Changes in minors’ gambling on slot machines in Finland after the raising of the minimum legal gambling age from 15 to 18 years: A repeated cross-sectional study

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ABSTRACT
AIM – The legal gambling age in Finland was raised from 15 to 18 years in 2010, but slot machines were given a transition period that ended with the full law coming into effect on 1 July 2011. The widespread accessibility of slot machines and their popularity among youth led us to consider how age limit was enforced in the Finnish gambling monopoly system and to analyse how underage gambling on slot machines changed after the raising of the minimum age. METHODS – Two nationwide cross-sectional surveys were conducted in 2011 and 2013 (12–18-year-olds; N=8101; average response rate 42%). The main measure was self-reported six-month prevalence of slot machine use overall and by venue (shops; kiosks; petrol stations; restaurants/cafés; ship travels to Sweden/Estonia; other). Changes from 2011 to 2013 were tested by using the $\chi^2$ tests and multivariate logistic regression analyses. As a reference group only, 18-year-olds were analysed, as they were of legal age to gamble. RESULTS – The six-month prevalence of slot machine use among 12–16-year-olds declined from 44% in 2011 to 13% in 2013 (p <.001). The decline was the most pronounced in shops. A significant interaction was found between age and survey year; slot machine use declined more sharply among 16-year-olds than among those aged 14 or 12. CONCLUSIONS – These findings suggest that raising the legal age limit from 15 to 18 years significantly decreased the prevalence of slot machine use among minors, even in a policy context where the general availability of gambling products was not reduced.
KEYWORDS – adolescent, gambling, slot machine, legislation, Finland

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Introduction
Adolescence is a period in life of heightened risk-taking behaviours, such as substance use and delinquency, while gambling can also be seen as a risk behaviour among youth (Derevensky, Gupta, Messerlian, & Gillespie, 2004). Adolescents are more vulnerable than adults to the negative consequences of gambling. For example, there is evidence that underage gamblers are two to four times more likely than adult gamblers to develop gambling problems (Hardoon & Derevensky, 2002). Moreover, early age of gambling initiation is related to a more severe profile of problem gambling at later age (Rahman et al., 2012).

Protecting minors from gambling is thus justified, and the most common strategy...
has been to set a legal minimum gambling age. A majority of Western societies regulate gambling and have set a legal gambling age, which currently varies from 16 to 25 years depending on the type of gambling and jurisdiction (Williams, West, & Simpson, 2012). In spite of these minimum-age requirements, gambling is a popular recreational activity for youth. A literature review shows that between 40 and 80% of underage persons had reported past-year gambling to some degree (see i.e. Derevensky, 2012; Luder, Berchtold, Akre, Michaud, & Suris, 2010; Blinn-Pike, Worth, & Jonkman, 2010; Molde, Pallesen, Bartone, Hystad, & Johnsen, 2009; Olason, Skarphedinsson, Jonsdottir, Mikaelsson, & Gretarsson, 2006).

To date, the body of research examining the effectiveness of raising the legal age for gambling has been limited; a review of the evidence assumes that raising the legal age for gambling is a beneficial strategy to minimise gambling-related harm (Williams et al., 2012). Considerable evidence of the effectiveness of age limit legislation exists in the alcohol and tobacco field (e.g. Stead & Lancaster, 2005; Wagenaar & Toomey, 2002; Rimpelä & Rainio, 2004; Anderson, Chisholm, & Fuhr, 2009). In a comprehensive review of the effects of minimum drinking age, Wagenaar and Toomey (2002) concluded that increasing the legal age for the purchase and consumption of alcohol is the most effective strategy when compared with a wide range of other programmes and efforts to reduce drinking among high school students, college students and other teenagers. Moreover, impact from the raised legal age limit appears to be related to the degree to which it is enforced (Babor et al., 2010). Altogether, the most important lesson in the previous research is that juridical regulations will only function effectively when the minimum legal age is rigorously enforced (e.g. Wagenaar, Toomey, & Erickson, 2005; Anderson et al., 2009; Productivity Commission, 2010).

Research on the effects of gambling policy measures has so far echoed research on policy measures related to the alcohol and substance use field: legislative measures and substantial restrictions on the general availability of gambling, such as restricting the location and number of gambling venues, have a considerable preventive effect (Hansen & Rosow, 2008; Att förebygga spelproblem, 2010; Williams et al., 2012). For example, a study from Norway (Rosow, Hansen, & Storvoll, 2013) reported a decrease in frequent gambling among adolescents in general after the ban and removal of slot machines. These results indicate that restrictions on the general availability of gambling also work to reduce the prevalence of gambling among minors. There is yet insufficient evidence on the impacts of information and education campaigns directed at youth gambling (Att förebygga spelproblem, 2010; Williams et al., 2012).

Although research on the effectiveness of enforcing age limit restrictions on youth gambling is limited, the theoretical support for such effectiveness can be considered strong. This article contributes to the empirical research on age limit control policies for gambling by analysing changes in adolescents’ slot machine use after the raising and enforcing of the minimum legal age in Finland. The legal gambling age was raised from 15 to 18 years in 2010, but slot machines were given a transition period that ended with the full law com-
ing into effect on 1 July 2011. The purpose of this study is to describe how age limits were enforced in the Finnish gambling monopoly system and to analyse how underage gambling on slot machines changed after the increased age limit restrictions.

Enforcement of legal age limits in the Finnish gambling monopoly system

The Finnish gambling system is based on a state monopoly that is regulated by the Lotteries Act. The gambling market is divided into three sections, each with a gambling operator, with the Slot Machine Association (RAY) having a monopoly on slot machines and casino games. The RAY operates through a nationwide network of gambling services that were originally built with the goal of making gambling accessible to all citizens. The general attitude supports gambling, as the profits from monopoly games are returned to society and used for non-profit purposes, such as Finnish sports, culture, science and art, youth and social work (Raento, 2011). The gambling network is among the densest in the world: in 2011 there were 19,838 slot machines (approximately 3.7 slot machines per 1000 inhabitants) installed in 7757 gaming locations (RAY’s responsibility report and annual report, 2011). The decentralised system guarantees easy access to gambling products for consumers; slot machines are widely available in nearly any retail venue, including supermarkets, grocery stores, kiosks, petrol stations, restaurants, bars and cafés, although there have been efforts to restrict minors’ gambling as a vulnerable group by raising the minimum legal gambling age.

Historically, the legal gambling age in Finland has been low and not effectively enforced (see Jaakkola, 2009; Matilainen & Raento, 2014). After 1976, the minimum legal age for slot machine gambling for some decades was 15 years. Following the amendment of the Lotteries Act, a new minimum legal age for gambling came into force in October 2010, which prohibited those aged under 18 from using all gambling products provided in Finland. However, the RAY was given a period of transition regarding the age-limit change for slot machines, and the new age limit came fully into effect on 1 July 2011. The reasons for the transition period were more or less practical: the RAY had to change age limit signs for every slot machine as well as update instructions for sales personnel in various gaming locations on how to enforce the new age limit.

There are many explanations for why Finland adopted the age limit of 18 years later than many other countries. Gambling was not viewed as an important public health or social policy issue in Finland before the turn of the new millennium (Tammi, 2014; Tammi, Castrén, & Lintonen, 2015). The late adoption of a more restrictive age-limit policy was probably linked to the fact that gambling was widely accepted as a leisure time activity which was loosely regulated (see Matilainen & Raento, 2014).

Gambling expenditure in Finland is one of the highest within the EU (The Economist, 2014). The gambling participation rate is high. According to a national survey, 78% of the adult population had participated in some form of gambling in the previous year, and half of them gamble on a weekly basis, with the most popular gambling activities being lottery games,
slot machines and scratch cards (Turja, Halme, Mervola, Järvinen-Tassopoulos, & Ronkainen, 2012). Unsurprisingly, the prevalence of slot machine use among Finnish adolescents has also been notably high compared with other European countries. Järvinen-Tassopoulos and Messo (2009) found that in 2007, prior to the passage of the new age limit, over 70% of ninth-grade boys (aged between 15 and 16 years) and a quarter of girls had played on slot machines at least monthly.

The RAY had to make considerable efforts before the age limit legislation took effect to enforce the age limit of 18 and to restrict availability for underage persons in gaming locations. The responsibility for monitoring and controlling underage gambling at gaming locations lies with the private providers, which are referred to as RAY’s “business partners”. The RAY agrees on the monitoring arrangements with the partner as part of the slot machine agreement. Each gambling location must have persons who have completed RAY’s surveillance training. RAY’s reports indicate that by the year 2011, the total number of persons who had completed the surveillance training in Finland was 49,446. Game providers were also equipped with blocking devices to prevent underage gambling. In 2011, the number of times a blocking device was used to close down a slot machine was 1,265,315. (RAY’s responsibility report and annual report 2013.)

New standards were also implemented for the location of slot machines: direct visual contact was required from the retail desk and specific marks on the floor were to highlight the gambling area and the new age limit. Special attention was paid to warning signs and sustained campaigns in gambling venues to inform customers about the new age limit. There were also mass media campaigns via the Internet, radio, newspapers and posters in public areas to increase general awareness of and support among the population for the new tighter age limit. According to the 2011 national gambling survey, the age limit legislation enjoyed strong public support, with 85% of the population considering the age limit of 18 to be an effective way to prevent gambling-related problems (Turja et al., 2012).

The Slot Machine Association RAY supervises the success of controlling underage gaming in decentralised gambling locations. There were 71,000 inspection visits by RAY’s maintenance representatives to monitor the control of underage gaming in 2012. Anyone can report an underage player, either to the staff of the location or directly to RAY’s customer service. In 2011, the number of notifications about suspected cases of underage gaming was 123. (RAY’s responsibility report and annual report 2013.) Repeated violations in the controlling of underage gambling can lead to a cancellation of the slot machine agreement for a period of at least three months. However, the actual risk of sanctions for violations of age limit legislation for game providers is low. In 2012–2013, not a single contract was terminated because of underage gambling with a business partner (RAY’s responsibility report and annual report 2013).

A repeated cross-sectional study design
Aims
This study set out to examine (i) short-term changes in adolescents’ self-reported...
Table 1. Number of 12–18-year-old respondents (n) in the Adolescent Health and Lifestyle Surveys in 2011–2013 by age, gender and study year.

| Age (years) | All respondents (n=8101) | 2011 | 2013 |
|-------------|--------------------------|------|------|
|             | Boys                     | Girls| All  | Boys | Girls| All  |
| 12          | 16.9 (1899)              | 12.2 (2667)    | 14.1% | 18.8% | 13.8% | 15.8% |
| 14          | 32.7 (29.1)              | 29.1 (31.4)    | 30.6% | 29.7% | 28.3% | 28.9% |
| 16          | 29.8 (26.1)              | 32.5 (31.3)    | 31.4% | 28.3% | 29.7% | 29.4% |
| 18          | 20.6 (18.8)              | 26.1 (20.2)    | 23.8% | 20.2% | 25.7% | 25.9% |
| Total       | 100.0 (100.0)            | 100.0 (100.0)  | 100.0%| 100.0%| 100.0%| 100.0%|
| Total (n)   | (1899)                   | (2667)         | (4566)|(1405) | (2130)| (3535)|

The samples were drawn from the Population Register on the basis of particular dates of birth, so that all those aged 12, 14, 16 and 18 born on certain sample days in June, July or August were included. The Ethical Committee of the Tampere region approved the study protocol.

The 2011 survey was the first time when a question was asked on adolescents’ slot machine use. This question was repeated in the 2013 survey. The number of respondents by age, gender and study year is given in Table 1. The overall response rates were 46% (2011) and 38% (2013).

Measures

Gambling on slot machines in the past six months in different gaming venues was assessed with the question: “During the past six months, have you gambled on slot machines?” with the response options “No”, “Yes”. If respondents reported “yes”, they were further asked “where?”, with the following list of gambling venues provided: “shops”, “kiosks”, “petrol stations”, “restaurants/cafés”, “passenger ships/ferry trips to Sweden or Estonia”, and “other venue”. Respondents were allowed to tick more than one option.

Other measures included in the present study were age, gender and survey year.
Data analyses

First, descriptive statistics were used to analyse data. We calculated the percentage prevalence, and the significance of the differences between survey years (2011–2013) was tested using Pearson’s chi-square tests. A P-value lower than 0.05 was considered significant. We calculated the six-month prevalence of slot machine use for the total study population. The prevalence of slot machine use in different types of gaming venues was calculated for slot machine gamblers and across the total study population. Analyses focused on the age groups targeted by the law (12–16 years). 18-year-olds were analysed as a reference group only, as they were of legal age to gamble.

Second, multivariate logistic regression models were applied, with adjustment for age and gender. The results are presented as odds ratios (OR) with 95% confidence intervals (CI). We also tested the interaction between age and survey year and gender and survey year. All statistical analyses were carried out in SPSS version 21.0 (SPSS, Inc., Chicago, IL, USA).

Results

Changes in slot machine use prevalence, 2011–2013

Table 2 shows that the six-month prevalence of slot machine use declined among 12–16-year-olds from 43.7% to 12.7% between 2011 and 2013 (relative reduction −71.0, p <.001). Slot machine use decreased in both boys and girls in all age groups targeted by the legislation. Among boys, the reduction was 64.9% and among girls it was 78.8% (p <.001). Although not subject to legislation, slot machine use also decreased among 18-year-olds.

In a multivariate age- and gender-adjusted logistic regression model, the odds ratio for slot machine use was 0.15 (95% CI = 0.13–0.18; p <.001), compared with the survey year 2011 (ref.). A significant interaction was found between age and survey year; the prevalence of slot machine use declined more sharply among 16-year-olds than among those aged 14 or 12 (see Figure 1). The interaction term between gender and survey year was not statistically significant.

Table 2. The six-month prevalence of slot machine use (%) before (2011) and after (2013) the raising of the legal gambling age to 18 years.

| Gambled with slot machines in the past six months | Before (2011) | After (2013) | p-value¹ | Percentage of change |
|-----------------------------------------------|--------------|--------------|---------|----------------------|
| N=4526                                        | N=3535       |              |         |                      |
| 12 years                                      | 18.1 (116)   | 7.3 (41)     | <.001   | −60.0                |
| 14 years                                      | 40.5 (563)   | 11.7 (119)   | <.001   | −71.1                |
| 16 years                                      | 58.4 (828)   | 16.6 (173)   | <.001   | −71.6                |
| All 12–16-year-olds                           | 43.7 (1507)  | 12.7 (333)   | <.001   | −71.0                |
| 18 years (ref.)                               | 50.5 (544)   | 40.2 (368)   | <.001   | −20.4                |
| Boys 12–16 years                              | 57.8 (861)   | 20.3 (228)   | <.001   | −64.9                |
| Girls 12–16 years                             | 33.0 (646)   | 7.0 (105)    | <.001   | −78.8                |
| Boys 18 years (ref.)                          | 73.8 (284)   | 64.1 (182)   | .007    | −13.1                |
| Girls 18 years (ref.)                         | 37.6 (260)   | 29.4 (186)   | .002    | −21.8                |

¹ Pearson’s chi-square test (2-sided) for differences from 2011 to 2013
Changes in slot machine use by different type of gaming venues, 2011–2013

Table 3 indicates that in both the total study population and among the slot machine gamblers, slot machine use was significantly (p<.001) reduced among 12–16-year-olds in shops, kiosks and petrol stations after the slot machine age limit of 18 years came into effect. The decline was greatest in shops; among the slot machine gamblers the reduction was 45.9% and in the total underage population, 84.5%.

Post-legislation changes in the prevalence of slot machine use in restaurants/cafés were modest and non-significant among slot machine gamblers. Conversely, there was a significant decrease of use in the total underage study population. Similarly, while there was a statistically significant post-legislation increase in the prevalence of slot machine use with regard to ship travel to Sweden/Estonia among 12–16-year-old gamblers, there was conversely a decrease for the total underage population. Additionally, while the reported use of “other venues” increased among slot machine gamblers following the 18-year age limit, no statistically significant difference from 2011 to 2013 was observed among the total underage population.

Pre- and post-legislation comparisons in the non-targeted age group (18 years) revealed that, among the slot machine gamblers, changes in the various gaming venues were all non-significant. When repeating the analysis in the total study population, similar non-significant findings were seen from 2011 to 2013, except for a decrease in slot machine use in shops and kiosks.

Discussion

The results of this study showed that the raising of the minimum legal gambling age from 15 to 18 years was accompanied by a substantive decrease in the six-month prevalence of slot machine use among the underage population. Setting the legal age
Table 3. The percentage of adolescents (%) reporting use of different type of gaming venues before (2011) and after (2013) the raising the legal gambling age to 18 years, among the past six-month slot machine gamblers and among the total study population.

| Slot machine location, age | Slot machine gamblers | | | | Total study population | | | |
|---------------------------|-----------------------|---|---|---|-----------------------|---|---|
|                           | 2011 (n=2051)         | 2013 (n=701) | p-value¹ | 2011 (n=4566) | 2013 (n=3535) | p-value¹ |
| Shop/retail outlet         |                       |               |           |               |               |           |
| 12                        | 49.1                  | 14.6          | <.001     | 9.3           | 1.1          | <.001     |
| 14                        | 71.9                  | 33.6          | <.001     | 29.6          | 3.9          | <.001     |
| 16                        | 86.6                  | 54.9          | <.001     | 51.5          | 9.1          | <.001     |
| 12–16                     | 78.2                  | 42.3          | <.001     | 34.9          | 5.4          | <.001     |
| 18 (ref.)                 | 82.4                  | 80.2          | <.001     | 42.2          | 32.2         | <.001     |
| Kiosk                     |                       |               |           |               |               |           |
| 12                        | 17.2                  | 14.6          | <.001     | 3.4           | 1.1          | <.001     |
| 14                        | 33.2                  | 15.1          | <.001     | 13.5          | 1.8          | <.001     |
| 16                        | 46.4                  | 35.8          | <.001     | 27.7          | 6.0          | <.001     |
| 12–16                     | 39.2                  | 25.8          | <.001     | 17.5          | 3.3          | <.001     |
| 18 (ref.)                 | 42.5                  | 35.6          | <.001     | 21.9          | 14.3         | <.001     |
| Petrol station            |                       |               |           |               |               |           |
| 12                        | 25.3                  | 9.8           | <.062     | 4.3           | 0.7          | <.001     |
| 14                        | 39.3                  | 23.5          | <.001     | 16.2          | 2.7          | <.001     |
| 16                        | 55.3                  | 49.1          | <.138     | 33.0          | 8.2          | <.001     |
| 12–16                     | 46.8                  | 35.1          | <.001     | 20.9          | 4.5          | <.001     |
| 18 (ref.)                 | 56.3                  | 62.8          | <.050     | 29.0          | 25.2         | <.061     |
| Restaurant/café           |                       |               |           |               |               |           |
| 12                        | 9.5                   | 7.3           | <.076     | 1.9           | 0.5          | <.039     |
| 14                        | 12.6                  | 6.7           | <.068     | 5.3           | 0.8          | <.001     |
| 16                        | 16.4                  | 16.8          | <.913     | 9.7           | 2.8          | <.001     |
| 12–16                     | 14.5                  | 12.0          | <.243     | 6.5           | 1.5          | <.001     |
| 18 (ref.)                 | 23.7                  | 27.7          | <.173     | 12.0          | 11.1         | <.529     |
| Ship travel to Sweden/ Estonia |               |               |           |               |               |           |
| 12                        | 56.9                  | 63.4          | <.466     | 11.1          | 4.7          | <.001     |
| 14                        | 35.5                  | 66.4          | <.001     | 14.9          | 7.7          | <.001     |
| 16                        | 21.7                  | 45.7          | <.001     | 12.8          | 7.6          | <.001     |
| 12–16                     | 29.6                  | 55.3          | <.001     | 13.4          | 7.0          | <.001     |
| 18 (ref.)                 | 22.4                  | 21.2          | <.659     | 11.9          | 8.5          | <.014     |
| Other location            |                       |               |           |               |               |           |
| 12                        | 5.2                   | 2.4           | <.466     | 1.2           | 0.2          | <.033     |
| 14                        | 1.2                   | 5.9           | <.001     | 0.8           | 0.7          | <.776     |
| 16                        | 0.8                   | 3.5           | <.006     | 0.5           | 0.6          | <.764     |
| 12–16                     | 1.3                   | 4.2           | <.001     | 0.7           | 0.5          | <.308     |
| 18 (ref.)                 | 3.1                   | 4.9           | <.173     | 1.7           | 2.0          | <.717     |

¹Pearson’s chi-square test (2-sided) for differences from 2011 to 2013

limit, however, did not stop underage gambling; about 13% of minors in our study reported that they had gambled on slot machines during the last six months.

The intended goal of the minimum legal gambling age legislation was to diminish minors’ gambling. The changes in slot machine use of minors (aged 12–16 years) from 2011 to 2013 were remarkable, although the pattern of changes did not occur to a similar extent across different age groups. The prevalence of slot machine use declined more sharply among 16-year-olds, with higher pre-legislation prevalence than among 14- or 12-year-olds. Interestingly, there was also a decline in the prevalence of slot machine use among 18-year-olds, even though they were not targeted by the legislation. While this seems to be an encouraging finding, we do not know whether their slot machine use would remain at lower level also in later
young adulthood. Also, it remains to be seen whether legislation has stimulated 18-year-olds to move to other gambling activities, such as online gambling. Close monitoring of these young adults is thus needed to determine changes in their gambling patterns.

Before and after comparisons of the use of different types of gaming venues revealed that slot machine use was remarkably and significantly reduced in shops, kiosks and petrol stations. The greatest relative reduction was found in shops, which had the highest pre-legislation prevalence of slot machine use. A previous Finnish study based on test purchases in retail outlets found that compliance with the minimum legal age among sellers was weaker for the use of slot machines than for purchases of alcohol and tobacco (Warpenius, Holmila, & Raitasalo, 2012). Thus, it is not likely that the increased surveillance of underage gambling in gaming locations would be the sole explanation for decreased gambling among minors. Since the introduction of the age limit of 18 in 2011, there have been no significant changes in the number of slot machines available or in the number of gaming locations (RAY’s responsibility report and annual report 2013), so general reductions in availability can be excluded as a potential explanation for the reduced slot machine use among minors. It is likely that the general attitudes and social norms about underage gambling have changed as a result of sustained campaigns in gambling venues and have thus led to increased social control of underage gambling among the population. But as we have no information about the social acceptability and control of underage gambling among the population, we can only reflect on the possible impacts of social norms on compliance among youth.

We found some differences between the total underage population and the slot machine gambler group when studying changes in the prevalence of slot machine use in different gambling venues. Among the total underage population, self-reported gambling decreased significantly in all venues, including restaurants/cafés and ship travel. Yet among those minors who reported having gambled, the proportion of slot machine use in ship travel even increased significantly and remained at the same level in restaurants/cafés in the post-legislation measurement. The reasons for these observations remain unclear. It would be logical to expect, however, that when access to slot machines has been restricted, adolescents who continued to gamble may have done so in environments where their gambling is less carefully monitored. For example, Finland’s geographical position next to Estonia and Sweden means that frequent tourist/holiday trips as well as school trips to these neighbouring countries are common. On several passenger ferries and cruise ships operating on the Baltic Sea, the age limit of 18 years on gambling is voluntarily applied as a part of responsible gambling policy, although it is not required by law. Nonetheless, the reported use of slot machines on ferries and ships may reflect low compliance with these self-imposed age limits.

The results of this study need to be considered in the light of some limitations. Basic limitations apply to the use of self-reports. In addition, the average response rate was fairly low, and decreased somewhat over the study period. Non-response
can be a threat to validity of the study results. If this is the case, one may assume, for example, that the difference in gambling prevalence is inflated as a result of a lower response rate. Moreover, the study was based on a natural experiment; the 18-year age limit for slot machines took effect nationwide, which means that it was not possible to set up a control population. Apart from the remarkable short-term changes observed in minors’ slot machine use after the raising of the age limit, it remains unclear whether these changes will continue in the longer term and what the impact on problem gambling might be in the future. It is possible that light gamblers stopped gambling after the new minimum gambling age while frequent gamblers continued. Thus the impact of age-limit legislation on gambling-related problems may be smaller than the impact on gambling prevalence among adolescents. Monitoring such changes is also warranted. Furthermore, our study could not answer whether the intervention led to substitution effects, i.e. whether slot machine gambling was replaced with other games. There is value in examining the factors contributing to the decline in slot machine use, although it could easily be argued that the overall downward trend reported in adolescent gambling participation in Finland may have affected the decreasing trend in slot machine use reported here.

Conclusions
The Finnish experience strongly suggests that raising the legal age limit from 15 to 18 years significantly decreased the prevalence of slot machine use among minors, even in a policy context where the general availability of gambling products was not reduced by external controls limiting the number of gaming locations or slot machines.

Declaration of interest None.

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