary to expectation, despite considerable variations in gambling history, availability and expenditure between jurisdictions, significant regional prevalence differences were not apparent.

Although US jurisdictional rates did not vary in relation to availability and expenditure, early prevalence estimates derived using the ‘lifetime’ SOGS from Australia, New Zealand, various parts of Spain and some Canadian provinces mirrored the rank ordering of these countries by percentage of personal income spent on gambling (Walker & Dickerson, 1996).

More recent national US studies have also examined regional prevalence differences. Because these surveys used different measures, it is not possible to determine whether or not national prevalence rates have changed since the initial 1975 survey. The first of these (Gerstein et al, 1999) found that prevalence rates were higher in the West than in

other regions. This finding was replicated by Welte et al (2001; 2002). Contrary to expectation derived from exposure theory, Western states do not have higher gambling expenditure than other parts of the country. Also contrary to expectation, Welte et al's (2001; 2002) survey found that the region with both the highest expenditure and highest percentage of regular gamblers, New England, had the lowest prevalence of problem gambling. While incompatible with exposure theory, these findings may be consistent with the adaptation theory, reflecting differences in the time that gambling has been legally available in the different regions.

Recently Volberg (2002) conducted a statewide survey in Nevada. As with the national surveys, use of different measures meant that direct comparison with the earlier 1975 study was precluded. The adult findings were contradictory. On two measures, past 12 months SOGS-R and lifetime NODS, the Nevada estimates (3.5% and 2.1% respectively) were significantly higher than corresponding national rates (1.9% and 1.2%). These findings are consistent with exposure theory. However, there was no significant difference between the Nevada (0.3%) and national (0.6%) past 12 months NODS prevalence estimate. In the case of adolescents, lower rates were found in Nevada than in other jurisdictions that had used the same measures. Additionally, adolescents in Nevada did not gamble more in casinos than adolescents in less exposed US jurisdictions or start gambling at a younger age. Given the very high levels of gambling exposure in Nevada, while not unequivocal, the adolescent and some of the adult findings suggest adaptation.

Findings from some cross sectional studies have found associations between access to casinos and problem gambling. For example, the Gerstein et al (1999) national survey referred to previously found adults resident within 50 miles of a casino (versus those resident within 50 to 250 miles) had approximately double the rate of pathological gambling. However, this relationship was only evident when general population and patron survey data were merged. It was not apparent from the general population data alone. Shaffer, LaBrie and LaPlantes' (2004) examination of county level data from the Volberg's (2002) Nevada survey is also relevant. While seriously compromised by small sample size, it appears that the four counties with the most access to casinos had higher prevalence rates than the four counties with the least access. A relationship between casino proximity and gambling problems was also found in the 1999 New Zealand national survey (Abbott & Volberg, 2000). Higher prevalence rates were found in the two cities that had introduced casinos within the last few years than in other, non-casino, cities. In some multivariate analyses this relationship remained when other factors associated with problem gambling were controlled statistically. While these studies focus on casinos, casinos contain large numbers of EGMs that typically involve the great majority of casino patrons and generate the majority of revenue.

Although able to examine regional differences, the recent US national survey samples were too small to assess state-level differences. While a large number of sub-national gambling participation and problem gambling prevalence surveys have been carried out in the US and Canada, the use of different methodologies and measures compromises meaningful assessment of the relationships between availability, expenditure and problem gambling prevalence (Abbott et al, 2004). This is also been the case in Australia (Abbott

& Volberg, 1999; Productivity Commission, 1999; Abbott, 2002). However, the 1998 national survey commissioned by the Productivity Commission did enable differences between individual states and territories to be considered (Productivity Commission, 1999). From their analyses the Commission concluded that prevalence rates are generally higher in states and territories with greater accessibility and expenditure. This relationship was apparent when each of the following measures was employed: EGMs per 1,000 adults, EGM expenditure per adult and total non-lottery gambling expenditure per adult. Significant relationships were also found between these measures and the number of Gamblers Anonymous groups per million adults and new clients receiving specialist help for gambling problems.

Although the Productivity Commission survey findings indicate significant relationships between some measures of gambling exposure and both problem gambling prevalence and help seeking, careful examination of the data suggests that the relationship is not linear. The two states with the lowest number of EGMs per adult and the lowest EGM expenditures per adult in 1998 (Western Australia and Tasmania) had the lowest rates of SOGS-R defined probable pathological gambling (0.7% and 0.4% respectively). At that time, New Zealand had similar numbers of EGMs and EGM expenditure per adult to these two states. It also had a similar SOGS-R prevalence rate (0.5%). The remaining Australian states and territories generally had much higher, although variable, EGM 'densities' and expenditures. Although they also had substantially higher rates of probable pathological gambling (ranging from 1.9% to 2.6%), *within* this group increased EGM exposure does not appear to be associated with higher prevalence (refer to Figures 1 and 2).

In the preceding paragraph, the qualification "generally" was made with respect to the differentiation between the three low and six high prevalence jurisdictions. This was because, with regard to machine density and problem gambling prevalence, Victoria is not where it 'should' be. The same is true of the Northern Territory with respect to EGM expenditure. In the case of Victoria, while having relatively low numbers of machines per capita at the time of the national survey, this state had a prevalence rate substantially higher than other states (and New Zealand) in the low density category (see Figure 1). However it is in its 'correct' place with respect to EGM expenditure (Figure 2). This difference in positioning reflects the much higher mean expenditure per machine in Victoria than in the other jurisdictions and is probably in large part a consequence of the imposition of a long-standing statewide binding cap on EGM numbers in that state. This was unique at the time of the national survey. Northern Territory, based on EGM expenditure per adult and perhaps EGM density as well, might also be expected to be grouped with the low prevalence jurisdictions. In this case the 'distortion' may have arise because of the very high levels of expenditure per adult in Northern Territory at that time, relative to all other jurisdictions, on casino and track betting (Productivity Commission, 1999).

From Figure 1 it appears that the relationship between increased EGM exposure and prevalence starts to break down when there are somewhere between six and ten machines per 1,000 adults and average annual EGM expenditure (losses) reaches about Aus\$200

per adult. With respect to all forms of non-lottery gambling, the expenditure ‘tipping point’ may be higher, at approximately Aus\$500 per adult.

Problem gambling prevalence data from Canadian provincial surveys are shown in Figure 3, plotted against EGMs per 1,000 adults. Unlike the Australian data displayed in Figures 1 and 2, these prevalence estimates are based on the Canadian Problem Gambling Index (CPGI) and come from separate provincial studies rather than a national survey. Somewhat different methods were used in these studies and they were not all undertaken at the same time. For these reasons greater caution is warranted in their interpretation than is the case with the Australian data.

In Canada, provinces without EGMs (British Columbia and Ontario) have lower rates of ‘serious problem gambling’ (0.4% and 0.7% respectively) than others for which information is available (0.8% to 1.4%). For comparison with the Australian data, it should be noted that CPGI serious problem gambling estimates are typically about half current SOGS-R probable pathological gambling estimates (Abbott & Volberg, in press). In contrast to Australia EGM densities are less variable in provinces that have them. Despite this relative lack of variability (range from 2.8 to 5.3 machines per 1,000 adults) relative to Australia, prevalence estimates range from 0.8% to 1.4%. This indicates that factors other than EGM density are responsible. If the Canadian CPGI rates of 0.8% to 1.4% translate to SOGS-R rates of approximately 1.6% to 2.8%, the question arises as to why they are so high when their EGM densities are low relative to most Australasian jurisdictions. Perhaps, at least in part, it reflects the longer duration of gambling exposure and greater degree of adaptation in Australia and New Zealand?

Replication surveys

Replication surveys provide a more direct and appropriate means by which to assess change over time in gambling participation and problem gambling prevalence at national or sub-national levels. Mention has been made of repeat US national surveys where different methodologies and measures did not allow meaningful assessment of problem gambling prevalence rates over time. To date, New Zealand is the only jurisdiction where nationally representative repeat (‘replication’) surveys have been conducted using the same measurement instrument, the SOGS-R. The first (baseline) survey was conducted in 1991. During the preceding three years per capita gambling expenditure had more than doubled, following the introduction of Lotto (a national lottery), Instant Kiwi (a scratch lottery) and the licensing of EGMs in clubs and hotels. Prior to this adult per capita gambling expenditure had been stable for over a decade. At the time of the 1991 survey, total annual gambling expenditure was NZ\$575 million; of which NZ\$107 million was on EGMs. The 1991 survey found that 48% of people 18 years and older reported participating in at least one form of gambling weekly or more. The ‘lifetime’ and current probable pathological gambling prevalence estimates were 2.7% and 1.2% respectively. Prior to this study, internationally, only so-called ‘lifetime’ measures of problem gambling had been used. The 1991 New Zealand lifetime estimate was higher than those from pre-1991 North American surveys.

A second New Zealand survey was conducted in 1996 (North Health, 1996). At that time total gambling expenditure was NZ\$695 million, of which NZ\$171 was on EGMs. The first New Zealand casino was also opened in 1995. Despite increased availability and expenditure this survey found lower gambling participation rates than in 1991 and a significantly lower current probable gambling prevalence estimate of 0.4%. The survey report was not released publicly and was obtained by invocation of the Official Information Act. The reason given for non-publication was that the sample was biased and that this and various methodological shortcomings reduced confidence that could be placed in its findings. While not devoid of deficiencies, Abbott and Volberg (1999) concluded that the overall quality of the study was comparable to that of most prevalence surveys conducted in North America and Australia. An alternative explanation for non-publication is that the commissioning body did not expect to find a reduction in prevalence or believe that it was in its interests for this information to be in the public domain.

A third survey was completed in 1999 (Abbott & Volberg, 2000). Total gambling expenditure was NZ\$1,167 million that year. This included annual expenditure of NZ\$360 on non-casino EGMs and NZ\$294 on casino gambling (most of which was on EGMs). Relative to when the first survey was conducted, while racing and lotteries expenditure had changed little, non-casino EGM expenditure had increased more than three-fold and casinos had been opened in the two largest New Zealand metropolitan areas. The 1999 'lifetime' and current probable pathological gambling prevalence estimates were respectively 1% and 0.5%. Weekly or more frequent gambling participation also decreased (1991, 48%; 1999, 40%). This reduction was a consequence of fewer people participating this frequently in continuous forms of gambling including EGMs, track betting and Instant Kiwi.

The New Zealand surveys are discussed more fully elsewhere (Abbott 2001a, 2001b; Abbott & Volberg, 1991, 1992, 1996, 2000, Abbott, Volberg & Ronnberg, 2004; Volberg & Abbott, 1994). Although the SOGS-R was used to assess problem gambling in all three studies, methodological and other differences may, at least in part, account for the different findings. For this and other reasons, the authors did not state that prevalence had reduced. They cautiously concluded that their findings failed to corroborate the hypothesis that prevalence rates would be higher in 1999 and further noted that two or three data points are insufficient to indicate a trend (Abbott & Volberg, 2000). Since 1999, EGM expenditure has tripled and total gambling expenditure nearly doubled (Department of Internal Affairs, 2006). While no national gambling-specific prevalence study has been undertaken since 1999, problem gambling questions were included in the Ministry of Health 2002/03 NZ National Health Survey. The author has recently reviewed a draft report on the gambling section of this study. While unable to comment on the detail prior to publication, the findings do not suggest an increase in problem gambling prevalence since the previous survey. Unfortunately failure to include the SOGS-R or another standard problem gambling screen precludes direct comparison with previous studies.

Although the Productivity Commission survey is the only truly national Australian study to date, an earlier survey was conducted in 1991 (Dickerson et al, 1996), at the same time as the first New Zealand survey. While referred to as a national study by the investigators, it was confined to four major cities, specifically Sydney, Brisbane, Melbourne and Adelaide. This 'four cities' survey used the SOGS-R, in a past 6-months format, the same measure that had been developed for the 1991 New Zealand study. Consistent with the much higher per capita gambling expenditure in Australia than in New Zealand and other parts of the world where surveys had been completed, the current probable pathological gambling estimate was also substantially higher. The current prevalence estimate was 6.6%. This finding is congruent with exposure theory. However, as in New Zealand, the problem gambling prevalence rate from this early study is substantially higher than the rate (2.1%) obtained from the later Australian national survey. It is also higher than rates obtained from all subsequent Australian sub-national studies. Although Australia already had high per capita gambling expenditure relative to other countries in 1991, that country experienced considerable and rapid growth during the late 1980s and throughout the 1990s, in large part due to greatly increased availability of high intensity EGMs in various settings including clubs, pubs and casinos. Thus, in both Australia and New Zealand, the findings are not consistent with the hypothesis that prevalence increases follow expansion of EGM availability and expenditure. They are, however, consistent with adaptation theory.

Since 1998, although there have been no other national surveys in Australia, some state and local studies have been conducted. Unfortunately the tradition of using idiosyncratic versions of problem gambling instruments and varying methodologies, noted by Abbott and Volberg (1999) and the Productivity Commission (1999), has continued. Banks (2003), in a review of these studies, concludes that this makes comparison of the recent findings with those from earlier studies difficult. An exception is a large Australian Capital Territory survey that used the current SOGS-R as well as other indicators of harm (AIGR, 2001). The prevalence estimate was 1.9%, similar to that obtained for ACT in the 1998 national survey (2.1%). While extreme caution is necessary in comparing findings from the other later surveys with corresponding national survey results, in none of the three cases was the more recent problem gambling estimate higher than the corresponding 1998 estimate (Banks, 2003).

Two national surveys have also been conducted in Norway, in 1997 (Gotestam & Johansson, 2003) and 2002 (Lund & Nordlund, 2003). Gaming machine numbers increased significantly in Norway during the period between the surveys. Unfortunately, as in the US, different measures and somewhat different methodologies were used in these studies. In 1997, based on a ten item DSM4 screen, the adult pathological gambling estimate was 0.15% (using the conventional criterion score of 5) and 0.6% (using a criterion score of 3). In 2002 the past year SOGS-R probable pathological gambling estimate was 0.2% and the past year NODS estimate was 0.3%. SOGS-R estimates are generally higher than DSM-based measures. Thus, it appears that there was little or no change over time.

In addition to the national studies, a substantial number of replication surveys have been completed at state and provincial levels in North America. In some instances the same measures and identical or similar methodologies have been used at baseline and 'replication'. Consequently, more confidence can be placed in their findings than is the case with the US national and Australian sub-national studies.

Early North American baseline surveys were undertaken prior to the development of the SOGS-R in 1991 and subsequent current problem gambling measures. In three cases, Iowa, New York and Quebec, baseline and repeat surveys used the original 'lifetime' SOGS (Volberg, 1995, 1996; Jacques, 1997). In contrast to national surveys discussed above, in all three instances there were substantial increases in prevalence over time.

More recent North American replications have used current measures of problem gambling. A review of these studies in 2001 found that seven obtained higher prevalence estimates at replication than baseline and eight obtained lower estimates (Abbott, 2001b). However, in some instances these differences were minor and not statistically significant. In other cases it was not possible to determine statistical significance owing to lack of relevant information or doubt about the appropriateness of confidence intervals given failure to take account of design complexity. These studies varied with respect to the interval between baseline and replication. There was also considerable variation in the extent to which gambling availability and expenditure had increased between studies. More careful examination of these repeat surveys and additional contextual information is necessary to interpret their findings.

Abbott (2001b) and Volberg (2001) examined the then most recent North American replications, in part to see if there were parallels with findings from the New Zealand national surveys. As indicated one of the most consistent findings in the literature is the high percentage of regular (weekly or more often) gamblers - particularly EGM, track and casino gamblers - who have gambling problems. It has been assumed that an increase in the availability of continuous forms of gambling, particularly EGMs, will lead to a rise in the proportion of regular gamblers and that this will in turn generate higher problem gambling prevalence rates (Abbott & Volberg, 1991; Griffiths, 1999; Jacobs, 2000). Dickerson and Maddern (1997) used this model to hypothesize how many more problem gamblers there would be in Tasmania if EGM availability increased in that state. It assumes that the proportion of EGM participants who have problems is fixed, when it might increase or, as appeared to be the case in New Zealand, decrease.

Contrary to expectation, as indicated previously, although EGM numbers and expenditure increased substantially in New Zealand from 1991 to 1999, the percentage of adults who gambled weekly dropped from 48% to 40%. This is of particular interest because it suggests that greater availability and expenditure do not necessarily increase high-risk exposure. In all five of the North American replications considered, gambling availability and expenditure increased between surveys. As in New Zealand, in all cases there were statistically significant reductions in the percentage of regular gamblers. In four of the five states, also as in New Zealand, the percentage of infrequent and non-gamblers increased.

Information is available to consider four of the US replications (Montana, North Dakota, Oregon and Washington State) more fully. In these states there were already substantial legal gambling opportunities at the time of the baseline survey and gambling availability increased further between baseline and replication. Additional casinos were opened in all states (two each in Montana and Oregon, five in North Dakota and ten in Washington State). In Washington State commercial 'card rooms' were permitted to greatly increase the number of tables per establishment. Two states (Montana and Oregon) introduced EGMs. The density of machines was much greater in Montana (26 per 1,000 adults) than Oregon (3 per 1,000). North Dakota was the only state without a lottery but had over 300 small charitable gambling operations in restaurants and bars.

As mentioned, despite increases in availability and expenditure in the four states, weekly or more frequent participation reduced. With respect to probable pathological gambling, significant increases occurred in Montana (0.7% to 1.3%) and North Dakota (0.7% to 1.4%). Significant decreases occurred in Oregon (1.4% to 0.9%) and Washington State (0.9% to 0.5%). Although probable pathological gambling increased in North Dakota, the proportion with less severe problems reduced significantly (1.3% to 0.7%). The combined rate showed no change over time.

From the foregoing it is evident that changes in the proportion of regular gamblers in these jurisdictions are not sufficient to explain increases or decreases in problem gambling prevalence. In all cases there were significant reductions in regular participation yet prevalence increased in some and decreased in others. A major difference between the states with increased and decreased prevalence was the availability of services for people with gambling problems. The two without services experienced increases; the two with services decreases. Lower prevalence was particularly evident for past year EGM participants. Greater EGM availability without specialist service provision was strongly associated with increased problems among EGM participants. In contrast, prevalence reduced among past year casino patrons regardless of service provision.

New Zealand, like the US states that apparently experienced significant reductions in problem gambling, developed services following the 1991 baseline survey. This included a national helpline and extensive network of specialist counselling services. There was also a high level of publicity about risks associated with frequent gambling and evidence of greater public awareness of and concern about problem gambling (Abbott & Volberg, 1999; 2000). Most Australian jurisdictions also developed problem gambling services between the 1991 'four cities' survey and the 1998 national study (Productivity Commission, 1999). Similarly, some provision was made in Norway, albeit rudimentary compared to that in Australia and New Zealand.

Other exposure studies

To this point consideration has been given predominantly to studies of national or regional general populations, both cross sectional and repeat surveys. This included

examination of casino location in relation to problem gambling prevalence. A small number of studies have examined changes in gambling and problem gambling following the introduction of a new form of gambling to a particular community. For example, Room, Turner and Ialomiteanu (1999) assessed the social impacts from the introduction of a casino to Niagara Falls in Canada. Local residents' casino gambling increased markedly in the year after the casino opened relative to people living elsewhere in the province. Over this period significantly more Niagara Falls residents experienced gambling problems and reported problems among people in their families and social networks.

As mentioned, the 1999 New Zealand national survey (Abbott & Volberg, 2000) found higher prevalence rates in the two cities with casinos than in other parts of the country. These differences held up in some multivariate analyses that controlled for other factors that were associated with problem gambling and might account for the geographical differences. This suggests that the introduction of casinos contributed to problem gambling, an interpretation strengthened by the lack of geographical variation in the earlier 1991 national survey. This possibility was examined using a stronger natural experimental design in 1998 (Abbott, Williams & Volberg, 1999). This prospective study re-assessed regular non-problem gamblers and problem gamblers seven years after they had taken part in the 1991 national survey. Participants resident in the two major cities where casinos had been introduced in 1995 (Christchurch) and 1996 (Auckland) were compared with their counterparts in the remaining major city without a casino (Wellington). Many other factors that differed between the casino and non-casino city participants, including those known to be associated with problem gambling, were controlled statistically. This study did not find any significant association between casino presence and participant's problem gambling.

Although the New Zealand natural experiment had a number of methodological strengths, it also had shortcomings. In particular, participants were not fully representative of adults resident in the centres that were studied. Prior to the introduction of casinos, participants had either already experienced gambling problems or gambled regularly without problems. The study did not include a sample from the 52% of adults at that time who did not gamble or who gambled less than weekly without significant problems. By the time they were re-assessed most participants had reduced their gambling interest and involvement and all were in their mid-twenties or older. While it cannot be concluded from this study that the introduction of casinos had no effect on problem gambling in the general population, the findings do suggest that they did not increase problems for people who had previously experienced them or who gambled regularly.

From the beginnings of public and occupational health research there has been interest in occupational groups with high exposure to particular environmental risk factors. In the case of gambling, it might be expected that industry employees would have elevated problem gambling prevalence relative to the general population. This has been demonstrated to be the case among casino employees in the United States (Shaffer, Vander Bilt & Hall, 1999). This is consistent with exposure theory. However, Shaffer and Hall (2002) note that younger and recent casino employees have higher rates of

problem gambling than longer-term employees. These latter findings, while they could arise in other ways, might reflect adaptation.

Families, like workplaces, provide another local social context where gambling exposure can be concentrated. Many studies report that problem gamblers, relative to non-problem gamblers, experience higher levels of gambling participation in their families of origin and current families. Problem gamblers also more often report commencing gambling at an earlier age and being introduced to gambling by family members (Abbott, 2001a; Raylu & Oei, 2002). These findings predominantly come from accounts of past behaviour and are thus subject to recall deficiencies and retrospective interpretation. They might also reflect social learning, genetic and other familial influences additional to exposure per se. Although there are associations between familial and early gambling participation and problem gambling, Abbott and Volberg (2000) found that the most at-risk groups were people who first gambled before the age of 13 years and those who first gambled aged 25 years or older. Introduction to gambling during the mid-teens to early 20s was associated with very low prevalence, suggesting that exposure at this time may be protective. Lack of familial gambling exposure and socialisation might increase vulnerability when people subsequently encounter gambling as adults.

Reducing exposure

If there is a causal relationship between gambling exposure and problem gambling, not only should problems increase with increased availability, problems should diminish when availability decreases. In part, the potential for reduction will be determined by the degree to which problem gambling is a transient rather than chronic state. This is because prevalence is determined both by the inflow of new cases (incidence) and outflow (problem resolution). These matters will be considered later.

Very few studies have examined the impact of reduced gambling availability, mainly because in recent decades there have been few instances where communities or jurisdictions have experienced significant reductions in availability. South Dakota is an exception. In 1994 all of the state's EGMs were shut down by court order for three months. Other forms of gambling were not affected. During that period there was an average of ten inquiries per month from people seeking help from gambling treatment centres, a marked reduction on previous consultation rates. During the year prior to the closedown there was an average of 68 inquiries per month. Following reactivation of the EGMs, during the next three months the number increased to an average of 24 per month. Although help seeking is only partly driven by the number of people with problems, these findings appear to be consistent with exposure theory. If so, however, they suggest that problem gambling is both highly responsive to environmental change and transient.

In recent years a number of jurisdictions, including New Zealand and most Australian states and territories, have placed caps on the number of EGMs permitted within the overall jurisdiction and/or within particular localities. Victoria, it will be recalled, provides an early example of a statewide cap. As indicated, this state is of interest because it is anomalous in a number of respects. The Productivity Commission (1999)

found a very strong, linear relationship between EGMs per 1,000 adults in Australian jurisdictions and EGM expenditure per adult. As machine numbers increased, so too did average expenditure. Victoria is the exception. While having less than half as many EGMs per capita than NSW and ACT, Victoria's EGM expenditure per adult was similar. In other words, far more was spent on each machine in Victoria than in other parts of Australia. Victoria's problem gambling prevalence was also similar to ACT and not significantly lower than that of NSW. This suggests that per capita EGM expenditure rather than EGM numbers mediates the relationship between EGMs and problem gambling.

Although it appears that the Victorian cap did not constrain expenditure or problem gambling, caution is required in generalising these findings to other jurisdictions. While capped at 30,000 machines, in 1999 this was eight for every 1,000 adults, a high figure by international standards. Victoria's EGMs are also widely distributed and following the introduction of the cap they were relocated to maximise revenue. This relocation appears to have been disproportionately to neighbourhoods with greater numbers of people at risk for problem gambling. This may be related to the high percentage of Victorian EGM expenditure (estimated as 27% by the Productivity Commission) accounted for by problem gamblers.

Partly in response to the relocation of EGMs to high-risk neighbourhoods, the Victorian government more recently introduced local caps in five regions. These regions had high concentrations of machines (10-14/1,000 adults), high adult per capita EGM expenditure and were socially disadvantaged. In contrast to the mid-1990s statewide cap, the regional caps involved an absolute reduction in machine numbers (a decrease of 406 over a 3-year period from a total of 5,494). The South Australian Centre for Economic Studies (2005) undertook a detailed assessment of the impact of the caps. It concluded that their introduction had no significant impact on EGM expenditure. The 'experimental' and matched 'control' regions experienced comparable changes in expenditure and there was no 'spill-over' (displaced expenditure to adjoining regions). Although not assessed directly, it was also considered likely that there was little or no impact on problem gambling prevalence or problem gamblers. The research team concluded that the regional reductions in EGMs, ranging from zero to 15%, were too small to reduce EGM availability. At the end of the phase out period machine density (9.3-13.1/1,000) remained above the overall state density of 7.3/1,000. It appears that sufficient machines remained per venue to prevent 'crowding out' people who wanted to use them.

The most notable finding of the SA Centre for Economic Studies report was the demonstration of a substantial and immediate impact of a smoking ban on EGM expenditure. This measure was estimated to reduce EGM expenditure in the regions examined by 13-19%. Another measure introduced during the study period, the phasing out of 24-hour EGM trading, was also assessed as having an additional, much smaller impact (3% average). A further noteworthy finding was a very large reduction, across almost all regions in Victoria, in help seeking for problem gambling. Statewide counselling case numbers fell from 5,309 in 2001 to 3,508 in 2003. While other

explanations might apply, this could indicate that there has been a significant reduction in problem gambling prevalence in Victoria.

Prevalence changes in population sectors

The examination of gambling participation and problem gambling in different population sectors is relevant to the assessment of exposure and adaptation theory. Early prevalence studies consistently found that men had much higher levels of gambling participation and problem gambling than women (Abbott & Volberg, 1991; 1999; Dickerson et al, 1996; Shaffer, Hall & Vander Bilt, 1997; Volberg, 2001). Men also outnumbered women in treatment settings and mutual help groups including Gamblers Anonymous. While male prevalence continues to be higher in some jurisdictions including the UK, Sweden and Norway, in others gender differences are greatly diminished or no longer present. This shift is particularly evident in Australia (other than in WA), New Zealand and some parts of Canada and the US. Table 1 provides relevant data from the 1991 and 1999 New Zealand national surveys. In 1991 the male current probable pathological gambling prevalence rate was twice that of women. In 1999 there was no significant gender difference. While reference is often made to female rates 'catching up' with males, in this instance females apparently 'caught up' by the male rate falling significantly to approximate the lower female rate.

The erosion of gender prevalence differences appears to be linked with the widespread availability of EGMs (Productivity Commission, 1999; Abbott, 2001b; Volberg, 2003; Abbott, Volberg & Ronnberg, 2004). In jurisdictions of this type relative, and in some instances absolute, increases in female problem gambling prevalence is reflected in formal help seeking, with males and females typically presenting in similar numbers. Most women have problems predominantly with EGMs. For example 95% of new female clients receiving face-to-face counselling in New Zealand during 2004, relative to 81% of males, reported EGMs as their primary mode of problematic gambling (Ministry of Health, 2005). This change was first noted in Las Vegas (Hunter, 1990) where 95% of female and 74% of male clients reported that they exclusively or predominantly played EGMs.

In considering the emergence of female problem gambling in Australia, the Productivity Commission concluded:

...liberalisation of gaming machines led to a whole new group of female problem gamblers. It is hard to think of any other process which could explain the formation of this group, other than the availability of machines. The Commission considers this the most powerful evidence in favour of a connection between problem gambling and the availability of gaming machines (Productivity Commission, 1999, p.8.22).

Age has also been consistently associated with differences in problem gambling prevalence (Shaffer, Hall & Vander Bilt, 1997; Abbott & Volberg, 1999; National Research Council, 1999). Adolescents and young adults generally have much higher

rates than adults in their thirties to fifties. Older adults have lower rates. High youth/young adult prevalence, particularly when assessed using 'lifetime' measures, has been interpreted as indicating that problem gambling has increased relative to earlier times. However, as with gender, some recent studies have found diminished age differences. New Zealand data are provided in Table 1. In 1991 people aged 18 to 24 years had a current prevalence rate almost four times higher than those aged 25 and older. In 1999 the younger group had significantly lower prevalence than eight years previously and did not differ from the older group. In the latter survey, the 25-34 years group had the highest prevalence, the same cohort that had a significantly elevated rate 1991 when they were younger. Although young adults had somewhat higher rates in the Productivity Commission survey, the difference between age groups was much less than in the earlier 'four cities' study.

Table 1 about here

Ethnicity and educational and socioeconomic status are additional factors that are often associated with prevalence differences. Findings from the Swedish national survey (Abbott, Volberg & Ronnberg, 2004) are typical of earlier North American and Australian studies, with elevated rates among males, youth, and some disadvantaged sectors of society. The Swedish findings are similar to those of the 1991 New Zealand survey. They are also somewhat similar to the 1999 'lifetime' prevalence findings. However, they differ markedly from the 1999 current prevalence data which, in addition to indicating no significant gender and age differences, suggested that unemployed people, beneficiaries and people in the lowest income groups were no longer at high risk.

Abbott and Volberg (2000) concluded that problem gambling appeared to have 'feminised', 'aged' and gone a bit 'up market'. Although these findings, along with those of the Productivity Commission survey, suggest that gambling participation and gambling problems have become more evenly spread throughout the population, there are exceptions. In New Zealand Maori and Pacific Islanders remained at high risk in the 1999 survey. Some migrant groups, predominantly recent migrants from non-English speaking countries, also experienced elevated risk. These latter groups also had higher prevalence rates in Sweden. Several of the high-risk groups in New Zealand and Sweden have interesting gambling patterns. Youth and women in Sweden, Pacific Islanders in New Zealand, and some groups of recent migrants in both countries, have 'bimodal' patterns of participation with relatively large numbers having little or no involvement in gambling and a significant minority that gambles frequently and has high expenditure. These appear to be sectors of the population that are beginning to enter the gambling 'market'. At this time of initial exposure, in addition to their bimodal participation patterns, they also have high rates of problem gambling. It has been proposed that as gambling becomes more widespread in these high risk population sectors, gambling problems will initially increase, then level out and decline over time (Abbott et al, 2004). As this proposed adaptation takes place, it is predicted that prevalence differences relative to groups that have gone through this transition previously will diminish.

Prospective studies

Pathological gambling is defined clinically as a chronic or chronically relapsing disorder with escalating disruption and harm to personal, family and vocational pursuits (American Psychiatric Association, 1994). This conceptualisation and the specific diagnostic criteria for pathological gambling derive largely from retrospective accounts by people who participated in Gamblers Anonymous groups and US inpatient treatment programmes during the 1960s and 70s. These people were predominantly middle aged, middle class white males who had developed problems with track betting and card games.

As indicated earlier, the prevalence (total stock) of a disorder is determined both by the inflow of new cases (incidence) and outflow of current cases through recovery, death and migration. If pathological gambling is a chronic disorder that can be arrested by treatment but not cured, then death or migration is the only way that people with this disorder can exit the population and contribute to a reduction in prevalence. While problem gamblers may have lower life expectancy owing to various health problems and elevated suicide risk, from the foregoing it follows that in this situation incidence would be the most important prevalence determinant.

Until the SOGS was modified in 1991 to include a current measure (Abbott & Volberg, 1991; 1992; 1996), only 'lifetime' measures existed, reflecting the prevailing notion that pathological gambling is a chronic condition. When the new measure was first used in a general population context it was found that under half of 'lifetime' probable pathological gamblers and a third of less serious problem gamblers met the criteria for inclusion in these categories currently (during the past 6 months) (Abbott & Volberg, 1991; 1996). These findings have since been replicated many times in different populations (Abbott & Volberg, 1999; Abbott et al, 2004). The difference between 'lifetime' and current (past 6 or 12 months) estimates has been regarded as an indicator of problem remission or recovery (Abbott & Volberg, 1991; Hodgins et al, 1999).

While typically 40-60% of people assessed as having had significant problems at some time are not currently problematic, Abbott and Volberg (2000) found large differences between sociodemographic groups in this regard. Asians, unemployed people and people with school qualifications only were of particular note, with very small proportions of 'lifetime' problem gamblers currently reporting problems. While compromised by small sample size, these findings raise the possibility that problems were highly transient in these groups. This is of interest in the present context because these were also groups that had much lower prevalence rates in 1999 than in 1991, suggesting that they might have high rates of natural recovery and that this played a part in accounting for the prevalence reductions.

To this point inferences have been made about change over time from cross sectional surveys. While suggesting that problem gambling is more transient than was previously thought and raising a number of potentially important questions, this type of investigation

is a poor proxy for prospective studies that re-assess the same individuals over a number of years. The first prospective adult general population study found that nearly three-quarters of 1991 'lifetime' probable pathological gamblers no longer scored within this range seven years later when reassessed using the same 'lifetime' measure (Abbott, Williams & Volberg, 1999; 2004). This indicates, among other things, that most people with serious gambling problems significantly under-report past problems. Although the original SOGS and 'lifetime' SOGS-R have good reliability over a short timeframe, it is apparent that they are highly unreliable when the re-test interval is extended to years rather than weeks. For this reason it cannot be regarded as a valid measure of the actual number of people who have ever experienced serious gambling problems during their lifetimes. A corollary is that the difference between 'lifetime' and current estimates in cross sectional studies greatly underestimates the transient nature of problem gambling. A further implication is that the apparently higher 'lifetime' prevalence rates for youth and young adults are an illusion, produced by the failure of most people who experienced problems when they were younger to report them as adults. The difference cannot, therefore, be interpreted as indicating that prevalence is increasing among younger people and, in the event that problems are of long duration, in the population as a whole.

A more accurate account of the stability of problem gambling is provided by consideration of change in current problem gambling status. Of those who were classified as current probable pathological gamblers in 1991, only a third currently experienced problems of this severity in 1998 (Abbott, Williams & Volberg, 1999). Just under a further third currently had problems of less severity and 45% were non-problematic. People who experienced less serious gambling problems when they were first assessed in 1991 were found to be in a highly transitional state. Only 9% remained currently problematic seven years later. Fourteen percent developed more serious problems (current probable pathological gamblers). Most (77%), however, were non-problematic. The majority of previous probable pathological and problem gamblers who no longer reported problems continued to gamble regularly, albeit rarely using EGMs. Thus, these findings were inconsistent both with the conceptualisation of pathological gambling as a chronic or chronically relapsing disorder and the belief that problem gamblers cannot return to non-problematic gambling.

Participants were only assessed twice, seven years apart, in the New Zealand prospective study. For this reason it might be argued that problem gamblers who did not experience problems at the time of their second assessment would do so subsequently, perhaps especially if they continued to engage in EGM or other forms of continuous gambling. While longer duration studies with multiple reassessments are required to examine this conjecture some relevant information is available. Another group included in the study consisted of 'lifetime' probable pathological and problem gamblers who, at the time of their assessment in 1991, were non-problematic and either did not gamble or gambled infrequently. Seven years later, in 1998, 92% of these previously problematic gamblers remained problem free and most of this group, approximately three-quarters, had resumed gambling regularly. The remainder, eight percent, relapsed and currently experienced problems.

Two further groups were included in the prospective study, 1991 regular continuous gamblers and 1991 regular non-continuous (predominantly lottery) gamblers who did not currently (in 1991) experience gambling problems. A significant minority in both groups had, however, experienced problems prior to 1991. In the case of regular continuous gamblers, under a third continued to participate this frequently in continuous forms seven years later. Most (63%) became infrequent or non-gamblers and a few (6%) developed gambling problems. In the case of regular non-continuous gamblers, most (59%) remained in this category, 16% gambled frequently using continuous forms, 20% did not gamble or did so infrequently, and four percent developed problems.

From the prospective study it was apparent that while a small number of people who were non-symptomatic in 1991 subsequently developed problems, far many more problem gamblers ceased to experience problems. It is important to note that people at low risk for problem gambling (non-gamblers and infrequent gamblers in 1991) were not included in the study and that many people in the 1991 non-problem study groups had previously experienced problems. It is likely that the incidence rate would be appreciably lower in the excluded sector of the population than the four to eight percent that was found in the 'non-problem' study groups. This suggests that outflow from the population of problem gamblers exceeded inflow and that this might in part explain the significant reduction in the prevalence rate in the subsequent 1999 national prevalence survey.

It is of further interest that none of the prospective study participants who did not have problems at follow-up received specialist gambling counselling. Reasons given by 1991 problem gamblers for decreased gambling involvement, when re-interviewed in 1998, included increased awareness of gambling problems or being "older and wiser" (25%), other priorities (16%), lack of interest (13%) and changes to lifestyle or residential location (13%). 1991 non-problem gamblers more often mentioned the last two reasons (33% and 23% respectively).

A small number of prospective studies have been conducted since the original 1999 study (see Abbott et al, 2004 for a review). All have confirmed the finding that problem gambling, for many, is a transitional rather than absorbing state. Unfortunately, less is known about the incidence of problem gambling in the general population, mainly because this requires the tracking of very large numbers of non-problem gamblers.

Before leaving the New Zealand study, findings from multivariate analyses are considered. Initially a large number of variables assessed in 1991 were examined individually in relation to current problem gambling outcome seven years later. Because some of these predictor variables were interrelated, stepwise multiple regression analysis was used to examine their relative predictive and explanatory capacity. One analysis was confined to people classified as having current or past gambling problems in 1991. A preference for track betting, current gambling problem severity and hazardous or problematic alcohol use were the strongest predictors of having problems seven years later. Male gender and non-European ethnicity (predominantly Maori and Pacific Islanders) were significant in univariate analyses but did not emerge in this multivariate analysis.

The ethnicity and alcohol use findings are congruent with Maori and Pacific Island ethnicity remaining major risk factors for problem gambling in the 1999 national survey (Abbott & Volberg, 2000), suggesting that part of the reason for this was that people in these groups more often have problems of longer duration. Given the focus of this article on EGMs in relation to problem gambling, it is of interest that a preference for EGMs did not predict future problems and that women had a better outcome than men, albeit that this was largely accounted for by other factors including gambling preference.

Closer examination of gambling participation is instructive. Of the 1991 probable pathological gamblers, at commencement of the study 51% reported track betting (betting on horse or dog races) weekly or more often and 31% reported playing non-casino EGMs this often. Seven years later, whereas there was no significant change in track betting participation (39%), only five percent played EGMs frequently ($p = .002$). Similar results were obtained for less serious problem gamblers. Frequent track betting was reported by 37% in 1991 and 26% in 1998; frequent EGM participation by 32% in 1991 and 8% in 1998 ($p = .012$). In the case of the 1991 non-problem groups, significant decreases (or increases) were not found with respect to either track or EGM participation.

Although further investigation is required, the above findings suggest that people who experience problems with track betting (who are more often men) typically have longer-lasting problems. Greater problem gambling severity and co-morbid alcohol problems further contribute to chronicity. Problem gamblers with this profile were typical of early GA and treatment participants in the US when the DSM pathological gambling diagnostic criteria were being developed. While the conceptualisation of pathological gambling as a chronic or chronically relapsing disorder may be appropriate for many problem gamblers of this type, in a number of countries they have been largely replaced by men and, increasingly women, who have developed problems in association with EGMs. It appears likely that EGM-related problems are labile, typically both developing and resolving much more rapidly than those linked to track betting and perhaps some other forms such as card games.

Data from counselling agencies in Australia are consistent with the view that women and people with problems with EGMs have much less enduring problems than those with problems with racing (Productivity Commission, 1999). The Commission, however, attributed this to the “more recent liberalisation of gaming machines” rather than disparate natural histories for different types of gambling problems and for this reason it concluded “...prevalence rates will climb in the future as the existing stock of problem gamblers accumulates” (p.6.60). The Commission data came from retrospective client accounts. As we have seen, prospective examination of problem gamblers drawn randomly from the general population and tracked over seven years suggests that these differences are real. Consequently, the ‘stock’ might not ‘accumulate’ in the way suggested.

The nature and measurement of exposure

Scientific investigation of relationships between proposed risk factors, such as the increased availability of or exposure to EGMs, and outcomes, e.g. problem gambling incidence or prevalence, requires accurate and reliable measurement. It also requires the incorporation of sound measures within methodologically robust studies in which exposure levels are varied while other factors that may affect outcome are held constant or controlled statistically. If the foregoing is not achieved, findings and conclusions drawn from research may be misleading or invalid.

Quantification is usually much easier when an agent is physical or organic in nature. In the case of agents of this type it is also generally easier to examine relationships between different exposures and outcomes in real-life settings as well to conduct controlled experiments to determine cause and effect. Different parameters of exposure may be examined including dose, potency and duration. This said, it can take many years or decades to elucidate the nature of linkages between a particular physical agent and outcome, for example tobacco smoking and lung cancer. It is much more of a challenge to quantify social and behavioural exposures, particularly those as diverse as gambling. Furthermore, there are practical and ethical constraints on experimental investigation.

Gambling research within a population health paradigm is at a rudimentary stage of development. This is reflected in the typically crude and varied ways in which aspects of exposure have been selected and measured in the studies referred to in this paper. This variability, along with the paucity of studies meeting criteria that enable strong causal inferences to be drawn, means that findings must be interpreted with caution. For example, failure to find a predicted relationship may be a consequence of selecting one aspect of exposure rather than another.

To illustrate the foregoing, consider the Productivity Commission (1999) finding of a very strong linear relationship between increase in the number of EGMs per capita at state/territory level and increased per capita EGM expenditure. Given the strength of this relationship it appears that it does not matter which of the two, machine numbers or expenditure, is used to measure exposure. However, while this relationship was strong overall, as discussed earlier, Victoria was a notable exception. Expenditure per EGM in Victoria was approximately double that of other jurisdictions. Using EGMs per capita to index exposure is misleading in this state. Per capita EGM expenditure, in this instance, allows more valid cross-jurisdictional comparison.

Western Australia is also relevant in the present context. In WA gaming machines are confined to one casino on the outskirts of Perth, the state's major city. Elsewhere in Australia EGMs, in addition to being located in casinos, are widely distributed in a variety of other settings. This means that machines are much less readily accessible in WA. This difference, which is likely to be important in terms of exposure and problem development, is not captured by simple measures such as number of EGMs per capita or mean expenditure per machine. Consequently, even in a single national jurisdiction such as Australia, a given index of exposure can mean different things in different sub-national jurisdictions.

Variability in the aspect or aspects of exposure selected and the way they are measured has potential to compromise meaningful accumulation and synthesis of data concerning the contribution of exposure to problem development and cessation. On the other hand, exposure is clearly multidimensional and it is only by differentiating and assessing various aspects in relation to gambling behaviour that this complexity will be understood.

It is important to develop more sophisticated and precise measures of gambling exposure. This could include the availability of, and expenditure on, different forms of gambling, the dispersal of and degree of accessibility to these forms, the time they have been available, and the extent to which problem gambling services and harm minimisation measures have been introduced. In addition to jurisdiction-wide assessment of exposure, it will also be necessary to examine exposure at local (Marshall, 2005) and individual (Shaffer, LaBrie & LaPlante, 2004) levels.

The Productivity Commission (1999) appreciated the potential importance of considering the multifaceted nature of exposure. Nine dimensions were identified. Some of these have been mentioned in this article, namely number of opportunities to gamble and number and location of venues. Others include opportunities to gamble per venue, opening hours, conditions of entry, ease of use of gambling form/s, initial outlay required and social accessibility. As discussed earlier, whether or not exposure measured by these or other indices has an impact is strongly influenced by the gambling form involved. For example in New Zealand and most parts of Australia there is very high exposure to lotteries and EGMs. However, only the latter is strongly associated with gambling-related problems (in particular circumstances). Casinos and track betting, while widespread, have relatively lower exposure. This may explain why, despite also being strongly associated with problems (again in particular circumstances), a much smaller proportion of problem gamblers report problems with these gambling activities. As discussed, these forms may also differ in the way in which they influence the nature and duration of problems.

Norway provides an interesting case with respect to the importance of considering the complexity of gambling exposure. As mentioned, adult and youth surveys suggest Norway has very low problem gambling prevalence rates relative to other national jurisdictions studied to date. On the face of it this is surprising given the relatively recent expansion of gaming machine availability and moderately high number of machines. At the time of the most recent Norwegian adult national survey, Norway had five machines per 1,000 adults. This is similar to New Zealand (6/1,000) at the time of the 1999 survey as well as to most Canadian jurisdictions (4-6/1,000) – all of which have substantially higher problem gambling prevalence rates. There are additional reasons for expecting that prevalence would be higher in Norway than it appears to be. While most machines are not high intensity EGMs, they are very accessible. Locations include petrol stations, supermarkets and shopping centres. At the time when prevalence surveys were undertaken the regulatory framework was loose and there was a virtual absence of measures explicitly designed to reduce gambling-related harms. There were few restrictions such as access age or the location of money vending machines. Problem gambling information and counselling services were rudimentary.

The author and Rachel Volberg recently examined information regarding gaming machine distribution in Norway and made site visits to venues. While machines are apparently more widely distributed than in most if not all other jurisdictions, there are some unusual aspects to their accessibility. Typically there were only one or a few machines per venue. Seating was not generally provided and they were in full view of people not engaged in gambling activities, e.g. buying petrol or groceries. It was not uncommon for a machine to be placed next to a supermarket checkout or a shop doorway. Given Norway's weather, these may not be comfortable locations for much of the year! Relatively few machines are located in venues where alcohol is served or smoking acceptable. These various contextual factors may play important roles in reducing lengthy exposure to otherwise high-risk gambling activities.

More rigorous examination of the Norwegian situation could be helpful in advancing understanding of the ways in which different facets of availability influence gambling behaviour. This might inform the development of harm minimisation strategies in other jurisdictions as well as in Norway. While there is strong evidence that rates are low in this country, it cannot be assumed that they will remain low if different types of machines are introduced and numbers and their distribution change appreciably. It is unlikely that major sections of Norway's population has gone through an 'adaptation' phase that appears to be occurring in longer EGM exposed jurisdictions.

Before leaving Norway, it is worth noting that national jurisdictions vary in numerous ways, apart from exposure to gambling activities. Some of these differences could have a significant impact on gambling behaviour including problem gambling. For example Norway, like other Nordic countries, has a high degree of ethnic homogeneity relative to Australia, New Zealand and many North American jurisdictions. In the case of New Zealand approximately half of problem gamblers are Maori, Pacific Islanders or Asians (Abbott & Volberg, 2000). The SOGS-R adult current probable pathological gambling prevalence estimates for Norway and New Zealand are 0.2% and 0.5% respectively. However, the New Zealand European estimate (0.3%) is not significantly different to Norway.

Conclusion

I recall a cartoon depicting an astronomer peering into space through a telescope and saying to a colleague, "I'm not sure if it's a huge pile of cosmic dust or the emergence of a new galaxy." A previous reviewer of the broad gambling studies literature concluded that it was "the most disconnected, confused mass of materials" he had ever come across and that it is "a true scientific mess" (Wildman, 1998). To provide a focus to the present paper and guide consideration of relevant research, four hypotheses were presented. The studies considered employ a variety of methodologies with differing strengths and weaknesses. While drawn from an area of study at an early stage of development conceptually and substantively - and not devoid of noise and uncertainty - some patterns appear to be emerging. I believe these patterns provide pointers that, through conceptual refinement and further investigation, will lead to more sophisticated understanding of

relationships between exposure to EGMs and gambling behaviour, including gambling-related problems. This understanding is expected to have important implications for policy and practice.

With regard to exposure theory, Shaffer, LaBrie and LaPlante (2004) asserted “to our knowledge, no scientific research has established a causal link between disordered gambling and either literal or figurative proximity to gambling” (p.43). This contrasts with the conclusion reached by other reviewers. For example, the Productivity Commission (1999) stated:

While causation is hard to prove beyond all doubt, the Commission considers that there is sufficient evidence from many different sources to suggest a significant connection between greater accessibility – particularly of gaming machines – and the greater prevalence of problem gambling (p.8.1).

Similarly, the Gambling Review Body (2001) concluded:

A central question for us has been whether increasing the availability of gambling will lead to an increase in the prevalence of problem gambling. The weight of evidence suggests that it will (p.85).

The Productivity Commission is correct in noting that establishing causation is particularly difficult. Strictly speaking theories or hypotheses are never proven and always remain tentative. Studies expose hypothesised relationships to risk of refutation. If a predicted relationship is not demonstrated, the hypothesis is rejected. However, if it is not rejected this does not mean it has been proven. Although researchers and others who cite their findings often refer to hypotheses being confirmed or proven, they are committing the logical error of affirming the consequent. This error is also implicit in the common practice of journal editors who display a preference for articles that describe ‘positive’ results – studies where expected relationships have not been rejected. In fact, predictive failures have much more weight in terms of their logical implications than successful predictions. Albert Einstein put this succinctly – “no amount of experimentation can ever prove me right: a single experiment can prove me wrong” (cited in Wynn & Wiggins, 1997, p.107).

Selective publication bias is relevant to the matters addressed in this paper. Mention has been made of a study that was not published. How many others are there? The author has reviewed technically sound manuscripts that reported ‘negative results’, e.g. problem gambling prevalence being unrelated to residential proximity to casinos, that have not been published. This practice has significant adverse consequences for the advancement of knowledge.

When outcomes are consistent with a hypothesis, all that can be concluded is that there was this consistency or that the findings are corroborative. Even multiple replications using rigorous methodologies do not constitute proof of a presumed causal relationship (Popper, 1972). However, as findings of this type accumulate, most reasonable people

experience increased confidence that the relationship is robust and likely to hold on future occasions.

The theoretical conjectures considered in this paper vary in the extent to which they have been exposed to serious risk of refutation. In the case of exposure theory in its original form, many studies have been corroborative. However, many others, and perhaps additional studies that remain unpublished, failed to demonstrate the predicted relationship. Rather than reject the theory, the version presented at the outset of this paper proposes that its applicability (range of convenience) is confined to the early stage of exposure. A number of the studies presented generated findings consistent with this modified formulation. Unfortunately, very few prevalence studies were undertaken prior to EGM introduction. This reduced opportunities to directly assess the modified model by comparison of prevalence rates before and after their introduction.

The application of adaptation theory to gambling is relatively new and has seldom been stated a priori and assessed explicitly. However, findings from a number of studies are consistent with the view that adaptation takes place at individual and societal levels. Although there are some indications that regulatory and public health measures may contribute to adaptation, relevant research is in its infancy. Similarly, little research has compared the duration of EGM-linked problem gambling with other forms. However, the findings of a few studies corroborate the hypothesis that the former are often more transitory than problems associated with track betting. Prospective studies, among others, are required to advance knowledge in this area.

While stated tentatively, it appears that the introduction and expansion of new forms of gambling during the past few decades, perhaps especially EGMs, has resulted in substantially increased levels of problem gambling. Initially, particular population sectors including males and youth were most affected, but over time in some jurisdictions problems have extended to groups that previously had low levels of participation and problematic gambling. More recently, in some jurisdictions that have experienced prolonged and increased availability, prevalence rates have remained constant or declined. Again, there is variation across population sectors. The reasons for prevalence reductions have yet to be clearly delineated but they apparently involve a diversity of adaptations at societal, community and individual levels. Both reduced exposure, e.g. fewer people gambling frequently, and protective changes may be involved. These adaptations appear to have reduced both the inflow of new cases and increased outflow. There are indications that while regular EGM participation often leads to loss of control and problem development, these problems are typically more transient than those associated with track betting and perhaps some other forms of continuous gambling. The extent to which this is related to inherent properties of different forms of gambling rather than factors associated with the individuals and groups who develop problems remains to be determined.

The major focus of this article has been on relationships between EGM exposure, participation and problem gambling. Like love and marriage, or horses and carriages, it appears that they come in a variety of forms and that while they can “go together”, this is

far from inevitable. Understanding of the circumstances under which EGM exposure, participation and problems are strongly linked, as opposed to weakly linked or disconnected, is rudimentary. It is apparent that future research, apart from refining the measurement of EGM exposure at macro and micro levels, will need to pay greater attention to the roles that other environmental and individual factors play in problem development and cessation. At present too little is known, in any particular context, to be able to predict with certainty the consequences of increased or decreased EGM availability.

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Table 1: Comparison of current probable pathological gambling prevalence estimates from the 1991 and 1999 New Zealand National Surveys

Selected characteristics		1991	1999
New Zealand		1.2 (0.9, 1.6)	0.5 * (0.3, 0.7)
Age Group	18-24	3.0 (1.7, 5.2)	0.4 * (0.1, 1.6)
	25 plus	0.8 (0.6, 1.3)	0.5 (0.3, 0.8)
Sex	Male	2.0 (1.4, 2.9)	0.4 * (0.2, 0.8)
	Female	1.0 (0.6, 1.6)	0.5 (0.2, 1.0)

* p < .05

Figure 1: Current probable pathological gambling prevalence estimates and the number of gaming machines per 1000 adults by jurisdiction: Australia and New Zealand

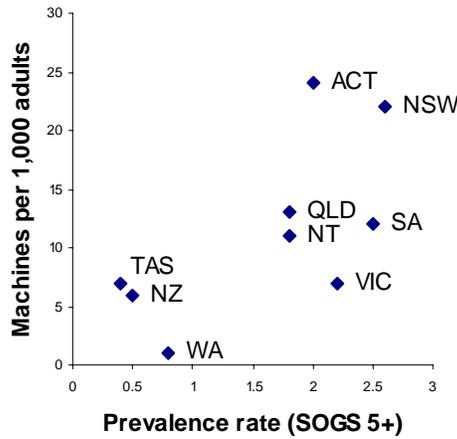


Figure 2: Current probable pathological gambling prevalence estimates and gaming machine expenditure per adult by jurisdiction: Australia and New Zealand

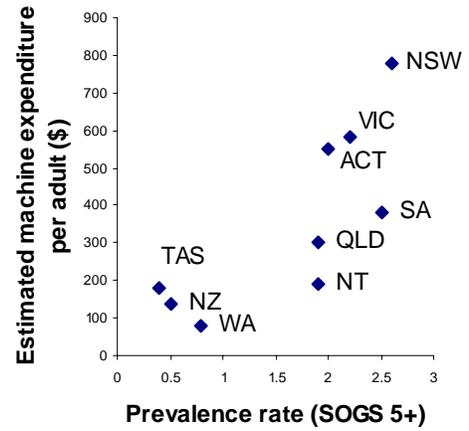


Figure 3: Current serious problem gambling prevalence estimates and gaming machine numbers by jurisdiction: Canada

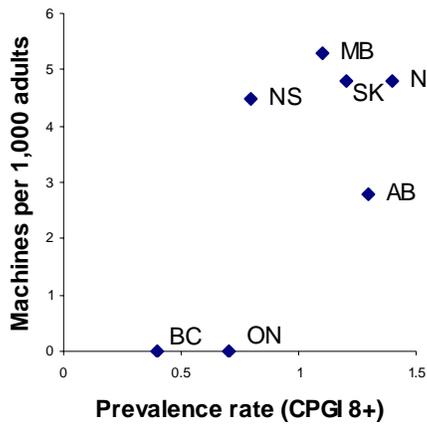


Figure 4: Current probable pathological gambling prevalence estimates: Australia and New Zealand surveys

