

Problem Gambling and Integrated Resort Development: Exposure, Adaptation, and Prevalence*

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June 15, 2015

I. INTRODUCTION

Over the past three decades there has been a considerable liberalization of the regulation and operation of gaming activities around the world, as well as an impressive growth of new and existing forms of gambling. This situation has led to a significant increase in the availability and accessibility of gambling opportunities. Along with this substantial liberalization and growth, there has been a significant increase in the advertising and promotion of gambling. However, while this worldwide growth and active promotion have played a central role in making gambling a popular and “normal” recreational activity, there is also increasing community concern regarding the impacts of the gambling industry. Particular attention has been paid to the impact of increased exposure to legal gambling opportunities on the prevalence of pathological or problem gambling, since it is assumed to be a key driver of social costs.

The academic literature on gambling and gambling behavior is continually developing. In this report we review the findings from the latest academic literature related to how the availability and accessibility of gambling have affected the prevalence of problem gambling. This review can help to inform policymakers and regulators in places such as Japan, South Korea, Taiwan, and other jurisdictions which are considering the legalization or expansion of the commercial casino industry. An understanding of these issues can be helpful to informing strategies for identifying, treating, and minimizing the harms associated with problem gambling.

* This report is written for Las Vegas Sands. The opinions contained in this report are those of the authors, not necessarily of institutions with which they are affiliated or of Las Vegas Sands. The authors retain copyright of the material contained in this report. Much of this material is based on R. A. St-Pierre, D. M. Walker, J. Derevensky, and R. Gupta (2014), How availability and accessibility of gambling venues influence problem gambling: A review of the literature. *Gaming Law Review and Economics*, 18, pp. 150-172. Readers interested in a more detailed review of the literature should see that paper.

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II. BACKGROUND

Pathological gambling, renamed ‘gambling disorder’ in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), is a serious psychiatric condition that interferes with life functioning, and negatively affects the gambler, significant others, and the community.¹ It is also referred to as ‘problem gambling’ in the literature, although this term has been used to denote to both pathological gambling and/or less severe forms of the disorder. In this report, we will consider problem gambling and pathological or disordered gambling as representing excessive gambling behaviors, and will use the term ‘problem gambling’ to refer to all of these behaviors.

Problem gambling is currently thought of as a behavioral addiction that is characterized by excessive and dysfunctional gambling behavior,² and typically leads to significant harm and distress for the individual. Several negative consequences are associated with problem gambling, and these include: (1) substantial financial problems (e.g., high debt, personal bankruptcy filing); (2) presence of other substance use problems and/or psychiatric conditions (e.g., depression, anxiety) in addition to gambling problems; (3) strained family relationships and violence; and (4) employment-related problems (e.g., absenteeism, loss of employment). Diagnosis of the disorder requires meeting four of nine criteria in the DSM-5, and symptoms include frequent thinking about or preoccupation with gambling, loss of control over gambling behavior, frequent chasing to recoup gambling losses, tolerance or a frequent need to gamble with increasing amounts of money, and lying or use of deception to conceal the extent of gambling involvement.³

As is the case with other potentially addictive behaviors such as alcohol and substance use, gambling for most individuals is an occasional recreational activity that leads to few negative consequences. However, evidence suggests that a small but meaningful proportion of the population do gamble excessively and experience significant problems. Current estimates reveal that anywhere between 0.4% and 7.6% of the general adult population, globally, meets DSM criteria for problem gambling.⁴ It is important to note that these rates differ depending on the specific country or jurisdiction that is examined, the year the survey was conducted, and the method or instrument used to assess the presence problem gambling. The lowest prevalence rates

¹ N. M. Petry, C. Blanco, R. Stinchfield, & R. Volberg (2012), An empirical evaluation of proposed changes for gambling diagnosis in the DSM-5. *Addiction*, 108, p. 575.

² M. N. Potenza (2013), Neurobiology of gambling behaviors. *Current Opinion in Neurobiology*, 23, p. 660.

³ American Psychiatric Association (2013), *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: Author.

⁴ These problem gambling estimates are ‘standardized’. This means that they represent the percentage of adults considered to be a problem gambler in the past year while taking into account the population from which the study participants were selected, and any differences in the methods or instruments used to assess for gambling problems. See S. Stucki & M. Rihs-Middel (2007), Prevalence of adult problem and pathological gambling between 2000 and 2005: An update. *Journal of Gambling Studies*, 23, pp. 251-252; R. J. Williams, R. A. Volberg, & R. M. G. Stevens (2012), The population prevalence of problem gambling: Methodological influences, standardized rates, jurisdictional differences, and worldwide trends. Guelph, ON, Canada: Ontario Problem Gambling Research Centre. (<http://hdl.handle.net/10133/3068>; accessed May 13, 2015.)

tend to be observed in Europe, while intermediate rates are found in North America, and the highest rates are reported in Asia.⁵ An illustration of differences in estimated problem gambling prevalence rates, depending on the jurisdiction, is provided in Table 1.

Table 1. *Estimated problem gambling prevalence rates by jurisdiction*

Jurisdiction	Prevalence rate*
Europe	
Denmark	0.1–0.2%
Germany	0.2–0.6%
Great Britain	0.2–0.7%
Iceland	0.3–0.6%
The Netherlands	0.3%
France	0.4%
North America	
Canada	0.5–1.3%
United States	0.6–1.4%
Asia	
Singapore	1.4–2.1%
Hong Kong	1.4–2.2%
Macau	1.8%

Sources: William et al., *op cit.*, pp. 63-130; Stucki & Rihs-Middel, *op cit.*, pp. 250-251.

Note: * These prevalence rates are 'unstandardized', and therefore represent the percentage of adults considered to be a problem gambler in the past year not taking into account any population or methodological differences.

III. RELATIONSHIP BETWEEN CASINO VENUES AND PROBLEM GAMBLING

There is a general assumption within the psychological and sociological literature that casino gambling contributes to the development of problem gambling. One reason given for this link is that there are a large number of different opportunities to gamble available within a single casino venue.⁶ Another possible explanation for this relationship is that casino-type gambling encompasses a large number of 'structural characteristics' that can encourage and maintain gambling behaviors.⁷ These structural characteristics include rapid event frequencies (i.e., opportunities to gamble are limited only by how fast a person can play), short pay out intervals

⁵ Williams et al., *op cit.*, p. 5.

⁶ A. C. Thomas, G. Bates, S. Moore, M. Kyrios, D. Meredyth, & G. Jessop (2011), Gambling and the multidimensionality of accessibility: More than just proximity to venues. *International Journal of Mental Health and Addiction*, 9, p. 90.

⁷ M. Griffiths (1999), Gambling technologies: Prospects for problem gambling. *Journal of Gambling Studies*, 15, p. 268.

(i.e., brief time delay between the initial gamble and the payment of winnings), player involvement in the game and perceived skill features (i.e., create an illusion of control over the outcome of the game), and near miss designs (i.e., create the illusion of coming close to winning a substantial prize).⁸ Although researchers have yet to decisively conclude exactly how many available gambling activities may increase the probability of developing a gambling problem or which structural characteristics are more likely to make certain forms of gambling more ‘addictive’ than others,⁹ the relationship between casino gambling and excessive gambling behavior warrants consideration.

An early study by Fisher compared frequent casino patrons who visit casinos once a week or more, to occasional casino visitors.¹⁰ She revealed that the prevalence of problem gambling among frequent casino gamblers was more than four times that of occasional casino patrons (8.1% vs. 1.7%). However, the greater proportion of problem gambling observed among frequent casino patrons must be considered in light of certain limitations; the survey did not ask casino patrons whether they participated in other gambling activities in addition to casino gambling. As such, it is possible that the frequent casino gamblers surveyed in Fisher’s study also participated in other betting activities that can also present a risk for the development of problem behaviors (e.g., playing electronic gambling machines [EGMs] outside of a casino venue), and that it is not frequent casino gambling alone that explains the higher percentage of problem gambling among this group.

Welte and his associates also examined the association of casino play with gambling problems in a series of papers. They surveyed U.S. youth (aged 14 – 21 years) and adults (aged 18 years and older) nationwide and found that, when all forms of gambling are considered simultaneously, casino gambling had the second greatest impact on individual gambling problems.¹¹ Also, using a more complex data analysis strategy, Welte and colleagues observed that casino play makes the largest contribution to the gambling problems of adult gamblers.¹² While the results from these studies do suggest that casino gambling is associated with problem gambling, definitive conclusions cannot be drawn about whether it is one particular casino game

⁸ T. Leino, T. Torsheim, A. Blaszczynski, M. Griffiths, R. Mentzoni, S. Pallesen, & H. Molde (in press). The relationship between structural game characteristics and gambling behavior: A population-level study. *Journal of Gambling Studies*. (<http://link.springer.com/article/10.1007%2Fs10899-014-9477-y>; accessed May 19, 2015.)

⁹ N. Dowling, D. Smith, & T. Thomas (2005), Electronic gaming machines: Are they the ‘crack-cocaine’ of gambling? *Addiction*, 100, p. 42; J. Parke & M. Griffiths (2006), The psychology of the fruit machine: The role of structural characteristics (revisited). *International Journal of Mental Health and Addiction*, 4, p. 175.

¹⁰ S. Fisher (2000), Measuring the prevalence of sector-specific problem gambling: A study of casino patrons. *Journal of Gambling Studies*, 16, pp. 35-36.

¹¹ J. W. Welte, G. M. Barnes, W. F. Wieczorek, M.-C. O. Tidwell, & J. H. Hoffman (2009a), The association of form of gambling with problem gambling among American youth. *Psychology of Addictive Behaviors*, 23, p.110; J. W. Welte, G. M. Barnes, W. F. Wieczorek, M.-C. O. Tidwell, & J. C. Parker (2004), Risk factors for pathological gambling. *Addictive Behaviors*, 29, p. 330.

¹² J. W. Welte, G. M. Barnes, W. F. Wieczorek, M.-C. O. Tidwell, & J. H. Hoffman (2007), Type of gambling and availability as risk factors for problem gambling: A Tobit regression analysis by age and gender. *International Gambling Studies*, 7, p. 191.

or activity that presents a greater risk to individuals for problem gambling, or whether it is the multiple opportunities to gamble available at casinos which poses a greater risk. Indeed, there is ample evidence to suggest that problem gamblers are more likely to engage in a larger number of gambling types or activities than non-problem gamblers.¹³

Besides the structural characteristics of casino gambling, it has also been suggested that the unique ‘situational characteristics’ of a casino venue can also make players more vulnerable to developing gambling problems.¹⁴ Situational characteristics refer to the features of the environment that are separate from the gambling activity or device itself, such as the location of the gambling venue/outlet, the number of gambling venues/outlets in a specific area, the venue/outlet’s opening hours, the use of advertising, and consumer incentives.¹⁵ The availability and accessibility of casino venues are particular situational characteristics that have attracted attention from researchers and policy makers over the past few decades.

Gambling availability and accessibility can be understood along several different dimensions, including geographical or physical accessibility, temporal accessibility, and social accessibility.¹⁶ Geographical accessibility refers to the scattering of venues and gambling opportunities within a specific geographical area. Included under the umbrella of geographic accessibility are the number of venues and gambling opportunities *per capita*, as well as the distance or travel time from the gambling opportunity to home, work, or community and socializing venues. Temporal accessibility, on the other hand, relates to the amount of time legal gambling opportunities have been available in a specific area, or the hours of operation of gambling venues. Recently, researchers have considered an interaction between geographic and temporal accessibility, called “space-time accessibility” or “geo-temporal accessibility”, as a dimension of accessibility. They argue that geo-temporal accessibility merits attention since gambling venues that are closer and have longer hours of operation offer far greater accessibility to individuals than those which are equally close but have shorter hours of operation or those that offer the same hours of operations but are more remote.¹⁷ Finally, social accessibility refers to the degree that a gambler perceives the gambling product or venue as attractive and safe. Encompassed within the concept of social accessibility are the gambler’s subjective judgments regarding conditions of entry (e.g., membership conditions and dress codes), ease of use (e.g., skill requirements of a game), safety (e.g., cleanliness, trustworthiness, and reputation), and venue incentives or rewards (e.g., loyalty programs, provision of courtesy transportation).

¹³ T. Holtgraves (2009), Gambling, gambling activities, and problem gambling. *Psychology of Addictive Behaviors*, 23, 299; Welte et al., *op cit.*, p. 331.

¹⁴ M. W. Abbott & D. Clarke (2007), Prospective problem gambling research: Contribution and potential. *International Gambling Studies*, 7, p. 127; H. J. Shaffer, D. LaPlante, R. LaBrie, R. Kidman, A. Donato, & M. Stanton (2004), Toward a syndrome model of addiction: Multiple expressions, common etiology. *Harvard Review of Psychiatry*, 12, p. 368.

¹⁵ Dowling et al., *op cit.*, p. 39; Griffiths, *op cit.*, p. 267.

¹⁶ D. Marshall (2005), The gambling environment and gambler behaviour: Evidence from Richmond-Tweed, Australia. *International Gambling Studies*, 5, p. 69; Thomas et al., *op cit.*, p. 89.

¹⁷ Marshall, *op cit.*, pp. 67-69; Thomas et al., *op cit.*, p. 90.

Geographical accessibility

While it would be important to consider all dimensions of accessibility, research examining the relationship between gambling accessibility and problem gambling has mainly focused on geographical accessibility. Positive findings for an association between the geographical availability and the prevalence of problem gambling have been reported in several studies. The majority of these studies used population surveys to measure gambling problems, and then evaluated how the dispersion of gambling venues in a specific geographical area influences problem gambling prevalence rates.

Rush, Veldhuizen, and Adlaf examined the distance between each survey respondent's residence and the nearest commercial or charitable casino and EGM venue in Ontario, Canada.¹⁸ They found that residential distance from the closest gambling venues had a minor relationship with problem gambling in the general adult population. Similar findings have been reported in two national studies with U.S. and New Zealand residents.

Specifically, the study by Welte, Wieczorek, and colleagues looked at the impact of residential distance to gambling venues (i.e., casinos, card rooms, racing tracks, jai alai frontons) on gambling problems, while also taking into account certain demographic and neighborhood-level characteristics (e.g., ethnicity, socioeconomic status [SES], neighborhood disadvantage).¹⁹ The results revealed a positive relationship between residential distance to casinos and the prevalence of problem gambling. Specifically, the researchers found that individuals residing within 10 miles of a casino were twice as likely to be problem gamblers than those who lived farther away.

The study by Pearce and colleagues also examined the relationship between residential distance to multiple types of gambling venues (e.g., casinos, non-casino EGMs, and betting outlets) and gambling behaviors, while taking into account demographic, neighborhood and urbanization variables (e.g., age, sex, SES, neighborhood deprivation, urban/rural residence).²⁰ They uncovered a positive link between residential distance and problem gambling, with people residing closest to all types of gambling venues (i.e., less than 0.4 miles away) being two times more likely to be problem gamblers than individuals residing at the greatest distance from these venues (i.e., more than 1.9 miles away).

However, there is evidence to suggest that the relationship between residential distance to gambling venues and gambling problems may differ depending on the age of the gambler. Specifically, using the same survey respondents as in the 2004 study, Welte and associates observed that residential distance to casinos (i.e., presence of casinos within 10 miles) had no

¹⁸ B. Rush, S. Veldhuizen, & E. Adlaf (2007), Mapping the prevalence of problem gambling and its association with treatment accessibility and proximity to gambling venues. *Journal of Gambling Issues*, 20, pp. 193-213.

¹⁹ J. W. Welte, W. F. Wieczorek, G. M. Barnes, M.-C. Tidwell, & J. H. Hoffman (2004), The relationship of ecological and geographic factors to gambling behavior and pathology. *Journal of Gambling Studies*, 20, pp. 405-423.

²⁰ J. Pearce, K. Mason, R. Hiscock, & P. Day (2008), A national study of neighbourhood access to gambling opportunities and individual gambling behaviour. *Journal of Epidemiology and Community Health*, 62, pp. 862-868.

effect on gambling problems for younger respondents (aged 18 – 29 years).²¹ On the other hand, they found that residential distance to casinos was significantly associated with gambling problems for older respondents (aged 30 years or more). It is important to note that the non-significant relationship between residential distance to casinos and problem gambling for individuals under 30 was not due to fewer opportunities for casino gambling amongst younger individuals or the enforcement of legal age limits. In fact, analyses revealed that residential distance to casinos had no relationship to gambling problems for respondents aged 21-29 years or for respondents aged 18-20 years.

One study has also examined the relationship between non-residential distance to casino venues and problem gambling among university students in Ontario, Canada.²² Adams and colleagues observed that attendance of educational institutions located near casinos was significantly linked to gambling problems. Specifically, they found that severe gambling problems were reported by a greater percentage of students enrolled in universities situated near casinos compared with students enrolled in universities located at a distance from casinos (80% vs. 20%). An important weakness of this study, however, is that the authors used less sophisticated data analysis methods. The drawback is that these methods do not allow the authors to tease apart the effects of non-residential distance to casino venues from other potentially influential factors, including the number of regulated gambling opportunities available in the area and residential distance from casinos or other gambling venues. As such, it is possible that the positive association of non-residential distance to casino venues with problem gambling is actually due to other geographical accessibility factors.

In addition to distance to gambling venues, Welte and colleagues investigated the impact of accompanying measures of geographical accessibility on gambling problems.²³ Unlike the studies discussed above, geographical accessibility was defined as the number of different forms of legal gambling operating within respondents' respective states. They found that the number of legal gambling operations available in a jurisdiction was positively associated with problem gambling. Specifically, Welte and associates observed that the likelihood of having gambling problems increased by 39% with each additional form of legal gambling operating in a jurisdiction for young adult respondents (ages 18 – 21 years). Alternatively, no significant effect of the number of legal gambling activities operating in a state on problem gambling was found for adolescents (ages 14 – 17 years). This is likely because of the limited number of gambling opportunities available to the younger age group, as well as the enforcement of legal age limits.

Since a high prevalence rate of problem gambling has been found among casino self-excluders, enrolment in self-exclusion programs can be also used an indicator of gambling problems. As such, LaBrie and associates assessed the geographical distribution of 6,599 self-

²¹ Welte et al. (2007), *op cit.*, p. 193.

²² G. R. Adams, A.-M. Sullivan, K. D. Horton, R. Menna, & A. M. Guilmette (2007), A study of differences in Canadian university students' gambling and proximity to a casino. *Journal of Gambling Issues*, 19, 9-17.

²³ J. W. Welte, G. M. Barnes, M.-C. O. Tidwell, & J. H. Hoffman (2009b), Legal gambling availability and problem gambling among adolescents and young adults. *International Gambling Studies*, 9, pp. 89-99.

excluders within the state of Missouri over a seven-year period.²⁴ They found that the *per capita* self-exclusion enrolment rates were higher in areas with closer access to casinos. Labrie and colleagues also reported that both the distance of self-excluders from the nearest casino and the number of casinos surrounding the nearest casino were significantly related to self-exclusion enrolment rates.

Similar to enrolment in self-exclusion programs, researchers have also looked at help-seeking behavior as an alternative marker of gambling problems. Specifically, Barratt and her colleagues studied the relationship between geographical accessibility and help-seeking behavior (i.e., using telephone and face-to-face counseling services), taking into account a multitude of demographic and area-level attributes (e.g., age, gender, area socioeconomic disadvantage, unemployment rate, crime rates, liquor license rates).²⁵ For the purposes of their study, Barratt and associates defined ‘geographic accessibility’ as EGM density or the number of EGMs in a region *per capita*. They observed that a 10% increase in EGM density would lead to a 3.3–6.0% increase in the number of problem gamblers seeking help. It is important to note, however, that this study focused exclusively on EGMs available in gambling venues other than casinos. As such, it is possible that Barratt and colleagues underestimate the strength of the relationship between geographic accessibility of EGMs and help seeking for problem gambling in their study.

Despite positive findings from a number of studies, not all existing research supports an association between geographical accessibility and problematic gambling behavior. In a first study investigating the relationship between casino geographical proximity and gambling behavior for 8,842 survey respondents in Québec, Canada, Sévigny and colleagues found no significant association between the travelling distance from the closest casino to participants’ residence and gambling problems.²⁶ Prevalence rates for problem gambling were therefore comparable for individuals residing near and individuals living at a distance from casinos.

In a second study, Sévigny and associates compared the gambling behaviors of a group of 4,922 survey respondents residing within a 100-km driving distance from the Montréal casino and a group of 3,920 respondents living more than 100 km from the same venue.²⁷ Again, no significant relationship between travelling distance from residence to the casino and gambling problems was observed. Nevertheless, findings from these two studies should be considered in light of certain limitations; the researchers did not ask respondents whether they participated in other gambling activities in addition to casino gambling or what their preferred gambling activities are. It is possible that the non-significant relationships between travelling distance to casino venues and gambling problems is attributable to survey respondents’ frequent

²⁴ R. A. LaBrie, S. E. Nelson, D. A. LaPlante, A. J. Peller, G. Caro, & H. J. Shaffer (2007), Missouri casino self-excluders: Distributions across time and space. *Journal of Gambling Studies*, 23, pp. 231-243.

²⁵ M. J. Barratt, M. Livingston, S. Matthews, & S. L. Clemens (2014), Gaming machine density is correlated with rates of help-seeking for problem gambling: A local area analysis in Victoria, Australia. *Journal of Gambling Issues*, 29, 1-21.

²⁶ S. Sévigny, R. Ladouceur, C. Jacques, & M. Cantinotti (2008), Links between casino proximity and gambling participation, expenditure, and pathology. *Psychology of Addictive Behaviors*, 22, pp. 296-298.

²⁷ *Ibid.*, pp. 298-299.

participation in other forms of gambling (e.g., EGMS, which are conveniently located in all geographical regions) or their gambling activity preferences (i.e., casino games may not be the main gambling activity for individuals with gambling problems).

Young and colleagues also examined the association between travelling distance from residence to most frequented gambling venues and risk of problem gambling among residents of the Northern Territory of Australia.²⁸ Unlike Sévigny and associates, however, the authors investigated the association between geographical access and gambling problem while taking into account other influential individual- and neighborhood-level factors (e.g., age, gender, neighborhood disadvantage). Nevertheless, even with attempts to control for other influential factors, Young and colleagues reported no significant effect of travelling distance to most frequently visited gambling venue on problem gambling. In other words, travelling distance to respondents' most frequented gambling venue affected the degree of risk for gambling problems equally for all gamblers.

Temporal accessibility

In comparison to geographical accessibility, the impact of temporal accessibility on the prevalence of problem gambling has been a relatively neglected area of research. A handful of studies have recently explored changes or trends in problem gambling prevalence rates over the past three decades, a period where the availability and accessibility of new and existing gambling opportunities has steadily increased in most jurisdictions. It is assumed that as availability and accessibility of gambling opportunities has increased over time, exposure to the game offers and venues has also increased. It is also expected that as exposure to game offers and venues increases, the likelihood for participating more frequently in gambling and for the development of gambling problems will increase accordingly.

Surprisingly, the majority of these investigations indicate that rates of current problem gambling have stayed somewhat constant over time,²⁹ or have declined.³⁰ It is important to note that stable or declining prevalence rates have been found in several different jurisdictions,

²⁸ M. Young, F. Markham, & B. Doran (2012), Too close to home? The relationships between residential distance to venue and gambling outcomes. *International Gambling Studies*, 12, pp. 257-273.

²⁹ M. W. Abbott, U. Romild, & R. A. Volberg (2014), Gambling and problem gambling in Sweden: Changes between 1998 and 2009. *Journal of Gambling Studies*, 30, p. 992; M. Abbott, C. A. Stone, R. Billi, & K. Yeung (in press), Gambling and Problem Gambling in Victoria, Australia: Changes over 5 years. *Journal of Gambling Studies*. (<http://link.springer.com/article/10.1007/s10899-015-9542-1>, accessed May 5, 2015); J. W. Welte, G. M. Barnes, M.-C. O. Tidwell, J. H. Hoffman, & W. F. Wieczorek (in press), Gambling and problem gambling the United States: Changes between 1999 and 2013. *Journal of Gambling Studies*. (<http://link.springer.com/article/10.1007/s10899-014-9471-4>, accessed April 16, 2015.)

³⁰ J. Storer, M. Abbott, & J. Stubbs (2009), Access or adaptation? A meta-analysis of surveys of problem gambling prevalence in Australia and New Zealand with respect to concentration of electronic gaming machines. *International Gambling Studies*, 9, p. 238; M. Winslow, C. Cheok, & M. Subramaniam (in press), Gambling in Singapore: An overview of history, research, treatment and policy. *Addiction*. (<http://onlinelibrary.wiley.com/doi/10.1111/add.12931/pdf>, accessed May 26, 2015.)

including North American (United States), European (Sweden), Australasian (state of Victoria, Australia) and Asian (Singapore) jurisdictions. In their review of prevalence studies conducted over the past 30 years, Williams and associates observed a general increase in prevalence rates from the late 1980s through the late 1990s, followed by a worldwide downward trend thereafter.³¹ A similar rise-and-fall trend in problem gambling prevalence rates has been reported specifically for Macau, China between the years 2003 and 2011,³² a period when the number of casinos in operation in Macau more than tripled.³³ Based on these findings, it appears that increased availability of legal gambling opportunities does not automatically give rise to steady increases in rates of problem gambling over time, regardless of the jurisdiction.

Only one study, to our knowledge, has investigated the influence of gambling venue opening hours on gambling behavior. Using simulations models of gambling behavior, Baker and Marshall found that an increase in venue opening hours had the potential to increase gambling involvement (e.g., greater amount of money and time spent gambling).³⁴ While this study does suggest that a change in temporal accessibility can potentially influence problematic gambling behaviors, additional experimental or survey-based research is needed to test this hypothesis directly.

Geo-temporal accessibility

Although research findings generally suggest that the distance to gambling venues and number of gambling opportunities available in a jurisdiction both influence the likelihood of problem gambling, the strength of the relationship between geographical accessibility and gambling problems varies from study to study. Additionally, there seems to have been a general increase in problem gambling prevalence rates beginning in the late 1980s, followed by a progressive decline in rates starting in the late 1990s and early 2000s worldwide. It would therefore appear that the association between gambling accessibility and gambling-related harm is complex and multidimensional, and definitions of gambling accessibility need to encompass various components. This situation has led several authors to argue for consideration of other environmental factors that can influence the effects of exposure to gambling opportunities in a jurisdiction, including changes in market offerings over time.³⁵

³¹ Williams et al., *op cit.*, p. 55.

³² G. Huang (2012, November), Exposure or adaptation? The case of Macao. Paper presented at the First Asia Pacific Conference on Gambling and Commercial Gaming Research, Macao, China. (<http://www.gamblingstudies.org/jgcg/index.php/apcg/article/view/24/20>, accessed May 26, 2015.)

³³ P. H. Loughlin & C. W. Pannell (2010), Gambling in Macau: A brief history and glance at today's modern casinos. *Focus on Geography*, 53, pp. 1-9.

³⁴ R. G. V. Baker & D. C. Marshall (2005), Modelling gambling time and economic assignments to weekly trip behaviour to gambling venues. *Journal of Geographical Systems*, 7, pp. 381-402.

³⁵ D. A. LaPlante & H. J. Shaffer (2007), Understanding the influence of gambling opportunities: Expanding exposure models to include adaptation. *American Journal of Orthopsychiatry*, 77, pp. 621-622; Marshall, *op cit.*, pp. 67-70; H. J. Shaffer, R. A. LaBrie, & D. LaPlante (2004), Laying the foundation for quantifying regional exposure to social phenomena: Considering the case of legalized gambling as a public health toxin. *Psychology of Addictive*

A small but growing number of studies have attempted to investigate the association of geo-temporal accessibility and gambling problems. These studies focus on the impact of the establishment of new venues or the removal of existing ones in a specified region on the prevalence rates of problem gambling over time. While significant effects of increased or decreased geo-temporal accessibility of gambling venues on problem gambling rates have been observed in some studies, research results have not been consistent.

In an early study, Room, Turner, and Ialomiteanu explored the impact of opening a casino in the city of Niagara Falls, Canada on gambling problems one year later.³⁶ Responses from 667 adults from the region surveyed either before the opening of the casino or in the 10 days following its opening encompassed the “before” dataset. Collected one year following the establishment of the casino, survey responses of 468 respondents included in the original group were combined with those of an additional 608 adults from the same region to form the “after” dataset. Comparing the two datasets, Room and colleagues found that the proportion of respondents reporting problem gambling behaviors rose from 2.5% to 4.4% one year after the casino’s introduction, which represents a 75% increase. This finding should nevertheless be interpreted with caution; the “after” dataset included individuals that were not surveyed prior to the casino’s opening. Also, it is unknown what impact the opening of a new casino venue had on problem gambling rates was following the first year. These limitations restrict the possibility of drawing definitive conclusions about the effect of establishing a new venue on the region’s problem gambling prevalence rates over time.

A study by Govoni and colleagues also evaluated the one-year impact of a casino opening on the levels of problem gambling for the local population of Windsor, Canada.³⁷ They surveyed 2,682 residents of the region prior to the opening of a casino and 2,581 residents 12 months later. Unlike Room and colleagues, however, no statistically significant differences in rates of problem gambling were detected one year after the establishment of a new casino in the region. Again, this finding should be considered in light of certain limitations; it is unclear what proportion of the “after” dataset included individuals that were not surveyed prior to the casino’s opening, or what impact the venue opening had on problem gambling rates subsequent to the first year. As such, no definitive conclusions can yet be drawn regarding the long-term effect of establishing a new venue on the prevalence of problem gambling.

Taking a different approach, Lund conducted a study looking at changes in levels of problem gambling following the ban of all EGMs (except automatic bingo machines) in Norway

Behaviors, 18, p. 42; Storer et al., *op cit.*, p. 227; M. Young, D. Lamb, & B. Doran (2009), Mountains and molehills: A spatiotemporal analysis of poker machine expenditure in the Northern Territory of Australia. *Australian Geographer*, 40, p. 265.

³⁶ R. Room, N. E. Turner, & A. Ialomiteanu (1999), Community effects of the opening of the Niagara casino. *Addiction*, 94, pp. 1449-1466.

³⁷ R. Govoni, G. R. Frisch, N. Rucich, & H. Getty (1998), First year impacts of casino gambling in a community. *Journal of Gambling Studies*, 14, pp. 347-358.

beginning in July 2007.³⁸ Data from 1,293 past-year EGM gamblers (aged 18 – 90 years) surveyed approximately 2.5 months before the ban on EGMs and again 5 months after the removal of EGMs from the market were used for the purposes of this study. Lund found significant reductions in the prevalence of problem gambling following EGM removal from the market, with the rates in the overall sample falling from 1.0% to 0.4%. Although the results do suggest that geo-temporal changes in market offerings are associated with problematic gambling behavior, it is important to note that there was a significant loss of respondents (24%) between the two time points, with problem gamblers overrepresented in the dropout group. It is possible that changes in the rate of problem gambling among this dropout group may be different than the changes observed among the respondents that remained in the study. This necessarily limits how generalizable the findings are to all past-year EGM gamblers.

Comparable findings were observed in the state of Victoria, Australia following the introduction of regional ‘caps’ policies that restricted the density of EGMs in disadvantaged areas. Using help-seeking behavior as an alternative marker of gambling problems, O’Neil and colleagues reported a small decline in using telephone and face-to-face counseling services across Victoria in the three years following the removal of machines.³⁹

In another study, Jacques, Ladouceur, and Ferland evaluated the impact of opening a casino in the Hull, Canada region on the gambling problems of nearby residents one year later.⁴⁰ Survey responses were collected from 457 adults from the Hull region less than one month before the opening of the casino and 12 months after its establishment. The same survey data was also collected from a second group of 423 adults from the Québec City, Canada area, a region without a casino at the time. This second group was intended to serve as a control group.⁴¹ Jacques and colleagues reported no statistically significant change in the current prevalence of problem gambling one year later for either the Hull (1.1% vs. 1.8%) or the Québec City regions (0.9% vs. 0.5%).

To explain their non-significant findings, Jacques and associates argued that it would be unlikely to observe an increase in the proportion of problem gamblers only 12 months following the establishment of a new gambling venue.⁴² Instead, they suggested that a longer period of exposure to new gambling venues could be necessary to influence the prevalence of problem gambling. To explore this possibility, Jacques and Ladouceur completed a follow-up study that

³⁸ This ban on most types of EGMs effectively reduced EGM density in the region. See I. Lund (2009), Gambling behaviour and the prevalence of gambling problems in adult EGM gamblers when EGMs are banned. A natural experiment. *Journal of Gambling Studies*, 25, pp. 215-225.

³⁹ M. O’Neil, S. Whetton, P. Neal, B. Dolman, M. Dolman, & V. Giannopoulos (2005), Study of the impact of caps on electronic gaming machines. Melbourne, Australia: The Victorian Gambling Research Panel. (https://www.adelaide.edu.au/saces/gambling/publications/Study_of_the_Impact_of_Caps_on_Electronic_Gaming_Machines.pdf, accessed May 26, 2015.)

⁴⁰ C. Jacques, R. Ladouceur, & F. Ferland (2000), Impact of availability on gambling: A longitudinal study. *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie*, 45, pp. 810-815.

⁴¹ This use of a control group allows for the researchers to better determine what influence an increase in casino density can have over time, even if it is an increase in only one casino venue.

⁴² Jacques et al., *op cit.*, p. 814.

evaluated the same respondents from the first study 3 and 5 years after the casino's opening.⁴³ Contrary to their expectations, however, no statistically significant changes in the prevalence of current problem gambling were found at either 3 or 5 years following the casino's opening for the Hull region compared to the Québec City region without a casino.

Social accessibility

Much like temporal accessibility, the impact of social accessibility on the prevalence of problem gambling has not received a great deal of research attention. Recently, Prentice and Wong surveyed 300 adult casino patrons at 30 casinos in Macau, China to investigate the various relationships of subjective judgments about casino attractiveness (e.g., ease of use, venue incentives and loyalty rewards) with gambling behaviors and problems.⁴⁴ They found that subjective judgments about casino attractiveness indirectly influence the prevalence of gambling problems. Specifically, Prentice and Wong observed that some subjective judgments regarding venue attractiveness (e.g., being in a convenient location, ease of obtaining gambling funds) directly impact certain gambling behaviors (e.g., increased length of play in the casino, increased gambling budget). They also reported that these gambling behaviors, in turn, influence problem gambling. It is important to note that the majority of the survey respondents in this study were Mainland Chinese tourists (91%), with only a minority visiting from Hong Kong (9%).

Game and venue type

Over and above the availability and accessibility of gambling venues, researchers have long speculated that the type of gambling activity or venue may have a powerful impact on the development of problem gambling. There is a general assumption that electronic machine gambling is a "highly addictive" form of gambling, and that it contributes to the development of problem gambling more than other gambling activities.⁴⁵ Empirical support for this assumption, however, is mixed.

In a study of the gambling behaviors of 809 adults residing in the Canadian province of Prince Edward Island, Doiron and Nicki examined the unique associations between different forms of gambling and problem gambling.⁴⁶ They observed significant relationships between participation in several "continuous-play" gambling activities where there is a short lag of time between wager and outcome (e.g., scratch cards, horse races, casino table games). On the other

⁴³ C. Jacques & R. Ladouceur (2006), A prospective study of the impact of opening a casino on gambling behaviours: 2- and 4-year follow-ups. *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie*, 51, pp. 764-773.

⁴⁴ C. Prentice & I. A. Wong (in press), Casino marketing, problem gamblers or loyal customers? *Journal of Business Research*. (<http://www.sciencedirect.com/science/article/pii/S0148296315001204>, accessed April 16, 2015.)

⁴⁵ Dowling et al., *op cit.*, p. 36.

⁴⁶ J. P. Doiron & R. M. Nicki (2001), Epidemiology of problem gambling in Prince Edward Island: A Canadian microcosm? *The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie*, 46, pp. 413-417.

hand, Doiron and Nicki also indicated that EGM play demonstrated the largest unique association to gambling problems.

Similar findings have been reported in other jurisdictions. For example, Clarke and colleagues found that of 11 gambling activities available in New Zealand, only gambling on EGMs distinguished problem gamblers from non-problem gamblers.⁴⁷ Of interest, the authors observed that EGM gambling outside of casino venues demonstrated a greater association to current problem gambling than casino EGM play when demographic characteristics (e.g., age, gender, ethnicity, marital status, employment status, etc.) and the total number of gambling activities engaged in are taken into account.

Smith and colleagues collected data from a large group of different types of gamblers (i.e., current gamblers but not on EGMs, low frequency EGM gamblers, moderate frequency EGM gamblers, and high frequency EGM gamblers) in Alberta, Canada.⁴⁸ Their study aimed to establish whether EGM play presents a greater risk for problem gambling than other gambling formats. Smith and colleagues also wanted to examine whether the frequency of EGM play poses an elevated risk for problem gambling. The results indicated that, compared with non-EGM gamblers, EGM gamblers were more likely to be categorized as problem gamblers. The results also revealed that frequency of EGM play is associated with problem gambling. Specifically, high frequency players were more likely to be categorized as problem gamblers than low or moderate frequency players.

In another line of investigation, Breen and Zimmerman compared the time delay for the onset of problem gambling amongst predominantly EGM gamblers versus those who gambled primarily on other forms of gambling.⁴⁹ From their group of 44 treatment-seeking adult problem gamblers, they found that the progression to problem gambling was significantly shorter for individuals that were primarily machine gamblers (mean latency = 1.08 years), compared individuals who gambled predominantly on other forms of gambling (mean latency = 3.58 years). Breen later duplicated these findings using a larger group of 180 treatment-seeking adult problem gamblers.⁵⁰

While these studies suggest a greater association with and more rapid transition to problem gambling among EGM gamblers, the results should be interpreted in light of important limitations. First, research on EGM play and problematic gambling behavior has generally involved asking respondents to report on their previous gambling behavior years later (which

⁴⁷ D. Clarke, J. Pulford, M. Bellringer, M. Abbott, & D. C. Hodgins (2012), An exploratory study of problem gambling on casino versus non-casino electronic gaming machines. *International Journal of Mental Health and Addiction*, 10, pp. 107-121.

⁴⁸ G. Smith, N. el-Guebaly, D. Casey, D. Hodgins, R. Williams, & D. Schopflocher, (2013, May). A longitudinal study of Alberta electronic machine gamblers. Paper presented at the 15th International Conference on Gambling & Risk Taking, Las Vegas, NV.

⁴⁹ R. B. Breen & M. Zimmerman (2002), Rapid onset of pathological gambling in machine gamblers. *Journal of Gambling Studies*, 18, pp. 31-43.

⁵⁰ R. B. Breen (2004), Rapid onset of pathological gambling in machine gamblers: A replication. *International Journal of Mental Health & Addiction*, 2, pp. 44-49.

requires them to rely heavily on memory), or has only looked at concurrent relationships between gambling behavior and problems. As such, assumptions about EGM play increasing the risk for *later* development of gambling problems remain unsubstantiated.

Additionally, it is unclear whether the type of venue itself or the concentration of EGMs within a venue best explains the strong association between EGM gambling and problem gambling. Indeed, recent research conducted in the Northern Territory of Australia indicates that gambling outlets with the highest concentrations of EGMs per venue are the most strongly associated with gambling problems.⁵¹

Further, there is some research evidence that when gambling involvement (i.e., the number of gambling activities individuals participate in) is taken into consideration, statistically significant associations between venue type and problem gambling are reduced or disappear.⁵² More recently, LaPlante, Afifi, and Shaffer examined the effects of different casino games and the frequency of gambling behavior on rates of problem gambling strictly among resort casino patrons in Las Vegas, NV.⁵³ The results revealed that problem gamblers were significantly more likely to play craps, roulette, baccarat, sports booking, and poker than non-problem gamblers, whereas non-problem gamblers were more likely to play slot machines than problem gamblers. Of importance, when the number of games played during the current casino visit and the frequency of play over the past year was also taken into account, LaPlante and colleagues observed that the relationships between games and gambling problems disappeared or were attenuated.

IV. IMPACT OF CASINO DEVELOPMENT ON PROBLEM GAMBLING: EXPOSURE, ADAPTATION, OR BOTH?

Access or exposure to legal gambling opportunities has been widely considered as a factor associated with the possible rise in problem gambling prevalence. The basic premise of the exposure theory is that exposure to environmental toxins will inevitably overwhelm the individual, and he/she will eventually “fall victim” to the influence of these toxins.⁵⁴ Proponents of the exposure theory argue while the causes of problem gambling are complex and multifaceted, “the more a product is supplied in an accessible form, the greater the volume of consumption and the greater the incidence and harm.”⁵⁵

Research on exposure has identified certain regional differences in the availability and accessibility of gambling opportunities that are positively related with prevalence rates of problem gambling. At issue, however, is that the results have not been consistent across all studies. Indeed, some studies have reported no concurrent link between legal gambling accessibility and rates of problem gambling, while other studies have found no significant increase or decrease in the prevalence of problem gambling following the introduction or removal of gambling venues or opportunities. Additionally, problem gambling prevalence rates

⁵¹ M. Young, F. Markham, B. Doran (2012), Placing Bets: Gambling venues and the distribution of harm. *Australian Geographer*, 43, p. 434.

across several international jurisdictions are observed to follow a rise-and-fall trend with the expansion of the gambling industry.

Although inconsistencies in the findings may be the result of differences in methods or instruments used to assess both accessibility and problem gambling, the study findings may also indicate that exposure does not impact all individuals, at all time points, and at all places in the same way.⁵⁶ The available literature also seems to suggest that the relationship of gambling exposure with prevalence of gambling problems may not be a direct or linear one.⁵⁷ Accordingly, scholars have been encouraged to consider alternate theories for understanding the impact of the availability and accessibility of gambling opportunities.⁵⁸ One such theory is the social adaptation model.

The basic premise behind the social adaptation theory is that, following initial increases in the number and types of negative reactions to new environmental toxins, individuals will eventually adapt and become unaffected by those toxins, and the number of associated negative reactions will subsequently “plateau” or decline over time.⁵⁹ The theory also incorporates the notion that novelty frequently stimulates interest in new social activities, but that through a range of mechanisms, individuals eventually adapt to the novelty of the activity and the effects of this activity will be limited over time.⁶⁰ The mechanisms proposed to be at work in the adaptive process include: the weakening of novelty effects, the emergence of competing interests or exposure to other novel social activities, regulatory changes and/or other policy reactions to increases in harmful social consequences, and the development or expansion of interventions.⁶¹

In the case of gambling specifically, the adaptation theory suggests that the expansion of gambling opportunities in a region will initially lead to increases in exposure and a subsequent rise in rates of problem gambling. However, as the novelty wears off and people become more aware of the harms and costs associated with gambling, the region’s population will eventually adapt to this increased exposure and rates of problem gambling will either level off or decline. There is, nonetheless, an important caveat to keep in mind regarding the process of adaptation;

⁵² D. A. LaPlante, S. E. Nelson, R. A. LaBrie, & H. J. Shaffer (2011), Disordered gambling, type of gambling and gambling involvement in the British Gambling Prevalence Survey 2007. *The European Journal of Public Health*, 21, pp. 535.

⁵³ D. A. LaPlante, T. O. Afifi, & H. J. Shaffer (2013), Games and gambling involvement among casino patrons. *Journal of Gambling Studies*, 29, pp. 191-203.

⁵⁴ Shaffer, LaBrie, et al., *op cit.*, p. 46.

⁵⁵ J. Orford (2005), Complicity on the river bank: The search for the truth about problem gambling: Reply to the commentaries. *Addiction*, 100, p. 1236.

⁵⁶ LaPlante & Shaffer, *op cit.*, p. 620.

⁵⁷ *Ibid.* p. 622; Thomas et al., *op cit.*, p. 89.

⁵⁸ *Ibid.*; Storer et al., *op cit.*, p. 227.

⁵⁹ LaPlante & Shaffer, *op cit.*, p. 621.

⁶⁰ Shaffer, LaBrie, et al., *op cit.*, p. 42.

⁶¹ Abbott et al. (2014), *op cit.*, p. 987; Abbott et al. (in press), *op cit.*, p. 3; Welte et al. (in press), *op cit.*, p. 16.

the relationship between exposure and adaptation is dose related.⁶² As such, different levels of exposure will lead to different levels of adaptation.

To better understand the complex interaction between the exposure and adaptation processes for explaining rates problem gambling in a jurisdiction, the Harvard Medical School's Division on Addictions developed a "regional exposure model" (REM).⁶³ The REM proposes that 'dose', 'potency', and 'duration' of gambling availability are important factors to consider in the intricate relationship between exposure, adaptation, and problem gambling. Within this model, dose is defined as the extent of exposure in a specific region (e.g., the number of gambling venues and the number of individuals employed by gambling venues in a region). Potency, on the other hand, refers to the source of strength of a specific social phenomenon (e.g., number of different types of gambling that are available in a jurisdiction). Finally, duration is described as the amount of time a social phenomenon has been available to the public (e.g., number of years since the legalization of gambling in the jurisdiction). Thus, the REM encompasses several dimensions of gambling availability and accessibility to explain the prevalence of problem gambling in specific regions.

The REM is particularly valuable because it incorporates mathematical equations that can be used to convert available data on dose, potency and duration of gambling availability into standardized scores, and then these scores can be combined to obtain an index of regional gambling availability, the Regional Index of Gambling Exposure (RIGE). The purpose of the RIGE is to rank different jurisdictions along a gradient and test assumptions about relationships between regional gambling availability and prevalence of problem gambling.

To illustrate the utility of the REM in understanding the association between exposure and the prevalence of problem gambling, Shaffer, LaBrie, and colleagues examined state-level data for all jurisdictions with casino gambling using the RIGE.⁶⁴ Their analysis revealed that the state of Nevada had the greatest estimated regional exposure to casino gambling, with the prevalence of gambling problems in Nevada expected to be close to eight times higher than any other casino state. However, Shaffer, LaBrie and associates' examination of the most recent available data on the prevalence of current gambling problems indicated that Nevada was not in fact eight times higher than other states. Rather, they found estimates of current gambling problems in the state of Nevada to range between 0.3–1.0%. Shaffer, LaBrie and colleagues' findings therefore suggest that the relationship between exposure and problem gambling prevalence in Nevada is not linear. One potential explanation for the non-linear relationship between exposure and gambling problems in the state is that residents of Nevada have adapted to the novelty of exposure.⁶⁵ To be precise, residents of Nevada are likely to have been exposed to gambling for such an extended period of time that the availability of gambling opportunities and

⁶² LaPlante & Shaffer, *op cit.*, p. 621-622;

⁶³ *Ibid.*, p. 619-620; Shaffer, LaBrie, et al., *op cit.*, p. 42-43.

⁶⁴ Shaffer, LaBrie, et al., *op cit.*, p. 43-45.

⁶⁵ H. J. Shaffer & R. Martin (2011), Disordered gambling: Etiology, trajectory, and clinical considerations. *Annual Review of Clinical Psychology*, 7, p. 483-510.

the proximity of venues no longer produce the same effects on gambling behaviors as they did originally. Overall then, the REM provides a tool for quantifying exposure and/or adaptation to gambling venues to allow for a clearer understanding of the relationship between gambling availability and pathological or problem gambling in a given jurisdiction.

While the REM is a useful tool, it does have important shortcomings. For one, the model examines only three exposure factors (dose, potency, duration). As such, the REM does not incorporate other relevant factors that impact the effects of exposure on the incidence of problem gambling. For example, the REM does not include community-focused harm minimization strategies (e.g., social marketing and education programs, early intervention initiatives, available treatment options) in its definition of exposure effects, even though these strategies can result in a population adopting less hazardous gambling patterns.⁶⁶ Also, the REM only considers the impact of regional exposure on the prevalence of problem gambling within a jurisdiction. However, it does not factor in the influence of exposure to gambling opportunities elsewhere, such as gambling venues in other jurisdictions as well as remote or Internet gambling venues.⁶⁷

V. CONCLUSION

Casinos continue their spread around the world, with the greatest degree of expansion expected in the East. Policymakers must weigh the various costs and benefits of casinos. Without exception, one of the greatest concerns with legalized casino gambling is its potential impact on problem gambling. In this report we have reviewed the most recent literature on problem gambling, and how it is affected by casino expansion.

The literature includes a number of different studies of problem gambling prevalence, from a number of jurisdictions. The results are mixed. However, it is clear that, despite the trend of increasing availability of legal casino gambling, there is no clear trend in the prevalence of problem gambling. Several theories have been proposed to explain why the prevalence of problem gambling has not seemed to have a consistent, positive relationship with the availability and expansion of casinos.

⁶⁶ Storer et al., *op cit.*, p. 239.

⁶⁷ H. H. Y. Tong & D. Chim (2013), The relationship between casino proximity and problem gambling. *Asian Journal of Gambling Issues and Public Health*, 3, p. 15.