

Prevention of Problem and Pathological Gambling:
A Comprehensive Review of the Evidence

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PREVENTION OF PROBLEM/PATHOLOGICAL GAMBLING: A COMPREHENSIVE REVIEW OF THE ISSUES AND THE EVIDENCE

Problem gambling prevention consists of a range of initiatives, each intended to reduce potential harm caused by legalized gambling. The traditional way of categorizing prevention efforts is by the type of people the efforts are directed toward. *Primary Prevention* is an effort to prevent individuals in the general populace from becoming problem/pathological gamblers. *Secondary Prevention* is an effort to prevent the development of problem/pathological gambling in individuals with risk factors for the condition. *Tertiary Prevention* is an effort to stop and potentially reverse the problems occurring in existing problem/pathological gamblers. However, another approach, and the one used in the present paper, is according to the nature of the initiative. Virtually all prevention initiatives can be categorized into two groups. *Educational Initiatives* are intended to change internal knowledge, attitudes, beliefs, and skills so as to deter an individual from problem/pathological gambling. *Policy Initiatives* are intended to prevent problem/pathological gambling through the alteration of external environmental controls on the availability and provision of gambling. The purpose of this paper is to comprehensively review what is known about the nature and effectiveness of educational and policy initiatives to prevent problem/pathological gambling.

In order to understand how to prevent something, it is first desirable to understand what causes it. Accordingly, discussion begins with an etiological perspective of problem/pathological gambling development.

ETIOLOGY OF PROBLEM/PATHOLOGICAL GAMBLING

The biopsychosocial approach is a well agreed-upon overarching etiology of addictive behaviour, including problem/pathological gambling (Griffiths & Delfabbro, 2001; Marlatt et al., 1988; Sharpe, 2001). Essentially this orientation states that there are a large number of biological, psychological, experiential, and social factors that both contribute to and protect individuals from developing problem/pathological gambling. There is a general sequence of events:

1. Genetic inheritance first creates a brain and nervous system that increases or decreases an individual's susceptibility to engagement in gambling and/or development of problem/pathological gambling. Biological risk factors include things such as increased impulsivity, risk-seeking, vulnerability to stress and mood disorders, vulnerability to addictive behaviour, and weak intellectual skills. A person who has the opposite attributes has inherited some protection from engaging in gambling and/or developing problem/pathological gambling.
2. The likelihood of initial experimentation with gambling is influenced by the above biological propensities, combined with parental, peer group, and societal modelling of the behaviour; and gambling's actual physical availability.
3. Continued involvement in gambling is influenced by all of the above factors as well as the person's psychology and learning experience. There are two aspects of the person's psychology that play a particularly important role. The first concerns whether the person

holds erroneous beliefs (gambling fallacies) about how gambling works (i.e., failure to understand the independence of random events, illusion of control, belief in ‘luck’, etc.). The second concerns whether gambling serves any psychological need for the individual (e.g., escape, excitement, recognition/importance) (Blaszczynski & Nower, 2002).¹ With respect to learning experience, the rewarding or nonrewarding consequences of the person’s early bets/gambles is a potent determinant of gambling continuation or discontinuation.

4. Once gambling is regularly engaged in, operant and classical conditioning begin to increase the frequency and strength of the behaviour and the physiological processes underlying it, making it progressively more difficult to wilfully resist. At a psychological level, the person begins becoming preoccupied with thoughts of gambling. At a behavioural level, the person starts playing more often and longer than intended and spending above planned spending limits. Someone with this pattern of play is known as an ‘**at risk gambler**’. In light of the negative consequences that begin to occur, the psychological need that gambling provides and the person’s beliefs about how gambling works are important factors influencing whether the behaviour continues (i.e., an erroneous belief that one is ‘due for a win’ or that ‘skilful play’ can recoup losses provides the intellectual justification for continuation).
5. Gambling behaviour that does progress unabated typically leads to negative consequences in a range of areas (financial, psychological, social, legal, health, employment/school). These negative consequences combined with impaired control over gambling behaviour constitute ‘**problem gambling**’, with severe forms of problem gambling being known as ‘**pathological gambling**’. In many people, the same biological and environmental risk factors that lead to problem/pathological gambling independently lead to problems in other areas (i.e., substance abuse, mental health problems, interpersonal problems, poor health practices, school/work problems, antisocial behaviour) (Petry, 2007; Petry, Stinson, & Grant, 2005; Rush et al., 2008). These associated comorbidities reinforce each other’s existence, hampering recovery from each.

Figure 1 illustrates this model. The particular pattern of risk factors that leads to problem/pathological gambling is often different for different people, as is the age at which problem/pathological gambling develops. Having said this, the pattern of risk factors within an individual is not totally random. Rather, evidence points to at least two main subtypes or routes to addiction: the impulsive/antisocial pattern (often in males) versus the emotionally vulnerable pattern (often in females) (e.g., Blaszczynski & Nower, 2002; Windle & Scheidt, 2004).

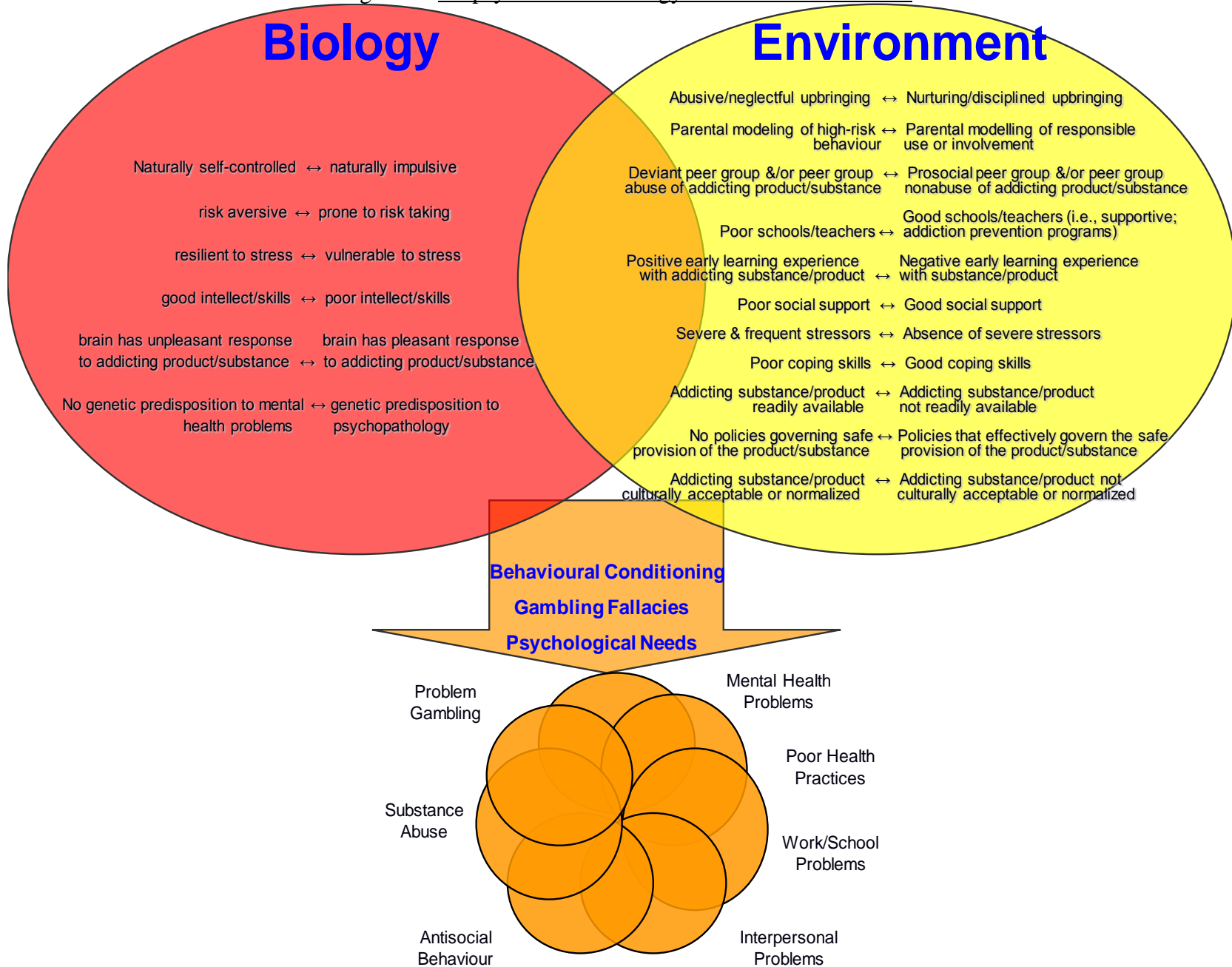
The biopsychosocial model of problem/pathological gambling has three important implications for prevention:

1. Because of the large number of risk factors as well as the biological basis of some of them, the risk of problem/pathological gambling in a population may be reduced but will never be eliminated.
2. Because many risk factors also apply to other addictions and psychopathology, generic prevention initiatives targeting a wide range of problems (especially in youth) are likely both an efficient and essential component of problem/pathological gambling prevention.

¹ Some of these psychological needs may derive from an abusive or neglectful upbringing, poor self-esteem, poor coping skills, lack of social supports, presence of severe stressors, etc.

3. Because a multitude of both internal and external factors contribute to problem/pathological gambling, effective prevention will almost certainly require a sustained, multifaceted, and coordinated approach provided to a wide range of age groups.

Figure 1: Biopsychosocial Etiology of Addictive Behaviour



EDUCATIONAL INITIATIVES TO PREVENT PROBLEM/PATHOLOGICAL GAMBLING

Preventive education targets individual learning within familial, societal, educational, and other environments. Initiatives include ‘upstream’ interventions, broad-based information/awareness campaigns, and more sustained and directed education such as statistical instruction and comprehensive in-school programs.

‘Upstream’ Interventions

It is well established that negative early childhood experience significantly influences the development of problematic behaviour later in life. Accordingly, it is not surprising that interventions to strengthen families and create effective parenting practices are generally one of the most powerful ways to reduce adolescent problem behaviours, and further serves to reduce problems at later ages (Foxcroft, Ireland, Lowe, & Breen, 2005; Kumpfer & Alvarado, 2003; Petrie, Bunn & Byrne, 2007). This is probably also true for the prevention of adolescent and adult problem/pathological gambling, although the approach has yet to be empirically tested. Nevertheless, there is good evidence that family-based programs are effective for the primary prevention of other addictive behaviour such as alcohol and drug use in young people (Foxcroft et al., 2005; Gates, McCambridge, Smith, & Foxcroft, 2006). It would be useful if future family/parenting interventions also included the incidence of gambling and problem/pathological gambling among the outcome measures.

For similar reasons, it is to be expected that exposure to well socialized peer groups, supportive teachers, and good schools would have the same beneficial effect on prevention of problem/pathological gambling as it does on the prevention of other problematic behaviour (Durlak, 1997; Durlak & Wells, 1997; Nation et al., 1993; Toumbourou, Williams, Waters, & Patton, 2005; Weissberg & Gullotta, 1997).

Information/Awareness Campaigns

When most people think of problem/pathological gambling prevention they think of information campaigns targeted specifically at gambling. These are known variously as ‘information/awareness campaigns’, ‘mass media campaigns’ or ‘social marketing’. Campaigns are directed at the general public and usually contain information consisting of one or more of the following elements (e.g., AADAC, 2001; Jackson, Thomas, Thomason, & Ho, 2002; Murray, 2003):

- Encouragement to ‘know your limits’ or ‘gamble responsibly’.²
- Warnings about the potential addictive nature of gambling.
- Identification of the signs/symptoms of problem/pathological gambling.
- Information about where people can go for help or more information on problem/pathological gambling (i.e., treatment agencies; 24 hour telephone help-lines) (‘tertiary prevention’)

² There has been an increasing usage of phrases such as ‘responsible *gaming*’, as opposed to ‘responsible gambling’. (Indeed, a Google search shows the former to now be the more commonly used expression). This is potentially problematic. When you portray your product as more benign than it actually is, you may defeat the purpose of alerting people to their over-involvement in it. It is somewhat analogous to taking ‘smoking kills’ messages off cigarette packages and replacing it with ‘please monitor your consumption of this enjoyable aromatic plant material’.

- Provision of the true mathematical odds of various gambling activities.
- Efforts to dispel common gambling fallacies and erroneous cognitions.
- Provision of guidelines and suggestions for problem-free gambling.

These initiatives are usually developed and delivered by governmental health or social service agencies, schools, or commercial gambling providers. The information itself is provided:

- On the gambling product (e.g., odds printed on the back of lottery tickets, ‘responsible gambling messages’ on electronic gambling machines (EGMs)).
- On posters and pamphlets at gambling venues and elsewhere throughout the community.
- In the form of ‘public service announcements’ on radio, television, and newspapers.
- By means of presentations, plays (Bell, 2004), or videos (most often presented in educational settings).
- Interactive CDs
- On government, social agency and/or gambling provider websites. Examples of some teen-oriented websites are: <http://www.zoot2.com>, <http://www.luckyday.ca>, <http://inyaface.co.nz>, <http://www.wannabet.org>, <http://www.thegamble.org>, www.responsiblegambling.qld.gov.au, <http://www.youthbet.net>.

Information/awareness campaigns are relatively inexpensive ways of delivering preventive health messages to a large portion of the population, and are intended to counter the often considerable commercial efforts to promote the product. The mass media is a particularly good way of reaching young people, as they are estimated to spend almost twice as many hours watching TV (22,000 hrs) as they spend in formal education (12,000 hrs) (Worden et al., 1988). Reaching young people is particularly important, as they may be more susceptible to commercial advertising promoting the product (a significant consideration in the case of gambling) (Atkin, 1995; Strasburger, 1995).

Although awareness campaigns to prevent problem/pathological gambling are relatively common across many jurisdictions, there is limited research on their impact (Auckland University of Technology, 2005). The evidence that does exist suggests that improvements in knowledge and awareness are reliably produced in people who are asked to attend to these messages. For example, a brochure on pathological gambling was found to effectively convey useful new information to members of the general public in Quebec who were shown it (Ladouceur, Vezina, Jacques, & Ferland, 2000).

There have been several evaluations of short school-based presentations. The Addiction Foundation of Manitoba evaluated their 45 – 60 minute gambling education and awareness presentation (“It’s Your Lucky Day”) among 894 grade 7 and 8 students in Manitoba (Lemaire, de Lima, & Patton, 2004). One month after receiving the presentation, students in the Intervention group showed improved knowledge of gambling and problem/pathological gambling and decreased gambling fallacies relative to students in the Control group. The International Centre for Youth Gambling Problems and High-Risk Behaviours (IGYGPHRB) in Montreal, Quebec undertook an evaluation of their interactive CDs for the prevention of problem/pathological gambling (“Hooked City” for grade 7 – 12 students and “The Amazing Chateau” for grades 4 – 6). Several months after being exposed to these interactive CDs, students had significantly improved knowledge about gambling, more awareness of the signs of problem/pathological gambling, and fewer gambling fallacies. However, there was no significant

change in gambling behaviour, although there was a trend in this direction (IGYGPHERB, 2004). A pre-post evaluation of 60 minute program developed by the Centre for Addiction and Mental Health in Ontario found the program to significantly improve students' understanding of random chance, but did not result in any change in gambling behaviour, coping strategies, or attitudes towards gambling (Turner, MacDonald, Bartoshuk, Zangeneh, 2008).

Ferland, Ladouceur, & Vitaro (2002) evaluated the relative effectiveness of a 20 minute video ("Lucky") compared to a 40 minute presentation, versus a 40 minute presentation + video among 424 grade 7 and 8 students in Quebec. One week later, all three conditions had significantly improved knowledge about gambling and decreased gambling fallacies compared to a Control group, with the presentation + video group having the greatest improvement. Ladouceur, Ferland, & Vitaro (2004) evaluated the same video (translated into English) in a group of 506 grade 7 and 8 students from Quebec and New Brunswick. Here again, after one week, students in the Intervention group had improved gambling knowledge and a decrease in gambling fallacies compared to students in the Control group. The same video was also evaluated against a presentation + video session by Lavoie & Ladouceur (2004) in a group of 273 Quebec grade 5 and 6 students. Immediately after seeing the video, students in both Intervention groups demonstrated significant improvements in gambling knowledge and a decrease in gambling fallacies compared to students in the Control group (with no greater advantage to the presentation + video condition). Ladouceur, Ferland, Vitaro, & Pelletier (2005) evaluated the effectiveness of a different 20 minute video (focusing on the adverse consequences of excessive gambling) among 586 Quebec grade 11 and 12 students. One month later, students had improved knowledge of both gambling and problem/pathological gambling relative to a Control group. Ladouceur, Ferland, & Fournier (2003) evaluated the effectiveness of a one hour interactive presentation among 153 Quebec grade 5 and 6 students. Students who received the presentation demonstrated improved knowledge and decreased gambling fallacies relative to students in the Control group, with the effect being stronger when the session was administered by a specialist in this area, as compared to the students' regular teacher. A similar one hour interactive session was evaluated in 345 Quebec grade 7 and 8 students by Ladouceur, Ferland, Roy, et al. (2004). Improved knowledge and decreased gambling fallacies was again achieved in the Intervention group relative to the Control group.

Awareness initiatives appear to have a very limited impact *if people are not explicitly asked to attend* to the information or have no intrinsic interest in it. For example, Indiana implemented a statewide awareness campaign to promote responsible gambling using radio announcements, billboards, brochures, newspaper advertisements, posters, pens, and t-shirts, press conferences, and 'problem gambling town hall meetings'. Najavits, Grymala, and George (2003) found that only 8% of the general public recalled seeing or hearing any advertising. However, of that 8%, 72% reported that the advertising had increased their knowledge of problem/pathological gambling. (One percent of the total sample took action based on seeing/hearing the ad such as calling the help line). A similar result was obtained in Ontario, Canada. Turner, Wiebe, Falkowski-Ham, Kelly, and Skinner (2005) found that 66% of the Ontario public was unaware of any initiatives to reduce problem/pathological gambling. This is notable considering that Ontario is cited as spending proportionally more on problem/pathological gambling prevention, treatment, and research than any other jurisdiction in the world (Sadinsky, 2005). However, people who participated in slots and instant lotteries were significantly more likely to be report being aware of initiatives to reduce problem/pathological

gambling, suggesting that gamblers may be noticing the presence of the help line number on tickets and slot machines. A more recent initiative in Ontario found that a media campaign to dispel myths about how slot machines worked was successful in significantly reducing these fallacies among a random sample of 900 Ontario gamblers in February 2005 before the campaign started, compared to a random sample of 900 gamblers in April 2007 after the campaign was completed (OLG, 2007).

In 1995 the Victoria Department of Human Services in Australia initiated a state-wide problem/pathological gambling awareness program consisting of a 5-week multi-language radio, newspaper and billboard advertisement phase in the first year, a 14-week television advertisement phase in 1996, and a 30-week radio and television advertisement phase in 1997 and 1998. Jackson, Thomas, Thomason and Ho (2002) evaluated the program, concluding that it produced an increased number of callers to the gambling helpline, and an increase in the number of new clients entering treatment. There was also more collaboration between help services and the staff at gambling venues, many of whom attended training/information sessions about problem/pathological gambling. In 2001, the Victoria government initiated a similar informational campaign which reportedly resulted in a 70% increase in calls to the helpline and a 118% increase in clients presenting themselves to treatment (Victoria Department of Human Services, 2002).

It is important to note that providing support to distressed gamblers or recruiting problem/pathological gamblers into treatment is a much less satisfactory 'prevention' outcome than results showing that awareness campaigns help inoculate the general public from developing gambling problems in the first place. There is no direct evidence on the effectiveness of awareness campaigns as a *primary* prevention tool for problem/pathological gambling, however, and the general public's lack of awareness of these initiatives is not very encouraging.

Fortunately, there is considerably more literature on the utility of public information/awareness campaigns for other health behaviours that contain lessons for the prevention of problem/pathological gambling (Byrne, Dickson, Derevensky, Gupta, & Lussier, 2005). In general, research has found that sustained information/awareness initiatives have significant potential to improve people's knowledge and/or change their attitudes at a community-wide level (Centre for Addiction and Mental Health [CAMH], 1999; Duperrex, Roberts, & Bunn, 2002; Grilli, Ramsay, & Minozzi, 2004; Sowden & Arblaster, 2005). Indeed, population surveys have long been known to show that mass media are in fact the leading source of information about important health issues, such as weight control, HIV/AIDS, drug abuse, asthma, family planning and mammography (Chapman & Lupton, 1994).

While knowledge and attitudinal changes have been fairly reliably obtained, *the ability of awareness campaigns to produce actual changes in behaviour is much less common* (CAMH, 1999; Duperrex et al., 2002; Grilli et al., 2004; Slater et al., 2005; Sowden & Arblaster, 2005; Stacy, Bentler, & Flay, 1994). Furthermore, the knowledge and attitudinal impact of prevention messages often decays with time, requiring that they be repeated regularly (Duperrex et al., 2002; Vidanapathirana, Abramson, Forbes, & Fairley, 2004).

The exceptions to this failure to achieve behaviour change are *situations where the information is personally relevant, behavioural change is comparatively easy to achieve, and/or*

the consequences of not changing behaviour are significant (Janz, Champion, & Strecher, 2002). For example, after extensive media reports on dietary studies relating cholesterol-rich foods with heart disease, consumption of beef, eggs and fatty milk products in North America declined. Similarly, reports on the risks of excessive sodium consumption were associated with increased use of salt-free food products. A decline in the use of birth control pills and IUDs between 1970 and 1975 correlated closely with publicity about their possible adverse effects (Jones, Beniger, & Westoff, 1980). Vidanapathirana et al. (2004) found that mass-media interventions have immediate effects in promoting HIV testing. In the gambling context, evidence of behavioural change is seen the increase in help line calls or treatment-seeking as reported by Victoria Department of Human Services (2002) and Jackson et al. (2002) (and, anecdotally, by agencies in other jurisdictions when promoting these services).

More Sustained and Directed Educational Initiatives

As noted above, the advantage of awareness campaigns is their potential to reach large numbers of people. They have two main disadvantages. First, the exposure of any individual to the message is uncertain. Second, the duration of the message is quite short for people exposed to it. Thus, it is useful to examine the effectiveness of more sustained and directed educational efforts to prevent problem/pathological gambling.

Statistical Instruction

It is a fairly commonsensical idea that if gamblers truly understood the negative mathematical expectation of gambling, they would be inoculated from over-involvement. There are two general areas of research that support the contention that improved knowledge of gambling probabilities should positively impact gambling behaviour. The first is research demonstrating a positive impact of educating problem/pathological gamblers in treatment on the nature of randomness, and other errors of thinking underlying gambling fallacies (e.g., Ladouceur, Sylvain, & Boutin, 2000; Ladouceur, Sylvain, Letarte, Giroux, & Jacques, 1998; Sylvain, Ladouceur, & Boisvert, 1997). The second is research that shows statistically trained college students to be less susceptible to certain specific fallacies (Benassi & Knoth, 1993), and to have better general reasoning skills for everyday problems (Fong, Krantz, & Nisbett, 1993; Kosonen & Winne, 1995).

However, the literature specific to the impact of improved statistical knowledge on gambling behavior is mixed, at best. Lichtenstein, Slovic and Zink (1969) found that explaining the concept of 'expected value' (EV) and making it explicit in the gambling tasks presented resulted in only one-third of subjects moving to maximize EV, with one-quarter moving toward lower EVs. Schoemaker (1979) found that university students who received statistical training made superior choices in a gambling task compared to untrained students. However, Gibson, Sanbonmatsu and Posavac (1997) found that students explicitly asked to evaluate the probability of a certain sports team winning tended to overestimate the team's actual chances, and subsequently gambled more relative to students not asked to evaluate any specific team. Similarly, Hertwig, Barron, Weber, and Erev (2004) found that students educated about the probabilities of certain events gambled on rare events more than they should, compared to students who were given direct experience with these probabilities but did not know the actual odds. Steenbergh, Whelan, Meyers, May, and Floyd (2004) found that university students who

were given an explicit warning about erroneous gambling beliefs and the negative mathematical expectation of gambling gained superior knowledge about these things, but were just as likely to gamble on a roulette game compared to students not given these messages. In contrast, Floyd, Whelan, and Meyers (2006) found that viewing messages on irrational gambling beliefs caused university students to have less risky gambling behaviour in a computerized roulette game with imaginary money. Recently, Williams and Connolly (2006) gave 198 Introductory Statistics university students lessons on probability theory using examples from gambling as well as several laboratories providing hands-on experience with casino games. Six months after the intervention, students receiving the intervention demonstrated superior ability to calculate gambling odds as well as resistance to gambling fallacies. However, this improved knowledge and skill was not associated with any decreases or changes in actual gambling behaviour. Similarly, Lambos & Delfabbro (2007) and Delfabbro, Lahn & Grabosky (2006) found that pathological gamblers had significantly higher rates of cognitive biases, but did not differ from nonpathological gamblers in knowledge of gambling odds or numerical ability.

In many ways, it may be that teaching people about gambling odds is analogous to telling smokers about the harmful effects of smoking, or alcoholics about the harmful effects of drinking. Individuals involved in these behaviours are usually already aware of these facts. Knowing something and having this knowledge alter your behaviour are often two different things. While knowledge is, in most instances, a necessary antecedent to changing or preventing harmful behaviour, it is often not sufficient on its own (e.g., Stacy, Bentler, & Flay, 1994; Williams & Gloster, 1999). It would seem that prevention frameworks that rely heavily on providing gamblers with ‘informed choices’ (e.g., Blaszczynski, Ladouceur, & Shaffer, 2004; Blaszczynski, Ladouceur, Nower, & Shaffer, 2005) may have limited preventative effects.³

Comprehensive Programs

Comprehensive and substantive elementary and high-school based prevention programs for problem/pathological gambling are relatively uncommon, but they do exist in some jurisdictions. Such programs typically have a broad scope of topics that include teaching statistical knowledge about gambling, providing information on the potentially addictive nature of gambling, explaining gambling fallacies, building esteem, and peer resistance training. Examples of these types of programs are “Don’t Bet On It” in South Australia for ages 6 to 9; “Gambling: Minimising Health Risks” in Queensland for grade 5; “Facing the Odds” in Louisiana for grades 5 to 8; “All Bets are Off” in Michigan for grades 7 and 8; “Kids Don’t Gamble...Wanna Bet” in Minnesota and Illinois for grades 3 to 8; “Youth Making Choices” for high school students in Ontario; “Count me Out” in Quebec for ages 8-17; and the “Problem Gambling Prevention Program” in Florida for middle and high school students; and “Gambling: A Stacked Deck” in Alberta for grades 9-12.

There has been very little published evaluation of these programs. Gaboury and Ladouceur (1993) evaluated a 3-session program (75 minutes per session) in 289 juniors and seniors from 5 Quebec high schools. The program included an overview of gambling, discussion of legal issues, how the gambling industry manipulates the chances of winning, gambling

³ Alternatively, it is possible that researchers have been targeting the wrong types of knowledge and that efforts focused primarily on correcting gambling fallacies may be more productive than efforts focused primarily on improved understanding of probability.

fallacies, development of pathological gambling, and coping skills. Six months later, students in the Intervention group had improved knowledge about gambling relative to the Control group. However, the improvement in coping skills seen after training was not maintained at 6 month follow-up, nor was there any significant change in students' actual gambling behaviour or attitudes toward gambling at either post-test or follow-up.

Ferland, Ladouceur and Vitaro (2005) evaluated a somewhat different 3-session program (60 minutes per session) with 1193 Quebec students in grades 8, 9 and 10. The program provided information on knowledge of and misconceptions about gambling activities, social problem solving to resist peer pressure, and excessive gambling. Three months later, students in the Intervention group demonstrated a significant improvement in knowledge about gambling and decrease in gambling misconceptions relative to the Control group. However, there was no improvement in their social problem solving ability or in actual gambling participation.

Encouraging results have been obtained from a high school curriculum in Alberta called "Gambling: A Stacked Deck". This program was first piloted in Calgary high schools in 2001/2002 (Davis, 2003; Williams, 2002) and later revamped based on the results and feedback from teachers and students. The program consists of a set of 5-6 interactive lessons (minimum 1 hour each) that teach about the nature of gambling; the true odds and 'house edge'; signs, risk factors, and causes of problem/pathological gambling; and skills for good decision-making and problem-solving. An overriding theme of the program is to approach life as a 'smart gambler' by determining the odds and weighing the pros versus cons of your actions. The program was administered to 1,253 grade 9 – 12 students in 10 schools throughout southern Alberta, with results compared to 433 students in 4 Control schools. Three to seven months after receiving the program, students had significantly more negative attitudes toward gambling, improved knowledge about gambling and problem/pathological gambling, improved resistance to gambling fallacies, improved decision making and problem solving, decreased gambling frequency, and decreased rates of problem/pathological gambling (Williams, Connolly, Wood, Currie, & Davis, 2004; Williams, Wood, & Currie, submitted for publication).

While the results of this study are encouraging, the program's long-term effectiveness is unknown. It is also sobering to examine literature from other fields (e.g., health promotion, tobacco and drug use), where results indicate that even with comprehensive educational approaches, effects on the desired behaviour are often small (Merzel & D'Afflitti, 2003; Sowden & Stead, 2000; Thomas & Perera, 2006; Wandersman & Florin, 2003) or nonexistent (Gates, McCambridge, Smith, & Foxcroft, 2006; Secker-Walker, Gnich, Platt, & Lancaster, 2002).

On-Site Information/Counselling Centres

'Responsible Gambling Information Centres' (RGICs) located within gambling venues are a fairly new initiative. The primary purpose of the RGIC is to provide, on patron request, information and education about the risks of gambling (e.g. odds of winning and losing; demonstrations/tutorials about slot machine workings/random number generation). A second purpose is to identify, support, and refer RGIC visitors who are experiencing problems with gambling. Immediate crisis intervention and counselling may be provided, but ongoing counselling services are not necessarily included in RGIC mandates. Third, information and support is provided to venue employees, to assist them with customer interactions. In all

jurisdictions, operational funding for RGICs has been provided either directly or indirectly by governments.

Several countries have implemented RGIC policies at gambling venues. The Crown Casino (2006) in Melbourne, Victoria, Australia has operated the Crown Customer Support Centre since May 2002. The Center is located away from gambling areas but within the Crown Entertainment Complex, and staffed by Casino employees who provide 24 hour on-site help, support, and counselling services to casino patrons (B. Horman, personal communication, August 11, 2006). In Queensland, a trial program is currently operational at one gambling club whereby a counsellor is made available on-site once per week, with associated costs borne by the venue (Queensland Treasury Department, personal communication, May 8, 2006). The Kangwon Land casino in Korea also offers on-site counselling services (Back, 2006). In Canada, the first RGIC opened in 2003 at the McPhillips Street Casino, Winnipeg, Manitoba. Information centres currently operate in 12 casinos in Canada: British Columbia (2), Alberta (2), Saskatchewan (1), Manitoba (2), Ontario (2), Quebec (1), and Nova Scotia (2). A thirteenth centre is located at a racino in Prince Edward Island. Canadian RGICs are variously staffed by persons with knowledge of addictions and counselling backgrounds. Employers include: addiction prevention/treatment agencies (AB, MB), the department of health (SK), crown corporations operating the gambling facility (QC, PE), non-profit organizations (ON), and for-profit organizations (NS).

Most RGICs began operations in 2005 and 2006, and are considered to be pilot projects. Effectiveness evaluations either have not yet taken place, or are in very early stages. There is some information on utilization rates, which appear to be fairly low by patron utilization standards, although high by treatment provider standards. Approximately 4,600 people accessed the two RGICs in Ontario in a 1.5 year period beginning in November 2005 (OLG, 2007). However, to put this in context, approximately 118,000 people visit OLG venues *every day* (OLG, 2007). Approximately 8,000 customers are reported to have accessed Manitoba's RGICs between 2003 - 2006, 75% for information only, 10% for support and referral, and 15% for other reasons (Mehmel, 2006). Approximately 10,000 people visit Manitoba casinos every day. It is also interesting to note that the actual number of problem/pathological gamblers who have received treatment from the Addictions Foundation of Manitoba has gone down during this time period (523 in 2003/4 to 467 in 2004/5) (AFM, 2004, 2005). Similar relatively low rates of RGIC patron utilization are reported at one of Alberta's largest casinos, the Palace Casino, which has averaged 3 – 5 people per day in the initial 6 months (Canadian Broadcasting Corporation, 2006).

There are two other issues concerning RGICs. First, the extent to which they simply provide information is the extent to which their utility is similar to the information/awareness campaigns discussed earlier (i.e., potential to improve knowledge but weaker at changing behaviour). Second, there is some risk that the presence of a RGIC in a gambling venue may diminish the onus on gambling venue staff to identify and intervene with at-risk gamblers. This would be unfortunate, as venue employees have considerably greater interaction with at-risk gamblers than do RGIC employees.

POLICY INITIATIVES TO PREVENT PROBLEM/PATHOLOGICAL GAMBLING

Health-oriented policies are measures taken by governments and industry intended to inhibit the adoption of risk gambling practices and cognitions and the subsequent onset of problems, or to promote the adoption of low risk (or self-protective) practices and cognitions. Policies can be organized into three categories: restrictions on the general availability of gambling; restrictions on who can gamble; and restrictions on how gambling is provided. As there is considerable evidence on this issue, the focus is primarily on research that reports actual changes in behaviour as a measure of effectiveness.

Restrictions on the General Availability of Gambling

Greater availability of a product is typically related to greater use of the product, especially among those with dependency-forming potential. Thus, alcohol availability is positively associated with higher levels of consumption, which is correlated with higher levels of alcohol-related problems (Cook, 2007; Cook & Moore, 2002; Gruenewald, Ponicki, & Holder, 1993; Rush, Gliksmann & Brook, 1986). Similarly, jurisdictions with higher levels of gun ownership have consistently higher rates of gun-related violence (Ajdacid-Gross et al, 2006; Hepburn & Hemenway, 2004; Killias, van Kesteren, & Rindlisbacher, 2001). It is important to note that these relationships are not perfect, nor are they simple. For example, there are circumstances where alcohol consumption can decrease despite increases in availability (e.g., Smart & Mann, 1995). Also, the relationship between gun ownership and *overall rates* of homicide and suicide is less consistent, offering some evidence of a substitution effect (Killias et al., 2001), although this interpretation is contested by some (Hepburn & Hemenway, 2004).

Evidence would suggest that gambling availability has a similar positive, but complex relationship to problem/pathological gambling prevalence. The expansion of legalized gambling in the 1980s and 1990s was followed by significant increases in the population prevalence of problem/pathological gambling as well as the introduction of specialized treatment services for problem gambling (National Research Council [NRC], 1999; Shaffer, Hall, & VanderBilt, 1997).⁴ There is also a strong within-country association between the availability of gambling and the prevalence of problem/pathological gambling (Lester, 1994; National Gambling Impact Study Commission [NGISC], 1999; Productivity Commission, 1999; Shaffer, LaBrie, & LaPlante, 2004; Welte, Wieczorek, Barnes, Tidwell, & Hoffman, 2004). However, it also seems clear that a) there are many other important factors that also influence the problem/pathological gambling prevalence rate, and b) the relationship between gambling availability and problem/pathological gambling is not a linear one; jurisdictions may show increased rates of problem/pathological gambling initially, followed by stable or decreased rates after time (Hodgins, 2005; Shaffer et al., 2004; LaPlante & Shaffer, 2007).⁵

⁴ In Canada, the first specialized treatment programs were developed in Alberta and New Brunswick in 1993.

⁵ There is also evidence that the average level of gambling activity in a jurisdiction also predicts the jurisdiction's level of excessive activity or problem gambling (e.g., Chipman, Govini & Roerecke, 2006; Grun & McKeigue, 2000; Lund, 2008). This is known as the 'single distribution theory' (Rose, 1985), which has been shown to have applicability in predicting rates of alcoholism. If this is also true for gambling, then studies that have reported increases or decreases in average gambling expenditure also indirectly report on the rates of problem gambling.

Because of the significant relationship between availability and problem/pathological gambling prevalence, it comes as no surprise that restricting gambling availability is a policy often used to prevent problem/pathological gambling by lowering the rate of onset or incidence. To this end, total gambling prohibition is one option, and does occur in a few jurisdictions (e.g., American states of Utah and Hawaii; Cuba; Pakistan; countries where the Islamic religion predominates). Discussing the pros and cons of total prohibition are beyond the scope of this paper, and, in any case, most jurisdictions opt for less drastic measures as discussed below.

Restricting the Number of Gambling Venues

Most countries require licenses for providers, but do not specify restrictions on the number of bingo halls, horse race tracks, or lottery ticket sales outlets. It is much more common practice to put restrictions on casino numbers and EGMs. Caps on numbers of casinos and/or gambling houses occur in Austria, Belgium, Italy (capped at 4, the lowest of all European jurisdictions), the United Kingdom (the highest cap at over 150), the Netherlands, Portugal, Slovenia, and Sweden (Sychold, 2006). A maximum of 40 casinos is allowed in South Africa, with 32 venues currently operational (National Gambling Board, 2005). In Canada, certain provinces (e.g., British Columbia, Ontario) have capped the number of casinos.

Venue caps make theoretical sense considering the positive association between product availability and product consumption. Specific evidence of their association with problem/pathological gambling is seen in the following:

- In the U.S., the NGISC (1999) found that living within 50 miles of a casino is associated with a 50% higher rate of pathological gambling.
- Welte et al. (2004) independently demonstrated a positive relationship between problem/pathological gambling in the United States and the existence of a casino within 10 miles of the gambler's home.
- Lester (1994), in a U.S. wide study, found that the opportunity to gamble at casinos with slot machines, on sports betting, at jai alai, and in teletheaters was associated with being in a state with a greater per capita prevalence of Gamblers Anonymous (GA) chapters.
- In New Zealand, living in a neighbourhood closer to a gambling venue significantly increases the odds that that person has gambled and that that person is a problem gambler (New Zealand Ministry of Health, 2008).
- Within Canada, Table 1 presents data demonstrating a significant positive relationship between provincial casino/racino density and provincial rates of problem/pathological gambling in 2002. There are also positive relationships between problem/pathological gambling rates and the density of bingo licenses and horse racing venues. Interestingly, there is no association with the number of EGM locations, and there is a negative association with the number of lottery outlets.

Table 1. Correlates of Canadian Provincial Problem/Pathological Gambling Prevalence in 2002.

	NB	QU	PEI	NF	BC	ONT	NS	AB	SK	MB	Correlation with PG Prevalence
Problem Gambling Prevalence ¹	1.5	1.7	1.9	1.9	1.9	2.0	2.0	2.2	2.9	2.9	
Casino/Racinos (C/R) per 100000 adults	0	.12	0	0	.59	.26	.27	.77	.94	.46	<i>r</i> = .74* <i>tau-b</i> = .63*
EGMs per 100000 adults	433	341	388	633	102	213	591	471	758	807	<i>r</i> = .68* <i>tau-b</i> = .42
Casino Table Games per 100000 adults	0	3.6	0	0	12.1	5.9	7.6	17.5	13.6	7.8	<i>r</i> = .56 <i>tau-b</i> = .59*
Horse Racing Venues per 100000 adults ²	.68	.60	1.91	.24	.65	1.11	1.36	2.26	1.21	2.30	<i>r</i> = .56 <i>tau-b</i> = .52*
Bingo Licenses per 100000 adults	57	40	37	138	N.A.	22	74	105	230	56	<i>r</i> = .53 <i>tau-b</i> = .20
EGMs outside of C/Rs per 100000 adults ³	433	237	388	633	0	0	441	255	507	582	<i>r</i> = .35 <i>tau-b</i> = .22
% Revenue on Prevention/Treatment ⁴	.59	1.25	.63	.38	.48	1.20	1.22	.52	1.53	.71	<i>r</i> = .32 <i>tau-b</i> = .24
# locations EGMs occur outside C/Rs per 100000 adults	111	62	87	138	0	0	73	50	93	67	<i>r</i> = -.02 <i>tau-b</i> = -.12
Lottery Outlets per 100000 adults	175	180	177	323	128	113	181	90	104	97	<i>r</i> = -.50 <i>tau-b</i> = -.47

1. As established by a Canadian Problem Gambling Index (CPGI) score of 3 or higher. The CPGI was administered as part of the Canadian Community Health Survey (1.2) (May – Sept 2002; n = 34,770).
2. Racetracks and Teletheatres.
3. Electronic Gambling Machines outside Casinos or Racinos for every 100,000 adults aged 18 and older.
4. Percentage of provincial government gambling revenue spent on prevention and treatment of problem/pathological gambling.

* Correlation significant at the .05 level (2 tailed)

Note. Unless otherwise stated, all data comes from the Canadian Gambling Digest, published by the Canadian Partnership for Responsible Gambling (2004) and the 2001 Statistics Canada Census. All data from the Canadian Gambling Digest pertains to the period April 2002 to March 2003.

Provinces are New Brunswick (NB), Quebec (QU), Prince Edward Island (PEI), Newfoundland & Labrador (NF), Ontario (ONT), Nova Scotia (NS), Alberta (AB), Manitoba (MB), Saskatchewan (SK).

Before versus after comparisons of the impact of venue openings is also relevant to this issue:

- Room, Turner, and Ialomiteanu (1999) found that Casino Niagara's opening in Ontario in 1996 brought an increase in gambling and reported gambling problems one year later among Niagara Falls residents. Toneatto, Ferguson, and Brennan (2003) also found that the casino opening was associated with increased South Oaks Gambling Screen (SOGS) scores for residential substance abusers who gambled most frequently on casino gambling in 1997 and 1998.
- Jacques, Ladouceur, and Ferland (2000) found that, as opportunities for casino gambling become available in two Quebec communities in 1996, there was increased participation rates and spending on casino gambling by local citizens and an increase in problem (i.e., less severe) but not pathological (more severe) gambling. These impacts were not seen at 2- and 4-year follow-up, although attrition rates were as high as 75% by 2002 (Jacques & Ladouceur, 2006).
- Govoni, Frisch, Rupcich, and Getty (1998) found that Casino Windsor's opening in Ontario in 1996 produced no significant change in Windsor residents gambling expenditure or rate of problem/pathological gambling one year later.
- Hann and Nuffield (2005) found that the opening of four casinos and one racino in Ontario in 1999 and 2000 produced an increase in the rate of probable *pathological* gamblers in these communities from 1.5% to 2.5% (although no change in the rate of problem/pathological gamblers at 2.4%).
- Blue Thorn Research, Population Health, and Williams (2007) found that the introduction of two new casinos and one new racino into the British Columbia Lower Mainland in 2004/2005 resulted in no change in the problem/pathological gambling prevalence rate in Vancouver, Surrey or Langley Township when examined 1.5 to 2 years later. However, rates did increase in the city of Langley. These authors attributed this differential effect to the extensive availability of casino gambling in Vancouver and Surrey prior to the introduction of these new venues (associated with a high baseline rates of problem/pathological gambling in these communities), compared to less availability of casino gambling and a low baseline rate of problem/pathological gambling in the city of Langley.
- Bondolfi et al. (2008) found no significant increase in pathological gambling (SOGS) from 1998 to 2005 despite widespread openings of casinos in Switzerland since 2002 (past year prevalence of 0.8% for problem gambling and 0.5% for pathological).

It is important to recognize that the stable problem/pathological gambling prevalence rates found in Govoni et al. (1998), Blue Thorn et al. (2007), and Bondolfi et al., (2008) still provide good evidence that gambling availability is causing *increased* problem/pathological gambling in the population. Although severe levels of pathological gambling are reasonably stable over time (e.g., Hodgins & Peden, 2005; Slutske, 2006), moderate levels of problem/pathological gambling (which are much more common) are not. Studies have found that the large majority of 'moderate' problem gamblers are no longer problem gamblers at 1-year follow up (Wiebe, Cox, & Falkowski-Ham, 2003) or 7-year follow up (Abbott, Williams & Volberg, 1999). Stable rates of problem/pathological gambling from time 1 to time 2 therefore indicate the existence of a large group of newly affected individuals roughly equivalent to the number of individuals who have recovered or remitted.⁶

Restricting More Harmful Types of Gambling

⁶ For the same reason, the relatively stable problem gambling prevalence rates in North America in the past 15 years is evidence that continued gambling availability is producing large numbers of new problem gamblers every year, thereby significantly increasing lifetime prevalence of this condition in the population.

It is a common policy to prohibit or restrict inherently more ‘dangerous’ forms of a product. For example, in many countries handguns, assault rifles, and automatic weapons are prohibited, whereas hunting rifles are legally available. Similarly, drugs with greater perceived potential for addiction (e.g., cocaine, methamphetamine, heroin) tend to be illegal in most countries, with substances perceived as less harmful being legally available (e.g., alcohol).

From a theoretical perspective, forms of gambling that can be played quite rapidly and that provide a high frequency of reinforcement (‘continuous forms’) should be the most problematic. Electronic gambling machines epitomize this characteristic and are the form of gambling most often identified by problem gamblers, treatment agencies, and gambling researchers as creating the most problems (e.g., Dowling, Smith, & Thomas, 2005; Brooks, Ellis, & Lewis, 2008). Casino table games also have this characteristic and are often identified as problematic in Asian countries (Ka-Chio Fong D, & Orozio B, 2005; Tang, Wu, & Tang, 2007; Teo, Mythily, Anantha, Winslow, 2007; Wong & So, 2003). Internet gambling is another form of gambling with an unusually high association with problem/pathological gambling (Williams & Wood, 2007a; Wood & Williams, 2007a; 2007b), presumably because of its ready availability as well as its provision of online forms of continuous gambling. Internet gambling is prohibited in several jurisdictions (e.g., U.S., Russia, Pakistan, Saudi Arabia, Greece, Portugal, Bermuda) because of concerns with its potential for harm. Unfortunately, prohibition of Internet gambling usually serves limited deterrent value because of enforcement difficulties.

Currently, EGM gambling is prohibited or does not occur in some jurisdictions (e.g., 15/50 U.S. states did not have EGMs in 2006), and there is some empirical evidence regarding the impact of EGM bans in two American states: South Dakota and South Carolina. In 1994, South Dakota’s 7,859 legal EGMs were declared unconstitutional, shut down for three months, and then reinstated by public referendum (Rose, 2003). In the 11 months prior to the ban, 4 substance abuse treatment centres averaged 68 inquiries and 11 problem/pathological gambling clients per month. During the shutdown, there were only 2 inquiries and 2 people treated among all four centres. In the 3 months after EGM reinstatement, the centres averaged 24 inquiries and treated 8 gamblers per month (Carr, Buchkoski, Kofoed, & Morgan, 1996). In 2000 the 36,000 legal EGMs in South Carolina were banned. Following the ban there was a significant increase in seizures of illegal machines, from 48 in 2000-2001 to 1,551 in 2004-2005 (South Carolina Law Enforcement Division, 2005). Nonetheless, the number of active Gambler’s Anonymous groups fell from 32 to 16 within 90 days of the shutdown, with several of the remaining active groups reporting the size of their group meetings decreasing from 40 to 1 or 2 (Bridwell & Quinn, 2002). Additionally, the most active gambler’s hotline in the state reported that calls fell from 200 a month to zero. These reductions have been maintained in subsequent years. Current directory information for Gamblers Anonymous (2006) indicates 10 active GA groups in South Carolina. Additionally, less than 1% of the 4,500 calls made to the South Carolina Gambling Helpline since its inception in 2004 have been related to problems with EGMs (J. Mount, personal communication, August 4, 2006).

Other machine bans are pending or in progress that could potentially provide more evidence on this issue. North Carolina legislated a phased-out ban starting in October 2006 (Eisley & Allegood, 2006). Portugal and Latvia intend to eliminate EGM gambling in 2007 (Sychold, 2006). A Norwegian ban on privately owned slot machines in July 2007 resulted in a reduction of people phoning a national gambling help line from 2,276 in 2004 to just 330 in 2008 (IGaming Business, 2008).

Placing a limit on the total number of EGMs is another variant on this policy strategy. Again, this makes theoretical sense given that there is a strong positive relationship between EGM numbers

per capita and problem/pathological gambling rates. For example, Australia has the world's highest per capita EGM ratio (~1 machine for every 99 people) (excluding smaller, tourist-oriented countries such as Monaco), as well as one of the world's highest rates of problem/pathological gambling (Productivity Commission, 1999). Within Australia, there is also a significant positive relationship between number of machines and regional problem/pathological gambling rates (Productivity Commission, 1999; South Australian Centre for Economic Studies [SACES], 2005). The same is true in Canada, as demonstrated by the significant positive correlation between provincial problem/pathological gambling prevalence rates and EGMs per 100,000 adults ($r = .68, p < .05$) seen in Table 1.

It appears that reductions in EGM numbers do not have a significant impact if they do not substantially change overall EGM availability. A study by SACES (2005) investigated the impact of regional restrictions on EGM numbers in the state of Victoria. Findings indicated that gambler losses were not generally reduced, help-seeking by problem/pathological gamblers did not change, and there were no sustained revenue losses in venues where machines were removed. However, the authors pointed out that the areas with new caps tended to be areas with the highest EGM per capita ratios to begin with, and the magnitude of the reductions was small. Similarly, a 25% reduction in EGMs outside casinos ('video lottery terminals') in Nova Scotia, Canada in November 2005 is said to have resulted in a relatively small reduction in revenue (Flinn, 2006).

Limiting Gambling Opportunities to Gambling Venues

"Convenience gambling", whereby gambling opportunities are available outside dedicated gambling venues, is sometimes cited as an important factor in the development of problem/pathological gambling. In Europe, EGM gambling is prohibited outside dedicated gambling venues in Cyprus, France, Greece, and Luxembourg, and is banned from 'low barrier' locations (e.g., bars; lounges; clubs) in Lithuania, Latvia, and the Netherlands (Sychold, 2006). In the United States, only five states allow EGMs outside of gambling venues: Louisiana, Montana, Nevada, Oregon and West Virginia (American Gaming Association, 2006). In Canada, 2 out of 10 provinces do not permit EGMs outside of gambling venues: Ontario and British Columbia. In Australia, the state of Western Australia does not permit EGMs outside its one casino.

The unique impact of limiting gambling opportunities to gambling venues is difficult to determine, as jurisdictions that utilize the policy also tend to have fewer total EGMs and sometimes are less accepting toward gambling in the first place. An example is Western Australia, where the prevalence rate of problem/pathological gambling is the lowest in all of Australia, but also where the ratio of 99 EGMs per 100,000 adults is the lowest (SACES, 2005).

In Canada, the provinces of Ontario and British Columbia allow no EGMs outside of dedicated gambling venues and also have the lowest ratio of EGMs per 100,000 adults. As seen in Table 1, they still have 'mid range' problem/pathological gambling prevalence rates, perhaps due to the fact they have the highest number of casinos/racinos in the country (25 and 19 respectively in 2002). The lack of EGMs outside casinos/racinos also likely explains why residents of these two provinces patronize EGMs within casinos/racinos at a higher rate than any other province, 28% and 22% respectively (Canadian Partnership for Responsible Gambling, 2004; Blue Thorn et al., 2007).

The overall relationship is relatively weak between provincial problem/pathological gambling prevalence rates in Canada, and the number of EGMs outside of gambling venues per capita ($r = .35, ns$), and nonexistent between problem/pathological gambling prevalence rates and the number of EGM locations per capita ($r = -.01, ns$) (see Table 1) (this is true even when removing ONT and BC

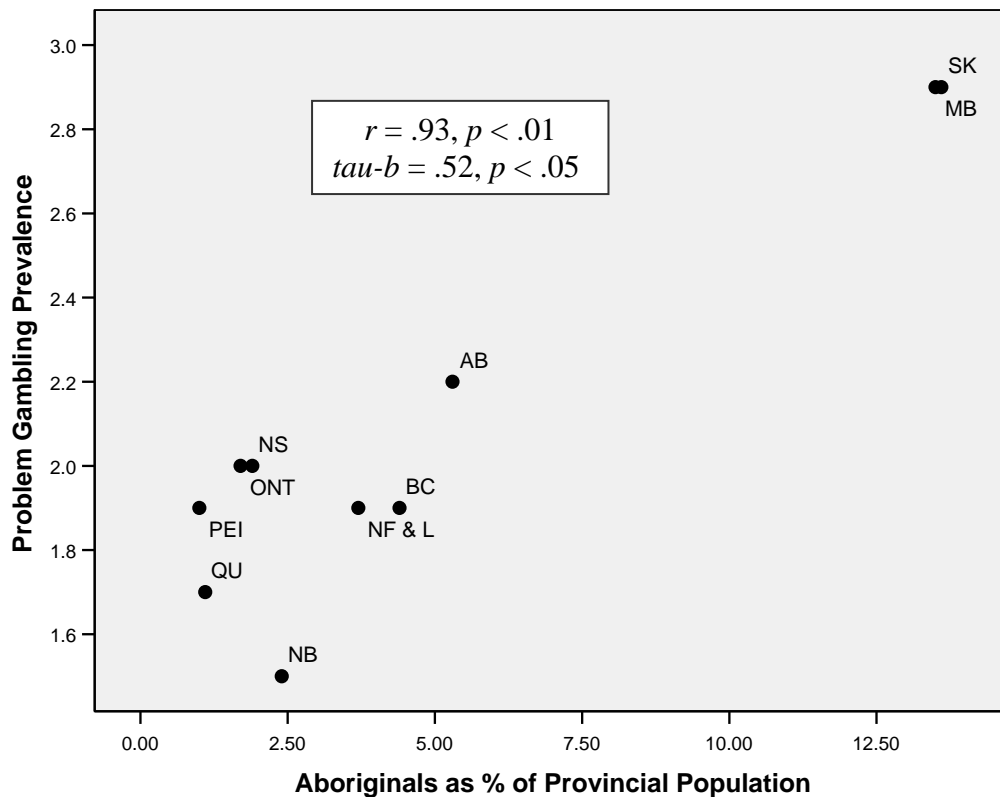
from the correlations). In the United States, there is no significant difference in the rates of problem/pathological gambling in states with EGMs outside casinos ($n = 4$, prevalence = 4.1%) compared to states without EGMs outside casinos ($n = 24$, prevalence = 3.9%), $t(26) = .17$, $p = .86$. These results are somewhat surprising considering the fact that increasing the number of alcohol outlets per capita tends to increase alcohol consumption (Wagenaar & Holder, 1995; Wagenaar & Langle, 1994). However, what these results perhaps indicate is that each available EGM represents an independent ‘outlet’ as opposed to each place where EGMs are located. Thus, total EGMs per capita may continue to be a much better predictor of jurisdictional problem/pathological gambling prevalence rates. A corollary of this point is that concentrating gambling opportunities within gambling venues may simply result in corresponding local concentrations of problem/pathological gambling (e.g., Shaffer et al., 2004).

Restricting the Location of Gambling Venues

Historically, casinos in Europe and the United States were placed in tourist destinations away from major urban centres. This is still the case in Asia and Africa. The historical rationale for this was that casinos would be deleterious for urban, working-class populations, and that the economic benefits of casinos are most apparent when they draw new money and wealth into the community rather than redirecting money from other local businesses (Grinols, 2004; McMillen, 1998). The other major benefit of ‘outside’ patronage is that the social problems created by gambling go home with the tourist, rather than impacting the local social service and health care system. These social and economic principles still appear to be sound, despite the tendency to locate most casinos in urban centres in recent years.

An additional consideration concerning placement of gambling venues is the fact that some groups of urban residents are much more vulnerable to problem/pathological gambling than others. In general, poorer neighbourhoods are positively associated with problem/pathological gambling (Welte et al., 2004). For individuals, Rush, Adlaf, Veldhuizen, Corea, and Vince (2005) (also in Rush, Veldhuizen, & Adlaf, 2007) found that substance abuse and demographic factors were the strongest predictors of problem/pathological gambling status (stronger than gambling venue proximity). In Canada, the national prevalence study of gambling in 2002 (Canadian Community Health Survey (CCHS) 1.2), found that people with less education, and those of Aboriginal descent have significantly higher risk of problem/pathological gambling (Marshall & Wynne, 2003). As seen in Figure 2, the Canadian provincial problem/pathological gambling prevalence rate is in fact *best* predicted by proportion of the population with Aboriginal ancestry ($r = .93$, $p < .01$). Almost equally strong is the relationship between provincial rates of alcohol dependence (established in the same CCHS 1.2 survey) and problem/pathological gambling prevalence ($r = .74$, $p < .05$).

Figure 2. Aboriginal Ancestry as it Relates to Canadian Provincial Problem/Pathological Gambling Prevalence in 2002.



Problem/pathological gambling prevalence established by a Canadian Problem Gambling Index (CPGI) score of 3 or higher. The CPGI was administered as part of the Canadian Community Health Survey (1.2) (May – Sept 2002; n = 34,770).

Provinces are New Brunswick (NB), Quebec (QU), Prince Edward Island (PEI), Newfoundland & Labrador (NF&L), Ontario (ONT), Nova Scotia (NS), Alberta (AB), Manitoba (MB), Saskatchewan (SK).

Aboriginal population figures from the Statistics Canada 2001 Census.

Limiting Gambling Venue Hours of Operation

Policies to limit the number of hours that patrons may gamble in any twenty-four hour period are intended to reduce harm associated with extended play. Restrictions may apply either to gambling venues or to certain types of gambling. For example, EGMs in Alberta may operate for 17 consecutive hours, and table games for 14 hours (although poker rooms in casinos remain open around the clock). The two casinos in Winnipeg, Manitoba are open from 10:00 A.M. to 10:00 P.M. daily during the summer months, and 10:00 A.M. to dusk the remainder of the year. Gambling venues in the Australian Capital Territory are closed from 4:00 A.M. to 7:00 A.M. daily, while in Queensland, venues are required to close between 4:00 A.M. and 10:00 A.M., with time variation possible on application; South Australian gambling machine clubs must close for a minimum of 6 hours each day. Elsewhere around the world there is wide variation, with some venues being open around the clock and others shutting down nightly.

As with most other preventative gambling initiatives, information is limited regarding the effectiveness of hours-of-operation restrictions. The province of Nova Scotia shut-down of EGMs

outside of casinos at midnight resulted in a *self-reported* 18% reduction in spending among a random sample of problem/pathological gamblers. Actual revenues only declined about 5.1 - 8.7% (Nova Scotia Gaming Corporation, 2005). In Australia, hours of operation restrictions currently apply in seven states and territories. However, as reported by the Centre for Gambling Research (2005), the large majority of venue operators reported no effectiveness of the short shut-down periods. Notably, the shut-downs occur at times of day when the patronage is already at its lowest.

Reduced hours of operation still make theoretical sense considering a) the general premise that reduced availability leads to reduced problems, and b) evidence in the alcohol field that restricted hours and days of operation reduce social harm (Babor et al., 2003; Chikritzhs & Stockwell, 2006). However, similar to reductions in EGMs, *unless availability reductions are meaningful and substantial, it seems unlikely that an overall beneficial impact will be obtained.*

Restrictions on Who can Gamble

Prohibition of Youth Gambling

Worldwide, it is a common policy to restrict gambling to individuals who are of legal adult age (Rose, 2001). There are some important regional variations on this policy. For example, there are no age limits to play electronic gambling machines ('fruit machines') with low prize limits in the United Kingdom. Sixteen year olds can purchase lottery tickets in England and Finland. A few U.S. states (and Alberta, Canada) permit bingo playing at age 16 (NRC, 1999). There is also wide variation on enforcement. In general, enforcement tends to be good in situations where gambling occurs in adult-only venues (e.g., casinos, bars/clubs/lounges) and poor in situations where gambling opportunities are available in public locations. Consequently, North American and Australian youth tend to have low rates of casino table game and gambling machine play (only available in adult venues), but high rates of lottery and scratch ticket play (available in public locations) (Delfabbro, Lahn, & Grabosky, 2005; Felsher, Derevensky, & Gupta, 2004; Jacobs, 2004). In contrast, gambling machine play is among the most common gambling activity among youth in Nordic countries, as these machines are available in public locations (Johansson & Gotestam, 2003; Olason, Sigurdardottir, & Smari, 2006).

The prevalence of gambling and problem/pathological gambling between youth in different jurisdictions is difficult to compare or even definitively establish, because of the use of different instruments (i.e., SOGS, SOGS-RA, DSM-IV, DSM-IV-MR-J), as well as serious concerns about whether these instruments overestimate true prevalence rates (e.g., Ladouceur et al., 2000; Pelletier, Ladouceur, Fortin, & Ferland, 2004). That being said, there are some interesting observations that can be made about these obtained rates. First, despite prohibition, the past year prevalence of both gambling (~70-90%) and problem/pathological gambling (~2-6%) appears to be at least as high, if not higher than adult rates (Rossen, 2001; Shaffer & Hall, 2001). Second, there do not appear to be any obvious differences in prevalence rates between jurisdictions, despite significant variations on availability and enforcement (Rossen, 2001; Shaffer & Hall, 2001). Finally, it is somewhat surprising to note that countries where youth have greater access to gambling opportunities (e.g., U.K.; Nordic countries) tend to have somewhat lower rates of adult problem/pathological gambling. Here again, differences in instrumentation, response rates, etc. may account for apparent differences in adult problem/pathological gambling rates. Furthermore, even if these differences are real, there are many things that could account for them (e.g., European electronic gambling machines tend to have low stakes and low prize limits).

However, it is also worth considering whether early exposure to gambling could have beneficial effects. The analogy here is the oft cited lower rate of adult alcoholism in many countries

where children are exposed to alcohol at an early age (e.g., China, Israel, southern European countries such as Italy) (Heath, 1995; Pittman & White, 1991). However, it is important to recognize that in many cases early exposure is known to be quite harmful. For example, indigenous groups (e.g., North American Aborigines, Australian Aborigines) and certain countries such as France have very high rates of alcoholism despite early exposure. Furthermore, an early onset of substance use (e.g., Taioli & Wynder, 1991; Dawson et al., 2008) and gambling (e.g., Gupta & Derevensky, 1998) tend to be a strong correlate of dependence later in life. Controlled animal research suggests that adolescent exposure to drugs (e.g., nicotine, alcohol) creates permanent neurochemical changes that results in increased adult consumption of these products as well as ongoing ‘relapse-like’ behaviour, with this effect much more pronounced for strains of addiction-prone animals (Diaz-Grandados & Graham, 2007; Levin et al., 2003; Rodd-Henricks, et al., 2002; Schramm-Sapyta et al., 2008; cf. Slawecki & Betancourt, 2001). It should also be noted that any cultural practice which promotes widespread substance use or gambling is potentially problematic because of the positive association between a jurisdiction’s overall level of the activity and its level of problem/pathological involvement in the activity (Chipman, Govini & Roerecke, 2006; Grun & McKeigue, 2000; Lund, 2008).

It is important to recognize that what is common among cultures with low rates of alcoholism *despite* early exposure *is ongoing promotion and modelling of moderate use in the context of family, meals, and/or religious service, as well as cultural taboos against drunkenness* (Heath, 1995; Pittman & White, 1991). Thus, it is likely that *extended modelling during initial use of the product* is the important ingredient. This is also the mechanism thought to account for the reduced rate of traffic accidents in jurisdictions that have introduced graduated driver licensing (e.g., McKnight & Peck, 2003). Hence, the evidence would suggest that deliberately exposing youth to gambling at a young age is probably counterproductive. However, managing and modelling their gambling in a controlled fashion when they are first legally able to gamble may well have value.

Restricting Venue Entry to Non-Residents

Some countries do not permit local residents to gamble at casinos. Examples include France, the Bahamas, Malaysia, Papua New Guinea, Vietnam, and Nepal. Australia does not permit residents to gamble at its government licensed online casino (Lasseters) although it does permit its citizens to wager money with Australian online sports and race books, poker rooms, lottery sites, and skill game sites. In other countries, resident access is severely restricted. For example, South Korean citizens are only allowed to gamble at one of South Korea’s fifteen casinos (Back, 2006). The rationale for this policy is the same as the rationale for locating casinos in tourist areas: to ensure that casino revenues come from outside the jurisdiction and to protect the local populace from social harm.

Although theoretically sound, there is a lack of empirical evidence on the effectiveness of this policy in preventing problem/pathological gambling amongst the citizenry. It is clear that gambling is still common in some countries where this policy exists. Anecdotally, South Korea is said to have high rates of problem/pathological gambling.

Restricting Venue Entry to Higher Socioeconomic Classes

Dress codes requiring formal attire exist in some European countries, partly to maintain the sophisticated ambience, and partly to cater to the higher socioeconomic classes. Significant entry fees are required in some countries (e.g., Papua New Guinea), which are intended to have the same effect. Recently, a bill has been proposed in Panama to restrict entry to the 13 Panamanian casinos to people with incomes of >\$1,000 U.S. per month (Yogonet.com, 2006). In Singapore, the Casino Control Act

bans casino entry to anyone who has claimed bankruptcy or receives social assistance payments (Rutherford, 2008).

Socioeconomic status (in western countries) is a fairly weak predictor of problem/pathological gambling status. Nonetheless, anything that effectively reduces overall gambling patronage would also likely reduce overall problem/pathological gambling prevalence.

Casino Self-Exclusion⁷

The first formal casino self-exclusion program was initiated in 1989 in Manitoba, Canada, coincident with the opening of the country's first permanent, year-round casino. In the Netherlands, Holland Casino developed a program in 1990. In the United States, a tribal casino in Connecticut implemented a self-exclusion program in 1994, and Missouri developed the first state-wide program in 1996. Since that time, many casinos and jurisdictions around the world have adopted self-exclusion programs. Several Internet gambling sites also offer self-exclusion programs (Wood & Williams, 2007a).

The effectiveness of self-exclusion programs can be measured in three ways. The first consideration is utilization rate. On the basis of self-exclusion data for seven Canadian provinces with casinos (as provided by regulatory agency staff to one of the authors (BW) in 2005), between 0.6% and 7.0% of problem/pathological gamblers signed up to self-exclude, depending on the province. These fairly low utilization rates are similar to what has been reported in Australia and the United States (SACES, 2003). One European jurisdiction with significantly higher rates is the Netherlands, due to the proactive nature of their program, where individuals with high rates of casino patronage are approached to see if they wish a 'visit limitation' or casino exclusion contract (Bes, 2002; De Bruin et al., 2001; Nowatzki & Williams, 2002).

Another measure of effectiveness concerns the percentage of self-excluded people who do not actually re-enter the casino(s) during the contracted period of exclusion. Evidence is very limited on this topic. Ladouceur et al. (2000) studied 220 individuals self-excluded from a Quebec casino. A subset of 53 went back to renew or re-establish a self-exclusion contract. Of this group, 64% reported not entering the casino during their previous exclusion period. However, the 36% who did return reported going back a median of six times. Steinberg and Velardo (2002) studied a small subset (n=20) of the 294 self-excluders at the Mohegan Sun Casino in Connecticut. Here again, most reported they did not return to the casino during the period of exclusion, but the majority of the 20% that did return went back more than 9 times. A review of self-exclusion in Victoria, Australia also concluded that a significant number of self-excluders re-enter casinos without being detected (O'Neil et al., 2003). Much higher compliance occurs in the Netherlands where personal identification is required to enter any of the 12 casinos operated by Holland Casino. A computer system registers all visits and immediately identifies anyone who has requested a ban or visit limitation (Bes, 2002; De Bruin et al., 2001).

A final measure of effectiveness concerns the impact self-exclusion has on overall gambling behaviour. Again, very little is known here. Of the 53 individuals who went back to renew a self-exclusion contract at a Quebec casino, only 30% reported they had stopped gambling completely during their previous contract (which had typically been for a period of 6 to 12 months) (Ladouceur et al., 2000). Two previous studies reported that about half of self-excluded patrons found other ways to

⁷ Casino self-exclusion is another 'tertiary' prevention initiative, as it is primarily utilized by existing problem gamblers to minimize further harm.

gamble, such as illegal gambling or electronic gambling machines outside of casinos (De Bruin et al., 2001; Ladouceur et al., 2000). Furthermore, a study completed in the Netherlands found that a large percentage of people who requested a ban or visit limitation eventually returned to the casino following the period of restriction. Some had a sharp increase in visiting frequency in the ensuing six months, although the frequency of most people stabilized over time to fewer than eight visits per month (De Bruin et al., 2001). A more positive evaluation was obtained by Ladouceur, Sylvain, & Gosselin (2007) who conducted a 6, 12, 18, and 24 month follow-ups of 161 self-excluders in Quebec. Follow-up evaluations found self-excluders to have significant reductions in urge to gamble, the intensity of negative consequences, and DSM pathological gambling scores.

While it is apparent that casino self-exclusion contracts have some preventive value in containing harm to established problem/pathological gamblers, it is also apparent that they could be a lot more effective.⁸ Nowatzki and Williams's (2002) review of self-exclusion programs identified the following areas in need of improvement:

1. *Mandatory and Aggressive Promotion.* Many problem/pathological gamblers are still unaware of these programs.
2. *Irrevocable Bans.* Revocable bans (which are common) defeat the purpose of self-exclusion, which is to set up enduring external constraints for people attempting to curb their gambling, usually after efforts at self control have failed. Evidence also indicates that patrons prefer irrevocable bans.
3. *Wide Range of Ban Lengths.* The appropriate length of abstinence required to prevent problem/pathological gambling relapse is unclear. However, for substance abuse, abstinence of 3 to 6 months is commonly achieved but has almost no predictive value in preventing relapse. Rather, periods greater than 2 years are necessary to prevent relapse in most cases. For alcohol abuse, 25% will still relapse after four years of abstinence and 7% will still relapse after 6 years (Vaillant, 1995). Thus, from a clinical perspective, it might be prudent for casino ban lengths to be for a minimum of 5 years. On the other hand, this minimum length may deter some people from entering into self-exclusion. Currently, many bans range from 6 months to lifetime.
4. *Application to all Gambling Venues within the Jurisdiction.* Self-exclusion has limited deterrent value if it is only applicable to one venue or one type of gambling. Jurisdiction-wide exclusion is common in Canada (except Quebec) and Europe, but it is less common in the United States and Australia. In Canada, self-exclusion also applies to racinos and bingo halls in some provinces. In Europe, at least one country (the Netherlands) extends self exclusion to its online gambling services (and vice versa). A Global Self-Exclusion Database has been recently developed by a U.S. ID verification company called Aristotle that allows Internet gamblers to ban themselves from all participating Internet gambling operators (Online Casinos.com, 2006).
5. *Computerised Identification Checks for Enforcement of Self-Exclusion.* This is the only method that will guarantee adequate enforcement. Venues report that it is impossible for security personnel to memorize the faces of hundreds of different people (SACES, 2003). In 2007 over 10,000 people were currently self-excluded in the province of Ontario (filling 22 binders) (CBC, 2007). In many European casinos, people show picture identification to enter the premises

⁸ It is sometimes pointed out that exclusion contracts do not exist for alcohol sales or service. However, a historical variant on this policy was the prohibition on selling alcohol to Indians in the United States prior to 1937. Similarly, after alcohol prohibition was repealed in North America, many states and provinces retained very restrictive practices over alcohol sales and service. For example, in Iowa to purchase alcohol you had to show your 'Liquor Book' that recorded all your alcohol purchases in the past year. If your purchases were judged excessive, the clerk had the right to refuse to sell you alcohol (this law was only officially repealed in 1963). More recently, a New Mexico lawmaker has proposed banning alcohol sales to people convicted of driving while intoxicated (Wines & Vines, 2005). Australia has plans to ban alcohol sales to Aborigines in the Northern Territory (CNN.com, 2007).

(driver's license or passport). This is required in at least one Asian casino in Korea (Back, 2006). Although North American casino owners often contend that patrons would not accept such a requirement, showing ID is a common practice to rent a video, cash a cheque, board a plane, etc. In Alberta, several bars have been using ID screening to exclude undesirable patrons for several years (www.barlink.ca). In a compromise between the Illinois Gaming Board who wanted ID screening for self-exclusion contracts, and the casino industry that did not, Illinois started requiring ID for anyone who looks 30 or younger in August 2006 (Fusco, 2006). Biometric facial identification is a technology that some North American casinos use for identification of card counters, cheats, and 'high rollers' (Market Wire, 2000), but which could also be extended to detect self-excluders. Computerized identification checks would also enable 'visit limitation contracts', as opposed to total bans, as is done in the Netherlands (Bes, 2002).

6. *Legal Liability and Penalties for both the Venue and the Gambler upon Breach of Contract.* There needs to be an incentive for both parties of a contract to abide by its conditions. Even though penalties to the gambler are often stipulated in these agreements (e.g., fines, confiscation of winnings, trespassing charges), they are rarely applied (Nowatzki & Williams, 2002). Mandatory identification for wins over a few hundred dollars combined with automatic confiscation of winnings for barred self-excluders would eliminate much of the incentive to violate bans. Gambling venues consider themselves absolved of any legal responsibility in the event that a self-exclusion contract is breached (their perspective is that these are 'agreements', rather than legally binding 'contracts'). To date, courts in the United States, Australia, and the United Kingdom (Armstrong, 2008) have agreed with this position. This has not always been the case elsewhere. In 2003 the Appeals Court of Austria ruled against Casino Austria, stating that the casino had an obligation to refuse entry to players whose financial solvency was in question (Rhea, 2005). In Ontario, the Ontario Lottery and Gaming Corporation has settled nine self-exclusion cases out of court in recent years, in favour of the patron (CBC, 2007; Rhea, 2005). Many observers believe it is only a matter of time before the legal 'duty of care' established for alcohol providers (e.g., U.S. Dram Shop liability laws; Canadian Supreme Court 1973 Menow ruling) is also firmly established under common law for gambling providers (Hillyer, 2003, as cited in Sasso & Kalajdzic, 2006).
7. *Optional counselling and a mandatory gambling education seminar prior to reinstatement.* Problem/pathological gamblers who sign exclusion contracts have taken an important first step, but many would also benefit from counselling or treatment (Sani, Carlevaro, & Ladouceur, 2005). Thus, counselling should be offered and encouraged to everyone who enters into a self-exclusion contract. In Manitoba, individuals are required to attend a responsible gambling awareness seminar prior to re-entry (review of past gambling history, information on how gambling works, plan for returning to gamble).

Restrictions or Alterations on How Gambling is Provided

On-Site Intervention with 'At-Risk' Gamblers

Several different initiatives have attempted to provide therapeutic interventions to at-risk and problem/pathological gamblers at the gambling venue itself. This makes a lot of theoretical sense considering that a) a significant portion of gambling venue patronage consists of problem/pathological gamblers (e.g., Fisher, 2000; Gerstein et al., 1999), and b) only a small minority of problem/pathological gamblers ever seek treatment (Hodgins & el-Guebaly, 2000). Following is a description of on-site initiatives and what is known about their effectiveness.

Employee Problem Gambling Awareness Training

In recent years problem/pathological gambling awareness training for employees of gambling venues has been initiated in many countries. The purpose of these programs is to increase employee recognition of problem/pathological gambling among patrons and to direct these patrons to appropriate treatment resources. Programs are variously delivered by venue owners/operators, departments of health/addiction agencies, contracted companies, or combinations of the foregoing. Program design tends to be based on collaborative consultation between government, gambling industries, and prevention/treatment agencies. Staff training is mandatory in several jurisdictions and is sometimes also required of EGM site holders/staff and lottery retailers. Front line employees at casinos typically receive a one-time knowledge and skill development session to understand and recognize problem/pathological gambling behaviours in patrons so as to alert their supervisors to these individuals. More extensive training is typically provided for supervisory and management personnel at casinos, whose responsibilities include approaching the identified individual to offer immediate crisis management or treatment referral.

Holland Casinos was the first gaming provider to provide an intensive training and education program for employees beginning in the late 1980s (d'Hondt, 2007). Manitoba, Canada was one of the first North American jurisdictions to implement an employee training program, beginning in 1998. Since that time all Canadian provinces have implemented either mandatory or voluntary programs. Awareness training for employees also exists in other countries. In South Africa, the National Responsible Gambling Program (a collaborative public/private initiative), encourages and provides voluntary industry staff training. Harrahs, in the United States, has operated 'Operation Bet Smart' for several years (Harrahs Entertainment, 2004). Staff training is in fact part of the American Gaming Association's Code of Conduct for Responsible Gaming, enacted in 2003. The European Casino Association's Code of Conduct has similar provisions and was ratified by the twenty member countries in January 2006. The World Lotteries Association Code of Conduct also includes a problem/pathological gambling employee training component. New Zealand's 'Host Responsibility Training' (a model of responsible gambling on which venue licensing is conditional) includes a mandatory staff training component.

Research on the effectiveness of training programs is limited. The Addictions Foundation of Manitoba found that 98% of 1,550 video lottery terminal (VLT) site-owners and employees reported finding the training useful (Smitheringale, 2001). The only known evaluation that included any sort of behavioural measure was conducted by Ladouceur et al. (2004). These investigators found that VLT retailers in Quebec reported greater confidence in recognizing and addressing problem/pathological gambling after receiving a 2 hour problem/pathological gambling awareness workshop, and also reported approaching problem/pathological gamblers more frequently than new retailers who had not yet attended the workshop.

A comparable, well researched initiative is training of alcohol servers to not serve intoxicated patrons. A systematic review of this evidence shows several instances where this training has resulted in the desired effect, but just as many instances where compliance with the training has been poor (Ker & Chinnock, 2006). Some of the main factors interfering with the effectiveness of this training include the likelihood that intervention will compromise profits; the voluntary nature of the training (in some jurisdictions); the lack of enforcement; and a low-skilled work force with high turnover and personal drinking habits that are inconsistent with these interventions (Ker & Chinnock, 2006; Mosher, Toomey, Good, Harwood, & Wagenaar, 2002; Reiling & Nusbaumer, 2006). It is important to note that all of these barriers to compliance also apply to the gambling industry (Dangerfield, 2004; Shaffer et al., 1999; Shaffer & Hall, 2002; Williams & Wood, 2004a, 2007). Screening prospective gaming employees for problem/pathological gambling would be a policy initiative that may be helpful in this regard.

Automated Intervention for ‘At-Risk’ Gamblers

A much more reliable on-site intervention system exists in the Netherlands. The requirement to show ID also allows Holland Casino to track the frequency of casino visitation. If the computer indicates a significant increase in visitation frequency or that the person has had 20 visits a month over the past 3 months then the person is *automatically approached* to see whether they would like to sign a visit limitation contract or self-exclusion contract (Bes, 2002). Only 18.5% of these approaches are perceived negatively by the patron (Bes, 2002). In 2004, a total of 21,360 interviews were held with patrons resulting in 3,155 visit restrictions and 4,423 admission bans (Holland Casino, 2006). Although this type of proactive intervention with ‘at-risk’ gamblers has not received extensive evaluation, *secondary* prevention (i.e., risk reduction) initiatives that prevent problems from occurring in the first place are always going to be more effective than treating existing problems. An indirect measure of the utility of Holland Casino’s approach is perhaps seen in the fact that the number of people seeking help for problem/pathological gambling from the official social services is only 50% of what these numbers were in 1995 (Holland Casino, 2006). Furthermore, patron surveys show that only 5% of patrons at any given time are pathological gamblers (2% of all patrons) (d’Hondt, 2007).

Recently, in Canada, a system called ‘I-Care’ has been jointly developed by iView Systems and the Saskatchewan Gaming Corporation (SGC, 2006). ‘Player Club’ card activity is used to identify at-risk gambling behaviour combined with facial recognition technology to identify when the player is in the casino. This strategy also provides the venue with the *potential* to intervene with some at-risk players. A related initiative is being piloted by the Ontario Problem Gambling Research Centre in collaboration with the Ontario Lottery & Gaming Corporation, where high frequency (once a week or more over the past year) members of a loyalty program receive a mailed “brief motivational intervention”. The intention is to educate recipients about impaired control, offer a means for self-assessment, argue that early intervention (before debt becomes unmanageable) is preferable to later intervention, and provide a confidential link to a controlled gambling counselling program. Both initiatives are significant in that they may become components of a “standard of care” that courts accept, either fully or in part, as fulfilling the obligations of providers under a duty of care owed to problem/pathological gamblers.

Modifying EGM Parameters

Because EGMs are associated with the highest problem rates, a number of research studies have investigated initiatives to alter features of EGMs so as to mitigate harm. In most cases, machines with the highest revenue generation continually replace less lucrative machines. Hence it can be expected that current machines have evolved to employ a wide array of characteristics to optimize revenue generation. Following is a summary of research that has attempted to ‘unravel’ some of the feature modifications intended to minimize EGM harm.

Reinforcement Parameters

In one of the first laboratory studies of gambling, Lewis and Duncan (1956, 1957, 1958) found that a lower percentage of wins during the trial period produced longer periods of persistent EGM play after the machines no longer delivered wins. Lewis and Duncan (1957) also found that the larger the size of the wins, the longer it took to achieve extinction of the response.

Levitz (1971) exposed university students to an EGM variable ratio schedule that either produced a net win or a net loss over 22 trials. Both groups were then subjected to a net loss schedule.

Participants with the prior exposure to the net win schedule persisted significantly longer in the second phase. In a laboratory simulation, Weatherly and Brandt (2004) found that percentage payback rate (75%, 83%, and 95%) did not influence EGM gambling behaviour over a 15 minute session.

Dickerson, Hinchy, England, Fabre, and Cunningham (1992) observed the natural play of 10 high frequency EGM gamblers and found that small wins (fewer than 50 credits) were associated with an increase in play rate, but big wins (more than 50 credits) caused a temporary decrease in play rates (termed ‘post-reinforcement pauses’). Similar results in similar naturalistic studies were reported by Dickerson (1993), as well as findings that the number of big wins during the session was strongly predictive of duration of the session. Delfabbro and Winefield (1999a), also using a naturalistic observational study, obtained the same findings concerning the effects of small versus big wins on play rates immediately following wins, but did not find they made a difference in overall rate of play. A post-reinforcement pause in laboratory EGM play following wins was also found by Schreiber and Dixon (2001) and Dixon and Schreiber (2002). In addition, the latter study found that the speed of play increased as the number of non-reinforced trials increased. In contrast to Dickerson (1993), Kassinove and Schare (2001) did not find that a ‘big’ win in a laboratory setting resulted in greater persistence to extinction, although they believed the size of the big win (\$10), may have been insufficient for the anticipated effect.

Game Play Speed

The permitted speed of play is also a reinforcement parameter, as it directly relates to frequency of rewards. Blaszczyński, Sharpe, and Walker (2001) (also reported in Sharpe, Walker, Coughlan, Enersen, and Blaszczyński, 2005) found no significant difference in money or time spent between individuals who played EGMs with 3.5 second versus 5 second game speeds in a study conducted with 210 EGM players in clubs and hotels in New South Wales. This was attributed to the fact that only 12% of players normally played at a wager cycle faster than 5 seconds. Delfabbro, Falzon, and Ingram (2005) found that 3.5 second games *did* produce an increase in number of games played, but not total time spent playing. Results of a study conducted by Ladouceur and Sevigny (2006) indicated that 5 second game speeds caused gamblers to play significantly more games and spend more money compared to 15 second game speed EGMs. Similarly, a 30% reduction in game speed was reported to be an important factor in a 14% reduction in expenditure and time spent by gamblers (particularly higher risk gamblers) in a study of VLTs in Nova Scotia (Corporate Research Associates, 2006)⁹.

The recent introduction of auto-play EGMs (machines that play automatically on insertion of money followed by the press of an ‘AutoPlay’ button), is relevant to the issue of game speed play, but there has been no research on their impact. Nonetheless, the presumption of greater harm is reflected in the fact that they have been banned in Victoria, South Australia, and Western Australia (Caraniche Pty Ltd., 2005).

Near Misses

Strickland and Grote (1967) found that placing frequent winning symbols early in the slot machine’s 3 symbol sequences increased persistence in laboratory slot machine play compared to when they were placed late in the sequence. Skaer (1985) similarly found that his subjects preferred to play the slot machine that was perceived to more frequently come close to paying off. More recently, both Kassinove and Schare (2001) and Cote, Caron, Aubert, Desrochers, and Ladouceur (2003) have

⁹ The actual time speeds used were not reported.

confirmed that people who come close to a ‘near win’ persist significantly longer in subsequent laboratory EGM play. Wohl and Enzle (2003) found that wagers following a near loss were significantly higher in subsequent games of laboratory-based, computerized roulette play.¹⁰

Number of Play Lines

In a series of observational studies, Williamson and Walker (2000) and Walker (2001) have found that gamblers have a preference for playing large number of lines (up to 20), with a minimum bet per line. This may be because of the increased rate of wins, size of wins, and near misses that occur with more lines. Consistent with these observations, in a laboratory investigation, Delfabbro, Falzon and Ingram (2005) found that a 3 line betting produced an increase in the number of games played and time spent compared to single line betting.

Bill Acceptors

The adoption of bill or note acceptors on EGMs beginning in the late 1980s and early 1990s was generally associated with significant increases in EGM revenues and lower operating costs for the gaming venue. It is thought that the increased revenues associated with note acceptors may have disproportionately impacted problem/pathological gamblers, as note acceptors decrease the need to visit the cashier on a regular basis (which might act as a sort of social constraint) and they decrease the need for breaks (Productivity Commission, 1999). There is no formal research on this topic. Norway banned the use of bill acceptors on VLTs in July 2006 (G4 Newsletter, 2006).

Limiting the size of the note that can be accepted has not been very effective. Blaszczyński, Sharpe, and Walker (2001) (also reported in Sharpe et al., 2005) found that limiting EGM bill acceptors to \$20 AU maximum had no significant effect on time or money spent gambling (even though more problem/pathological gamblers than recreational gamblers used large note acceptors). They attributed this to the fact that all venues have facilities to change larger denominations to smaller notes. This same initiative was reported to be ineffective in a study of Queensland EGM players (Brodie, Honeyfield, & Whitehead, 2003), a significant portion of whom indicated the maximum note amount should be lower than \$20 (or eliminated altogether as has been legislated in Norway, South Australia, and within hotels and clubs in Tasmania and the Australian Northern Territory). (Note: in certain Australian jurisdictions it is possible to put up to \$10,000 into a machine at any one time).

Bet Size

A policy to limit EGM bets to a maximum of \$10 was reviewed in the Australian Capital Territory (McMillen & Pitt, 2005). The policy did not result in behavioural change for either recreational or problem/pathological gamblers, as it was perceived as a higher limit than was usually bet. However, Blaszczyński et al. (2001) (also reported in Sharpe et al., 2005) found that reducing maximum bet from \$10 to \$1 resulted in significantly decreased EGM expenditures and time spent playing. Weatherly and Brandt (2004) found that students in a laboratory situation tended to bet more when they were staked with \$1 and each bet was worth \$0.01, compared to students who were staked with \$10 and each bet was worth \$0.10, suggesting that the perceived magnitude of bets and losses may affect duration of play. Delfabbro, Falzon, and Ingram (2005) found no influence of bet size (1 versus 3 credits) on time spent gambling or number of plays.

¹⁰ A related phenomenon likely with the same effects is ‘nudging’, where an EGM reel appears to come to a halt with a winning sequence, and then a second or two later, nudges over to a different outcome.

It is perhaps worth noting that the lower rates of problem/pathological gambling found in many European countries compared to North America and Australia is associated with significantly lower bet and win sizes on most European EGMs. For example, in 1998 the maximum bet in the U.K. was only £0.50, whereas it was \$10 in Australia, \$100 in Canada, and \$500 in the U.S.) (Caraniche Pty Ltd., 2005).

Maximum Win

There has been no research on this issue for EGMs other than the above mentioned cross-country comparisons. This is expected to be an important parameter considering the increasing popularity of ‘progressive’ EGMs offering much larger jackpots, and the fact that lottery patronage increases significantly as a function of jackpot size (Kearney, 2002). In the United Kingdom, new regulations regarding gambling machine categories were enacted in September 2007, whereby Class D ‘amusement’ machines with low stakes and low maximum prizes (10-30 pence and £5-8) continue to be available to all citizens, including children (Department for Culture, Media and Sport, 2006). Problem/pathological gambling prevalence in the UK has historically been low, and low stake/prize machine gambling has long been accessible to children. It remains to be seen whether the coming liberalization of gambling laws (and the expected licensing of large, regional casinos offering unlimited stake/prize EGMs), will impact the prevalence of problem/pathological gambling.

Interactive Features

The increasingly interactive nature of EGMs almost certainly promotes the illusion of control (Griffiths, 1993, 1994; Langer, 1975). However, there has been very little empirical research that investigates the magnitude of this effect on EGM play. Loba, Stewart, Klein and Blackburn (2002) found that gamblers did not believe that the presence or absence of a ‘stop reel’ function (button) would alter gambling behaviour. However, in two studies that examined actual behaviour, the presence of this ‘stop reel’ function was found to significantly increase length of gambling sessions (Ladouceur & Sevigny, 2005) as well as money spent gambling (Corporate Research, 2006). In this latter study, higher risk gamblers were most influenced.

Pop-Up Messages

Ladouceur and Sevigny (2003) investigated the effectiveness of two different pop-up messages on 30 EGM players. The study found a significant reduction in the number of bets made by players who saw a message about randomness as well as players who simply saw the word ‘break’ compared with a group not exposed to pop-up messages. They explained this outcome as interrupting cognitive processes that tended to facilitate narrowed attention and ‘loss of reality’. Schellinck and Schrans (2002) found that an EGM pop-up message after 60-minutes of continuous play (and 30 minutes thereafter), telling players how long they had played and asking if they wished to continue, resulted in a small but significant reduction in session length and a decrease in expenditure among higher-risk players. Habituation to these messages was noted as a potential problem. In the second phase of this study, Schrans, Grace and Schellinck (2004) found that a pop-up message after every 30 minutes produced no significant improvement over the 60 minute message. Cloutier, Ladouceur, & Sevigny (2006) found that pop-up messages regarding erroneous beliefs produced a significant decrease in these erroneous beliefs at post-test. In contrast to these findings, pop-up reminders indicating how much time the person has played did not influence the amount of money spent gambling on VLTs in an Alberta study (Wynne & Stinchfield, 2004).

Clock

Schellinck and Schrans (2002) found that an on-screen clock was associated with improvements in keeping track of time and playing within desired time limits, but had no effect in reducing session length or expenditure. An on-screen clock also had no effect on gambling behaviour in a study by Wynne and Stinchfield (2004).

Mandatory Cash-Out

A recent naturalistic study of EGM play found a logarithmic distribution of time spent playing EGMs, with a median gambling duration of 13 minutes, an average of 24 minutes and a maximum of 525 minutes (Townshend & Stansfield, 2007). Only 10% of players play for one hour or more, which suggests that time limitations or mandatory cashouts may have some utility. However, the only formal research on this issue is a study by Schellinck and Schrans (2002) which found that mandatory cash out after 145 minutes did not alter EGM player behaviour. To date, shorter cash-out periods have not been investigated.

Privacy

Video lottery terminal players reported that placing VLTs in isolated areas of bars and taverns likely contributed to impaired control in a study by Ladouceur, Jacque, Sevigny, and Cantinotti (2005). However, a laboratory test did not find these same people to gamble more in a more secluded setting. On the other hand, in a laboratory study by Lalumiere, Williams, and Morgan (2006) it was found that having someone directly observe their VLT play resulted in a very significant reduction in the amount of time played among 180 male gamblers. The effect was equal for male and female observers, and for problem versus non-problem gamblers.

Money versus Credits

Although it is believed that the use of credit and debit cards increases spending relative to actual cash, there is not much evidence on this topic with respect to EGMs. For example, money (versus credit) counters on VLTs were not found to influence gambling behaviour in a study by Wynne and Stinchfield (2004). In Canada, although all EGMs outside of casinos (i.e., 'VLTs') pay winnings via a credit slip rather than cash, there tends to be no difference in their revenue generation compared to cash-paying slot machines inside gambling venues (Canadian Gambling Digest, 2004). In the Australian Capital Territory, policies to restrict EGM *cash* payments to winnings less than \$1,000 simply caused gamblers to cash out their winnings (and then resume play) before the \$1,000 limit was reached (McMillen & Pitt, 2005).

Time and Spending Limits/Smart Cards

Schrans, Grace and Schellinck (2004) found that a feature allowing players to set a time limit on their VLT play was only effective in influencing one of the six behaviours being targeted for improvement. In recent years, 'smart cards' have been introduced into a few jurisdictions (e.g., New South Wales) that permit EGM players to set time and or spending limits on cards that are then used to play designated EGMs. While gamblers and EGM venue operators tend to offer support for such cards (Independent Gambling Authority, 2005; Nisbet, 2005; Omnifacts Bristol Research, 2005, 2007), there is limited research on their effectiveness. Anecdotally, problems have been expressed about their effectiveness when non-card EGMs are also readily available (as is the case in New South Wales). There is also a concern that because of the significant amount initially put on the card (e.g., \$200 in NSW) gamblers may increase spending, either due to more money being readily available or

because they require less embarrassing interactions with cashiers and other gambling venue staff (Nisbet, 2005). That being said, people who actually use the cards have some tendency to report that the card helped them manage their spending (Nisbet, 2005; Omnifacts Bristol Research, 2005, 2007).

Limited support for these cards is found in one of the few empirical studies. Focal Research (2007) tracked VLT play for a 6 month period in a region of Nova Scotia that only had player-card activated machines available (~51 EGMs in 9 locations played by 1,824 players). Roughly 71% of regular players (playing once a month or more) opted to try one of the responsible gaming (RG) features these cards permitted (i.e., 'spending limit', 'play limit', '2 day exclusion', or 'account summary' showing win/loss over various periods of time). Roughly 65% of these people continued to use one or more RG features in subsequent sessions. A subsample of these RG adopters (n = 122) had a baseline period of non-RG use that allowed for a pre-post comparison. These individuals were found to have a significant decrease in per session expenditure (\$47 to \$40), an increase in play length (82 min to 98 min), and no change in frequency of play per month (9.3 to 9.3). Examination of individuals with high risk characteristics found no decrease in expenditure for high frequency players (18+ times in 6 months), and a tendency toward decreased per session expenditure offset by a tendency toward increased frequency of play for people with CPGI scores of 5 or higher.

In September 2008 Norway implemented a system whereby EGMs are only accessible to pre-registered users via prepaid cards. Furthermore, these cards limit the amount that can be bet per game to \$10 and set a loss limit of \$80 per day and \$440 per month per player even in they have more than one card (IGaming Business, 2008).

Lights and Sounds

Although there is considerable speculation and observational commentary about the effects of lights and sounds on gambling behaviour (e.g., Griffiths, 1993), there is very little empirical research. There is some evidence that alterations are related to subjective enjoyment of gambling (e.g., Loba et al., 2002). In one of the few empirical studies, Delfabbro, Falzon, and Ingram (2005) found that EGMs with 35% lower illumination significantly increased either the number of plays or time spent playing. However, the presence or absence of sound did not influence gambling behaviour. Further investigation is needed to determine whether such features have differential effect on problem/pathological gambler sub-types such as those posited by Nower and Blaszczynski and cited earlier. The emotionally vulnerable sub-type, for example, gambles to cope with negative affect and may be drawn to more calming environments and games, whereas the impulsive anti-social sub-type may seek the most stimulating alternatives.

Summary of EGM Parameter Modifications

In summary, the above research on EGM features has identified several modifications that appear to have some potential to reduce harm. Such features include slower speed of play, eliminating early big wins (perhaps by decreasing maximum win size), reducing the frequency of near misses, reducing the number of betting lines available, reducing the interactive nature of EGMs, and presenting pop-up messages. There is conflicting or insufficient evidence on the importance of payback rates, maximum win size, limiting maximum bet size, more public placement of EGMs, bill acceptor limitations, time and spending limits, mandatory cash-outs, and ambient light and sound. No evidence exists as to the effectiveness of on screen clocks or monetary rather than credit displays.

There are two important caveats about this research. The first is that almost all of these studies have been conducted on people with prior EGM experience. The effectiveness of EGM parameter

modifications as primary prevention tools is plausible, but less certain. Second, the magnitude of the effects tends to be small. The reality is that any automated device employing a variable ratio schedule (or more properly, random ratio schedule) with significant reinforcers and an event frequency of 5 seconds will tend to produce very strong behavioural patterns that are resistant to extinction (Ferster & Skinner, 1957).¹¹ Thus, EGMs will likely always be ‘high-risk’ devices with a strong association to problem/pathological gambling. In many ways the efforts to mitigate the harm of EGMs is somewhat analogous to the (ultimately unsuccessful) efforts to mitigate the harm of tobacco consumption by putting filters on cigarettes or promoting low-tar varieties of tobacco.

Maximum Loss Limits

In addition to loss limits that are available on some EGMs, policies to limit the amount of money a gambler can lose are found on several of the major Internet gambling sites (e.g., www.Betfair.com, www.888.com). Limits are usually placed on maximum losses or deposits. However, similar problems to casino self-exclusion programs exist concerning the ability to revoke limits or having easy access to other sites where limits have not been placed.

It is rare to find maximum loss limit policies in land-based venues. One exception is the state of Missouri, which from 1994 – 2008 had restricted each gambler’s losses to a maximum of \$500 during two hour ‘excursions’ on its eleven riverboat casinos (patrons can buy no more than \$500 in gambling chips for the slot machines and table games). There is no information on the effectiveness of this measure other than the Missouri casino industry repeatedly pointing out that their revenues were much smaller than competing riverboat casinos in neighbouring jurisdictions (Brokopp, 2006; Volkman, 2008). Here again, there are logistical problems involved with applying this policy to more than one venue at a time.

Restricting Access to Money

In Canada, the granting of house credit is banned in all jurisdictions except in Ontario’s commercial, resort-style casinos. Automatic/automated teller machines (ATMs) are commonly located in casinos and EGM gambling venues throughout Canada (either on or off the gambling floor). Venue-imposed ATM withdrawal limits do not appear to exist, and both debit and credit transactions are generally allowed. Manitoba is unique in banning debit card use for VLT gambling. Also in that province, cheque-cashing and credit card use are not allowed in casinos.

House credit is common practice in U.S. gambling venues, especially casinos. Cheque-cashing is considered to be a form of house-credit, and is the only form allowed in some states. ATMs are located in gambling venues, and limits on ATM withdrawal amounts do not appear to be in place. However, in a move to curb Internet gambling, on July 11, 2006, the U.S. House of Representatives

¹¹ Indeed, there are many who would argue that operant conditioning is the main theoretical framework with which to understand EGM play (Delfabbro, Falzon, & Ingram, 2005; Delfabbro & Winefield, 1999a, 1999b; Dickerson, 1979; Dickerson, 1993; Dickerson, Cunningham, Legg-England, & Hinchy, 1991; Dickerson et al., 1992; Dixon & Schreiber, 2002; Knapp, 1976; Petry & Roll, 2001). However, while principles of learning (both operant and classical) are likely of fundamental importance, it is clear that they are insufficient on their own. While pigeons pecking keys for food under a variable ratio schedule will all develop very persistent behaviour, only a minority of people who ever play EGMs find them appealing and continue playing them. Secondly, the evolutionary purpose of operant conditioning is to shape behaviour so as to optimize returns. Excessive EGM play (i.e., problem gambling) is not an adaptive response to the environmental contingencies these machines offer.

passed legislation to prevent gamblers from using credit cards to bet online on sports betting and casino games; online lottery and horserace betting would still be allowed (“U.S. moving”, 2006).

In Europe, house credit is banned. ATMs appear to be generally available at gambling venues, but information regarding withdrawal limit policies was not found in a search of electronically available information. Credit card use at ATMs appears to be allowed.

The Republic of South Africa (2004) does not allow credit to be provided in gambling venues, and prohibits the placing of cash dispensing machines/automated teller machines in gambling venues as follows: “No person may place or operate a cash dispensing machine contrary to this Act—(a) within a designated area; or (b) within a prescribed distance from such a designated area” (p. 30).

In New Zealand, credit card use to a limit of \$200 per day is allowed. There appear to be no limits on ATM withdrawals, and regulations require that ATMs be located away from gambling areas within gambling venues.

Credit is banned in Australian states and territories, with the exception of South Australia. In that state, credit is allowed for non-machine gambling. ATMs and EFTPOS (Electronic Funds Transfer at Point of Sale) facilities are available at almost all gambling venues throughout Australia, generally located away from the gambling floor. In South Australia, ATM withdrawals are limited to \$200 a day, but can be increased on formal application. In the Australian Capital Territory, there are no daily withdrawal limits for gambling purposes, and credit transactions on ATMs are allowed. ATM withdrawals in Queensland are limited to \$100 per day. The state of Victoria limits transactions at ATM and EFTPOS facilities to \$200 per use, and credit card withdrawals are not allowed. Beginning in 2012, ATMs will be banned from Victorian pubs and clubs that have poker machines (The Age, 2008). In certain Australian states, winnings in excess of certain amounts are paid by cheque, and certain jurisdictions do not permit the venue to cash these cheques (Caraniche Pty Ltd., 2005).

There is a lack of empirical research concerning the effectiveness of monetary restrictions. However, existing anecdotal and survey data indicate that restricting ready access to cash is a potentially effective strategy. First, it is well established that problem/pathological gamblers access cash machines more frequently than regular gamblers (Caraniche Pty Ltd., 2005; Independent Pricing and Regulatory Tribunal, 2004). Second, problem/pathological gamblers in treatment report that the most common reason for terminating a gambling session and leaving a gambling venue is because they have run out of money (Productivity Commission, 1999). Indeed, self-reports of problem/pathological gamblers consistently identify easy and immediate access to cash as exacerbating gambling-related harm (e.g., Caraniche Pty Ltd., 2005; McMillen, Marshall, & Murphy, 2004; SACES, 2005). The majority of 418 EGM players in Victoria, Australia were of the view that ATMs should not be located in gambling venues at all. Among this same group, this measure was deemed to be the most effective harm minimization strategy available (Caraniche Pty Ltd., 2005). A total of 72% of people who enrolled in Alberta’s casino self-exclusion program indicated that they felt that restricted access to ATMs would be a ‘very effective’ procedure, with another 10% reporting it would be a ‘somewhat effective’ procedure (AGLC, 2007).

Implementation of policies to ban credit, limit ATM withdrawals, or remove ATMs from or near gambling venues is often opposed by the gambling industry as well as some gambling researchers, due to the potential inconvenience it would impose on non-problem gamblers (McMillen et al., 2004). While this may be true, it must be said that several problem/pathological gambling prevention policies have the same potential. And it is certainly fairly common practice for policies

governing the provision or use of problematic products (e.g., alcohol, tobacco, firearms) to restrict unfettered use by at-risk *and* non at-risk individuals so as to benefit society as a whole.

Restrictions on Concurrent use of Alcohol and Tobacco

Gambling and drinking often co-occur, particularly where gambling occurs at problematic levels (e.g., Crockford & el-Guebaly, 1998; Giacomassi, Stitt, & Vandiver, 1998; Grant, Kushner, & Kim, 2002). The link between increased drinking and increased gambling has also been demonstrated. A study on consumption of alcohol during VLT play found that length of play, rate of double-up betting, and play of losing hands increased during moderate alcohol intoxication, especially for probable pathological gamblers (Ellery, Stewart & Loba, 2005). Kyngdon and Dickerson (1999) found that alcohol consumption prolonged gambling sessions, with the potential for greater financial loss associated with increased risk taking. Other research replicates the finding that alcohol has a disinhibiting effect on gambling in terms of taking increased risks (Baron & Dickerson, 1999; McDonnell-Phillips Pty Ltd, 2006; Phillips, Triggs, Coman, & Ogeil, 2005). Given this knowledge, restrictions on the use of alcohol while gambling have significant potential as a harm minimization strategy for problem/pathological gambling.

While policies regarding the sale of alcohol in gambling venues vary worldwide, responsible service practices (e.g., prohibiting continued sale of alcohol to intoxicated gamblers) are generally either legislated or otherwise entrenched in government policy. Policies concerning free drinks and other complementary goods and services are less likely to be included in responsible gambling codes. Following is a brief review of alcohol-related policies in various gambling jurisdictions.

Casinos in Canada may provide free goods and services, but free alcoholic beverages are not allowed. Alcohol service is prohibited in some British Columbia casinos, where municipal governments assume responsibility for such licensing decisions. In the United States, free drinks are provided to casino patrons in 6 of 11 states with commercial casinos (Colorado, Iowa, Louisiana, Nevada, Mississippi, and New Jersey). Low-cost drinks are also common. The Oneida Nations Turning Stone Resort and Casino near Syracuse, New York, bans the service of alcohol entirely. Free drinks and discounted alcoholic beverages are either banned or not commonly available in most European countries, except in some Eastern European countries (e.g., casinos in the Ukraine). Some casinos in Australia (e.g., Casino Canberra; Crown Casino, Victoria) provide low-cost or free drinks for customers. ‘Host Responsibility’ regulations in New Zealand prohibit free drinks, and include responsible practices for the serving of alcohol.

Just as gambling and alcohol consumption are related, the association between gambling and tobacco use has been established. Public health campaigns have successfully led to implementation of ‘public place’ smoking bans in growing numbers of jurisdictions around the world in order to reduce the well-known health risks associated with smoking and second-hand smoke. In Canada, smoking is banned province-wide (with the exception of First Nations reserves), in Ontario, Quebec, Saskatchewan, Manitoba, and New Brunswick. The Government of Alberta has given to municipalities the responsibility to implement bans if desired. Tasmania is the only region of Australia with a current total ban, but several other states and territories intend to implement such bans within the next few years. Growing numbers of states in the USA are smoke-free, and Montana intends to become so as of October 2009 (except for Native casinos). New Jersey implemented a smoking ban this year that exempts all casinos. England will implement a smoking ban in the summer of 2007.

Smoking bans may inadvertently act as one of the more effective policies to reduce problem/pathological gambling, given that the majority of problem/pathological gamblers are smokers

(e.g., Petry, Stinson, & Grant, 2005; Rodda, Brown, & Philips, 2004). It is no coincidence that gambling venues are the most common places to petition for and receive exemptions from public smoking bans. Indeed, significant reductions in gambling revenues have followed gambling venue smoking bans in various jurisdictions, including Canada, Australia and New Zealand (Atlantic Lottery Corporation, 2006; Hospitality Association of New Zealand, 2005; Pakko, 2005; Saskatchewan Liquor and Gaming Authority, 2006; Skycity Entertainment Group, 2005). This is notable considering that a large proportion of gambling revenue traditionally has derived from problem/pathological gamblers (Williams & Wood, 2004a, 2004b, 2007). It is hypothesized that problem/pathological gamblers may be less likely to gamble for extended periods if they cannot smoke, thereby introducing a mechanism for reducing harm. Among a group of 418 EGM players in Victoria (49% of whom smoked, with significantly higher rates among problem/pathological gamblers), 67% regarded the restriction of smoking in gambling areas to be an effective gambling harm minimization strategy (Caraniche Pty Ltd., 2005). Forty-nine percent of the smokers reported that they spent less time playing EGMs, and 5% reported they spent more time. This is corroborated by a survey of EGM venue operators, who reported that among all the harm minimization measures, the smoking ban was the most effective (Caraniche Pty Ltd., 2005). In New Zealand, a 15.8% drop was seen in the number of government-funded problem/pathological gambling service users after the first year of the smoking ban (Ministry of Health, 2006).

Interestingly, there is also evidence that EGM and casino revenues may return to their previous levels after some time (e.g., Buchanan, 2006, p. 13, citing Tattersall's 2005 Annual Report: "Gaming revenue returned to full-year growth following the downturn after the introduction of smoking bans in Victorian gaming venues in 2002"). There is no empirical research to indicate whether this is due to a) smokers (and problem/pathological gamblers) having adjusted to this requirement, or b) non-smokers patronizing gambling venues at higher rates because of the smoke-free environment.

Restricting Advertising and Promotional Activities

Policies to restrict gambling advertising and promotional activities are based on the belief that these activities may induce gambling in vulnerable groups (e.g., problem/pathological gamblers, minors), or may serve to counter-act advertising that promotes responsible or low risk gambling. There is some support for these contentions. In one study, half of a sample of pathological gamblers reported that advertising triggered them to gamble (Grant & Kim, 2001). Also, the amount of money devoted to gambling advertising is many magnitudes greater than the amount of money devoted to problem/pathological gambling prevention. For example, the province of Ontario is reputed to spend more money on prevention, treatment, and research than any other jurisdiction in the world, amounting to \$36 million in 2003/2004 (Sadinsky, 2005). By comparison, the Ontario Lottery and Gaming Corporation's budget for marketing, advertising, and promotions is over \$570 million, not including the additional advertising budgets of the three commercial casinos. Whereas previously reviewed research indicates that most people are unaware of 'responsible gambling' initiatives (Turner et al., 2005), it is the rare person who is unaware of the omnipresent lottery and casino advertisements on television and radio and along public roadways.

With respect to alcohol and tobacco, earlier research tended to indicate that advertising influenced market share, but did not influence overall consumption (Boddewyn, 1994; Fisher, 1993; Smart, 1988). However, more recent research has found a much stronger relationship between exposure to tobacco or alcohol advertising and subsequent use of these substances in youth (Ellickson, Collins, Hambarsoomians, & McCaffrey, 2005; Lovato, Linn, Stead, & Best, 2006). Furthermore, Weiss et al. (2006) found that anti-tobacco advertising is typically insufficient to counteract the effects of pro-tobacco advertising.

Prohibiting misleading advertising is as important as restricting the amount of advertising. Typical examples are lottery advertisements that suggest the chances of winning are better than they actually are, and that a person's overall wellbeing will be substantially better after winning a jackpot (e.g., Korn, Hurson, and Reynolds, 2005). Similarly, websites that provide players with information about the frequencies of winning lottery numbers deceptively convey the impression that useful information might be gleaned from this data.

Gambling Venue Design

Many casinos around the world employ a 'Vegas-style' design. The essential elements of this design are a lack of windows, an absence of clocks, a maze-like interior, low ambient light punctuated by the bright colorful lights of EGMs, and the constant background noise of EGMs, particularly the sounds of winning (there is no sound of losing). The presumption is that all of these elements help induce and perpetuate gambling. However, here again, there is a lack of empirical evidence on the issue.

Subjectively, many gamblers believe that design characteristics do promote different patterns of play (e.g., Finlay, Marmurek, Kanetkar, and Londerville, 2007), and that alteration of these features would be useful harm minimization strategies (Caraniche Pty Ltd., 2005; Hing, 2003). Some researchers have also demonstrated that the light and sound characteristics of EGMs are arousing and attractive features to gamblers (Griffiths, 1993; Griffiths & Parke, 2005). Delfabbro, Falzon, and Ingram (2005) empirically demonstrated that EGMs with lower illumination significantly increased time spent playing (sound did not influence gambling behaviour). There is also some tentative evidence that people gamble more under red lighting (Griffiths & Swift, 1992; Stark, Saunders, & Wookey, 1982).

However, even if it was well established that these elements promoted gambling behaviour among current gamblers, a plausible mechanism might be their conditioned association to the gambling itself (lights and sounds being very salient, easily conditionable stimuli). The other observation relevant to this issue is that EGMs have no difficulty generating significant revenues in all sorts of different environments, including convenience stores, bars, clubs, hotels, arcades, restaurants, racetracks, and boats.

Increasing the Cost of Gambling

This is mentioned as a strategy because of the effectiveness of increasing the cost of alcohol and tobacco (through taxation) as a policy for helping to prevent alcohol and tobacco use and abuse (e.g., Babor et al., 2003; Cnossen, 2005; Cook, 2007). However, it is unclear whether increasing the cost of legal gambling would effectively deter problem/pathological gambling (Clotfelter, 2005). Substantial economic 'costs' are already built into gambling products. Furthermore, the current payback rate or cost of a gambling product tends to have little relationship to its use (i.e., highest patronage for lotteries, which offer the lowest payback rate; relatively low patronage of casino table games with higher payback rates). That being said, there is evidence that variation of payback rates within a particular gambling format (e.g., roulette, sports betting), does influence spending on that format (i.e., lower spending with lower payback rates) (Harvey, Swayze, Walls, 2004; Paton, Siegel, Vaughan-Williams, 2004).

Regulatory Approach

Regulatory approaches to the legal provision of gambling exist on a continuum from a free market approach with the government only being involved as a regulator (e.g., U.S.), to the government being very much involved in the actual provision of gambling or being the primary financial beneficiary of private gambling operations (either through a state monopoly, or high tax burdens on private operators). A conflict of interest obviously exists when the regulator (i.e., government) and the operator are part of the same organization or the regulator is the primary financial beneficiary of gambling. This conflict of interest potentially compromises the regulator's ability to implement truly effective prevention policies, and to effectively regulate the operator.¹² Effective prevention and treatment will typically negatively impact revenues, introducing a policy conflict between the protection of public health and the maximization of gambling revenues. Thus, it seems fairly evident that total independence between the regulator and the provider is *in theory* a policy more conducive to the prevention of problem/pathological gambling. However, what is seen in practice is that jurisdictions with this conflict of interest also tend to offer considerably more in the way of problem gambling prevention and treatment initiatives. However, as the next section will discuss, it is important to note that the prevention initiatives these jurisdictions choose to implement have also tended to be the least effective ones.

¹² This lack of independence (or perception thereof) is reinforced by appointments that are made. For example, in Ontario, Canada, the head of the regulatory body (Brown; with the Alcohol and Gaming Commission) was subsequently appointed the head of the operating body (Ontario Lottery & Gaming Corporation). The head of the operating body (Sadinsky), was subsequently appointed as an 'independent reviewer' of Ontario's responsible gambling initiatives (wherein OLG plays a large part).

SUMMARY AND RECOMMENDATIONS

Table 2 summarizes the evidence concerning the effectiveness of various educational and policy initiatives to prevent problem/pathological gambling. This table makes several important points. First, there exists a very large array of prevention initiatives, many of which have been implemented in various jurisdictions. This reflects the considerable interest and effort that is being put into mitigating the harm caused by gambling in recent years

Second, much is still unknown about the effectiveness of many individual initiatives. There is not a single initiative where the evidence is conclusive. In most cases the evidence is fairly limited and estimations of effectiveness are tentative. There is a particular lack of well conceived and well designed educational initiatives that show efficacy. Considerably more research is warranted. In conducting this research it is important to focus on *meaningful behavioural change as the measure of effectiveness*. Improvements in awareness, knowledge or attitudes are of value as intermediate steps in the right direction, but of very limited importance if not accompanied by behavioural change (Simpson et al., 2006). Similarly, the perceptions or opinions of at-risk gamblers toward a particular prevention policy is useful information, but is never a substitute for actual changes in behaviour. Because prevention initiatives are rarely implemented in isolation, annual or regular periodic evaluations of population prevalence and incidence are a good way of monitoring the overall impact of these efforts, and would comprise a very minor expense in relation to the magnitude of gambling revenues. Furthermore, developing these initiatives in the context of a theoretical model of behavioural change (e.g., Health Beliefs Model; Janz et al., 2002) will improve the likelihood of a successful outcome. Most of these initiatives lack explicit theoretical underpinnings that help explain why the behavioural effect would be expected.

Third, *the most commonly implemented prevention measures tend to be among the least effective options* (e.g., awareness/information campaigns, responsible gambling features on EGMs, casino self-exclusion, etc.). Furthermore, when potentially more effective initiatives are implemented, they are typically done in such an inconsequential or perfunctory fashion as to virtually ensure lack of impact (e.g., small reductions in number of gambling venues or numbers of EGMs, minor restrictions on access to money, etc.). This is partly because policy makers are trying to implement preventive measures that do not cause inconvenience to non-problem/pathological gamblers and/or adversely impact revenues. However, this latter goal is difficult if not impossible to achieve, considering that problem/pathological gamblers account for a substantial portion of overall gambling revenue (Productivity Commission, 1999; Williams & Wood, 2004a, 2004b, 2007b). *There needs to be acceptance of the fact that effective problem/pathological gambling prevention will likely only occur with some inconvenience to non-problem gamblers and a decrease in gambling revenues*. The reality is that all societies have policies/laws that ‘infringe’ on unfettered individual freedoms (e.g., ownership of automatic weapons, highway speed limits, etc.) even though these policies are likely only necessary for a small percentage of vulnerable or high-risk individuals. Similarly, it is not uncommon for governments to implement socially responsible policies that adversely affect their revenues (e.g., current restrictions on tobacco advertising and consumption). These are the sort of limitations that citizens routinely accept, and initiatives that governments routinely make, to produce a healthier society overall.

Table 2. Estimated Effectiveness Potential of Problem/Pathological Gambling Prevention Initiatives.

	high	moderately high	moderate	moderately low	low
EDUCATIONAL INITIATIVES					
'Upstream' Interventions		✓			
Information/Awareness campaigns				✓	
More Sustained and Directed Educational Initiatives			?		
Statistical Instruction				✓	
Comprehensive Programs			?		
On-Site Information/Counselling Centres (RGIC)			?		
POLICY INITIATIVES					
Restrictions on the General Availability of Gambling		✓ ¹			
Restricting the Number of Gambling Venues (casinos/racinos)		✓ ¹			
Restricting More Harmful Types of Gambling		✓ ¹			
Limiting Gambling Opportunities to Gambling Venues			?		
Restricting the Location of Gambling Venues		✓			
Limiting Gambling Venue Hours of Operation				? ²	
Restrictions on Who can Gamble			?		
Prohibition of Youth Gambling				? ³	
Restricting Venue Entry to Non-Residents		? ⁴			
Restricting Venue Entry to Higher Socioeconomic Classes				?	
Casino Self-Exclusion				✓ ⁵	
Restrictions on How Gambling is Provided			?		
Problem Gambling Training for Employees of Gambling Venues				?	
Automated Intervention for At-Risk Gamblers			✓		
Modifying EGM Parameters				✓ ⁶	
Maximum Loss Limits				?	
Restricting Access to Money			?		
Restrictions on Concurrent use of Alcohol and Tobacco		✓			
Restricting Advertising and Promotional Activities				?	
Gambling Venue Design					?
Increasing the Cost of Gambling				?	
Independence Between Gambling Regulator and Gambling Provider			?		

1. If the reductions are substantial
2. Unless the time reduction is very substantial.
3. Likely has higher potential for preventing youth problem gambling.
4. Prevention benefits limited to residents rather than non-residents.
5. If done appropriately.
6. Primarily slower speed of play, eliminating early big wins (perhaps by decreasing maximum win size), reducing frequency of near misses, reducing number of betting lines, reducing interactive features, elimination of bill acceptors, and presentation of pop-up messages.

Note. Question mark indicates uncertainty due to insufficient evidence.

Fourth, Table 2 suggests that while certain initiatives are more effective than others, *there is almost nothing that is not helpful to some extent and, conversely, there is almost nothing that, by itself, has huge potential to prevent harm*. There is no ‘magic bullet’ to prevent problem/pathological gambling. Even total prohibition would likely only have a moderately positive impact, with some offsetting negative consequences. Similarly, even the less effective initiatives may change the behaviour of a few individuals, lay the foundations for later behaviour change, or may contribute to the effectiveness of other initiatives.¹³ Furthermore, the present review makes the case that external controls (policy) can be just as useful as internal knowledge (education). Within the gambling field, sentiments are sometimes expressed that external controls are inferior strategies (e.g., Napolitano, 2003), or that the primary emphasis should be placed on educating gamblers so they can make ‘informed choices’ (e.g., Blaszczynski et al., 2004; Blaszczynski et al., 2005). Strong counterpoint can be found within the substance abuse field, however, where research shows that a) mandated treatment is generally as effective as voluntary treatment (Miller & Flaherty, 2002; Wild, Roberts, & Cooper, 2002), and b) contingency management approaches tend to be more effective than counselling (Higgins, Silverman, & Heil, 2007; Prendergast, Podus, Finney, Greenwell, & Roll, 2006). No one argues that policy measures in the form of laws concerning bicycle helmets, fencing around swimming pools, speed limits, and maximum blood alcohol levels while driving, etc. are not helpful in preventing undesirable outcomes. The same logic applies to gambling policy.

The corollary of this last point is that *effective prevention in most fields actually requires coordinated, extensive and enduring efforts between effective educational initiatives and effective policy initiatives aimed at the same outcomes* (Nation et al., 1993; Stockwell, Gruenewald, Toumbourou, & Loxley, 2005). The biopsychosocial model makes it clear that problem/pathological gambling develops through a complex interaction between many different endogenous attributes and exogenous stimuli. Hence, effective prevention of alcohol abuse, for example, has required extensive and pervasive educational and policy initiatives directed at the individual, group and community level (CAMH, 1999; Foxcroft et al., 2005; Holder, 2005; Slater et al., 2005; Winters et al., 2007). Multiple prongs are often synergistic, with overlapping initiatives reinforcing the message and power of each other. Arguably, the need for comprehensive educational and policy efforts is even greater for problem/pathological gambling, as the age of onset tends to be broad in range, not circumscribed to early adolescence as is the commonly seen in substance abuse.¹⁴

The final point to be made is that *prevention efforts have to be sustained and long-lasting, because population-wide behavioural change takes a long time*. As indicated earlier, even where comprehensive approaches have been applied in other fields, the immediate effects on behaviour have sometimes been small (Merzel & D’Afflitti, 2003; Sowden & Stead, 2000; Wandersman & Florin, 2003) or absent (Gates et al., 2006; Secker-Walker, et al., 2002). Tobacco use best illustrates this point. There was no dramatic reduction in tobacco use after prevention efforts began in the mid 1960s. Rather, a very slow but progressive decline has been seen over the past 40 years as educational efforts, policies, and public attitudes have coalesced and strengthened.

¹³ The only caveat to this ‘everything is helpful’ notion concerns situations where the presence of weak initiatives is deemed sufficient, thereby impeding the adoption of more effective ones.

¹⁴ This broad range of age onset for problem gambling will likely narrow with increased time and continued exposure to gambling opportunities.

These things appear to be mobilizing more quickly with gambling, so there is some possibility that reductions in problem/pathological gambling may occur more quickly.

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