Impulsivity and socio-economic status interact to increase the risk of gambling onset among youth

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ABSTRACT

Aims To determine if impulsivity and socio-economic status (SES) interact to influence gambling onset in youth. Design Longitudinal study of grade 7 students followed for 8 years. Setting Montréal, Canada. Participants A total of 628 adult students aged 12.6 years on average at cohort inception. Measurements Impulsivity and SES (parent education, area deprivation) were collected during secondary school. Age of gambling onset was collected retrospectively when participants were aged 20.3 years. Cox proportional hazards regression was used to model the association between time to first report of gambling and interaction terms for each of impulsivity and parent education, and impulsivity and area deprivation accounting for sex and ethnicity. Findings Median (interquartile range) age of gambling onset was 17.0 (4.0) years. Impulsivity independently increased the risk of gambling onset among participants with no university-educated parent [hazard ratio (HR) 1.3; 95% confidence interval 1.1–1.5] and those living in highly deprived areas (HR 1.7; 1.5–2.0). Impulsivity was not associated with gambling onset among high SES youth. Among participants with high impulsivity, risks were elevated for those with no university-educated parent relative to one or more university-educated parent (HR 1.7; 1.1–2.7), and for participants living in deprived relative to advantaged areas (HR 5.0; 2.6–9.6). SES was not associated with gambling onset among participants with low impulsivity. Conclusions Impulsivity is a risk factor for gambling onset among low but not high SES youth, and low SES influences gambling onset primarily among impulsive youth. Gambling prevention programmes may need to consider potential interaction between impulsivity and SES.

Keywords Adolescent, educational status, effect modifiers, gambling, personality, proportional hazards models, residence characteristics, social class.

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INTRODUCTION

A growing number of studies indicate that gambling among youth is widespread and that opportunities to gamble are increasing [1–4]. Youth gambling is associated with high-risk behaviours such as delinquent activities and substance use [2,5–8], as well as with mental health problems, including depression [9]. Despite growing interest in the determinants, natural history and consequences of gambling, few studies identify factors that contribute to gambling onset among youth [4]. The majority of those that do are cross-sectional [6,8,10,11]. Among the few published longitudinal studies, almost none investigate factors associated with the timing of gambling onset [12], despite evidence that early initiation of gambling behaviours may increase the risk of problem or pathological gambling later in life [13–15].

To date, studies that investigate determinants of gambling focus upon psychosocial or personality characteristics [16,17]. Trait-impulsivity, for example, relates to gambling behaviours consistently across studies and may be part of a larger constellation of antisocial characteristics linked to addictive behaviours [3]. Some studies suggest that low socio-economic status (SES) youth engage in gambling behaviours more frequently than higher SES youth [15,18]. Prospective studies that assess
whether impulsivity relates to gambling onset in young people have rarely investigated SES explicitly as a risk factor for gambling. They have been restricted to low SES youth only [15,19], did not account for SES [3] or were limited by other factors, such as use of impulsivity measures that were based on attention disorders rather than personality traits [20].

Furthermore, the existing literature provides little information on whether or not impulsivity and SES interact to influence gambling onset. This issue needs clarification, because impulsivity may influence gambling onset differently in advantaged compared with disadvantaged youth. Disadvantaged individuals are known to be more susceptible (or vulnerable) than advantaged people to biological or genetic risk factors [21], and there is little reason to believe that risk factors such as impulsivity would be an exception. Conversely, the influence of disadvantage on addictive behaviours may be modified by personality characteristics that potentiate the effects of risk factors such as low SES. There is emerging evidence that area-based SES, including neighbourhood deprivation, is associated with self-control in youth [22]. Clarifying potential modifying effects of personality characteristics may help to explain the relationship between neighbourhood disadvantage and gambling observed in previous research [23].

Our objective was to describe the relationships between impulsivity, SES and gambling onset behaviour in a cohort of young people, and more specifically to determine whether impulsivity and SES interact to influence the onset of gambling behaviour. We used two different SES indicators (parent education, area material deprivation) to capture individual and area-level SES separately. We hypothesized that impulsivity may be associated more strongly with gambling onset among low SES youth (i.e. youth with less educated parents; youth living in deprived areas), and that socio-economic disadvantage may be associated more strongly with gambling among persons with higher levels of impulsivity.

METHODS

Data were available in the Nicotine Dependence in Teens (NDIT) study, a longitudinal cohort investigation of 1293 grade 7 students aged 12.6 [standard deviation (SD) 0.4] years on average at cohort inception, recruited in 10 secondary schools in or near Montréal, Canada. Baseline data were collected from all participants in autumn 1999 in self-report questionnaires. Follow-up data were collected in an additional 19 survey cycles completed at 3-month intervals during the 10-month school year over the next 5 years (i.e. four survey cycles were administered each school year from grades 7–11 until participants graduated from secondary school at age 17.1 years on average). Eighty-five of the 1293 NDIT participants were either lost to follow-up or declined to continue to participate in NDIT after secondary school. Seventy-three per cent of participants (873 of 1208 eligible for follow-up in 2007) completed mailed self-report questionnaires in survey cycle 21, which was administered 8 years after cohort inception, when participants were aged 20.3 (SD 0.6) years on average. Detailed descriptions of the study design and methods are available elsewhere [24,25].

Study variables

Gambling behaviour

Data on the age of onset of selected gambling behaviours were collected retrospectively in survey cycle 21. Participants were asked: ‘Have you ever done any of the following? If yes, how old were you when you did it the first time?: (i) played games (cards, bingo, dice) for money; (ii) bet money (slot machines, sports pools, casinos, over the internet); and (iii) bought lottery tickets (6–49, Sports Select, Instant lottery, Scratch and Win)’. Age of onset of gambling behaviour was defined as the earliest age at which any of the three behaviours was reported [20]. Purchasing lottery tickets, entering casinos, bingo halls or areas containing video lottery terminals and playing games or betting through a third party (such as a bookie) are illegal in Québec before age 18 years [26]. Personal bets or games played for money that are not organized through a third party are not regulated [26].

Impulsivity

Impulsivity was assessed in both grades 10 and 11 (in survey cycles 14 and 18) when participants were, on average, aged 15.8 and 16.7 years, respectively. We used a shortened version of the Eysenck impulsivity scale [27], which is validated for use in adolescents [28,29]. Participants were asked how true (not at all true, a little true, somewhat true, pretty true, very true; scored 1–5, respectively) the following statements were: (i) I often do things without stopping to think; (ii) I am an impulsive person; (iii) I often talk quickly before thinking things out; (iv) I often get involved in things I later wish I could get out of; (v) I need to use a lot of self-control to keep out of trouble; (vi) I often get into trouble because I do things without thinking; and (vii) I get carried away by new and exciting ideas, but I don’t think of the possible problems. The impulsivity score was computed as the average of the seven questions. Because there was no statistically significant difference between impulsivity scores in survey cycles 14 and 18 (P-value of t-test for mean of differences = 0.2), the mean score for both survey cycles was used as a continuous variable when data for both cycles were available. When data were available in one survey
cycle, the score was based on data for that cycle. Impulsivity scores ranged from 1–5 [mean (SD) = 2.3 (0.8); median (interquartile range) = 2.2 (1.1)].

Socio-economic status

We used two indicators as proxies for each of individual- and area-level SES. Parent education (mother and/or father completed university, neither parent completed university) was used as an individual-level SES indicator. Data on parent education were collected at the first survey cycle in grade 7. The Pampalon composite index [30,31] was used as an indicator of area material deprivation for the neighbourhoods in which participants resided during survey cycle 13 (grade 10) when they were aged 15.5 years on average. This index was developed in a principal components analysis of census information on the proportion of people employed within census dissemination areas (the smallest area for which Statistics Canada provides socio-economic data), the proportion of people without a high school diploma and the average income within areas. Dissemination areas were grouped into high, moderate or low material deprivation based on ranked factor scores obtained from the principal components analysis. Statistics Canada’s Postal Code Conversion File was used to identify the dissemination areas in which the participant’s postal code was located [32], and participants were assigned to the corresponding category of deprivation (i.e. high, moderate or low area material deprivation).

Covariates including sex and ethnicity (Caucasian, other) were selected based on previous studies reporting that these variables are associated with gambling [1,10,33,34].

Statistical analyses

The analytical sample was restricted to 628 participants with complete data (245 participants with missing data on gambling, impulsivity and/or individual- or area-level SES were excluded). Age of gambling onset, SES and impulsivity scores were similar among participants with and without missing data. SES and impulsivity were tested as independent predictors of elapsed time from age 0 years to age first gambled using Cox proportional hazards regression, first without and then with sex and ethnicity included as covariates. Impulsivity × parent education and impulsivity × area material deprivation interaction terms were tested and used to calculate hazard ratios (HR) for effect modification; 95% confidence intervals (CI) were computed using the impulsivity–SES covariance matrix and delta method [35]. We tested the proportional hazards assumption using log(–log survival) curves and the cox.zph function [36], and verified model fit using scaled Schoenfeld residuals. School level clustering was accounted for using the robust sandwich estimator [37]. Because preliminary analyses indicated that the associations were similar in males and females, the models were not stratified according to sex [38]. Analyses were undertaken using R software [39].

The NDIT study was approved by the Institutional Review Boards of the McGill University Faculty of Medicine and the Centre de recherche du CHUM. Parents provided written informed consent and participants provided assent during secondary school, which conforms to ethical requirements of school-based research in Québec. Participants provided written consent for the mailed questionnaire administered in survey cycle 21.

RESULTS

Overall, 79% of participants reported initiating one or more gambling behaviour, including 85% of males and 74% of females. The most common gambling behaviour initiated by boys was playing games for money, and by girls, purchasing lottery tickets (Table 1). Mean (SD) age of gambling onset was 15.6 (3.4) years [median (interquartile range) = 17.0 (4.0)]. Twenty-six per cent of participants began gambling at age 18 years, the legal gambling age in Québec [26]. When all three gambling behaviours were considered together, the incidence was highest from age 12–17 years when most participants were in secondary school (36% began gambling during this period), although 10% of participants reported gambling onset below 12 years of age, when most participants were in elementary school.

Table 1 Proportion of participants according to age first gambled.

<table>
<thead>
<tr>
<th>Age (years) first gambled</th>
<th>Male (n = 280) %</th>
<th>Female (n = 348) %</th>
<th>Both sexes (n = 628) %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Played games for money</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥11</td>
<td>4.6</td>
<td>4.3</td>
<td>4.5</td>
</tr>
<tr>
<td>12–17</td>
<td>44.3</td>
<td>17.0</td>
<td>29.1</td>
</tr>
<tr>
<td>≥18</td>
<td>20.7</td>
<td>20.1</td>
<td>20.4</td>
</tr>
<tr>
<td>Total</td>
<td>69.6</td>
<td>41.4</td>
<td>54.0</td>
</tr>
<tr>
<td>Bet money</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥11</td>
<td>1.1</td>
<td>0.0</td>
<td>0.5</td>
</tr>
<tr>
<td>12–17</td>
<td>22.1</td>
<td>6.3</td>
<td>13.4</td>
</tr>
<tr>
<td>≥18</td>
<td>40.0</td>
<td>33.0</td>
<td>36.1</td>
</tr>
<tr>
<td>Total</td>
<td>63.2</td>
<td>39.4</td>
<td>50.0</td>
</tr>
<tr>
<td>Bought lottery tickets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥11</td>
<td>6.1</td>
<td>4.3</td>
<td>5.1</td>
</tr>
<tr>
<td>12–17</td>
<td>22.1</td>
<td>14.1</td>
<td>17.7</td>
</tr>
<tr>
<td>≥18</td>
<td>36.4</td>
<td>40.8</td>
<td>38.9</td>
</tr>
<tr>
<td>Total</td>
<td>64.6</td>
<td>59.2</td>
<td>61.6</td>
</tr>
</tbody>
</table>

*aGambling behaviours are not mutually exclusive.
Table 2 shows the proportion of participants who gambled according to selected socio-demographic characteristics. Participants who reported gambling behaviours had slightly higher impulsivity scores [mean (SD) = 2.3 (0.8), median = 2.2, range = 1–5] than participants who had never gambled [mean (SD) = 2.2 (0.8), median = 2.0, range = 1–4.6], although the difference was not statistically significant (P-value = 0.08). There was no difference in impulsivity scores between males and females (P-value = 0.3), across levels of parent education (P-value = 0.6) or across levels of area material deprivation (P-value = 0.8).

In a model with no interaction terms, impulsivity increased the incidence of gambling onset independently

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Proportion of participants who reported gambling according to selected socio-demographic characteristics (n = 628).</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Reported gambling %</td>
</tr>
<tr>
<td>Sex</td>
<td>Male 280 85.4</td>
</tr>
<tr>
<td>Parent(s) university-educated</td>
<td>Yes 358 76.3</td>
</tr>
<tr>
<td>Area material deprivation</td>
<td>Low 291 76.3</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Caucasian 504 81.2</td>
</tr>
</tbody>
</table>

Table 3 Adjusted hazard ratios (HR) or β coefficients with 95% confidence intervals (CI) for the relationship between impulsivity, socio-economic status and gambling onset.

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HR (95% CI)</td>
<td>P-value</td>
<td>β (95% CI)</td>
</tr>
<tr>
<td>Impulsivity</td>
<td>1.2 (1.0, 1.3)</td>
<td>0.006</td>
<td>0.1 (–0.1, 0.2)</td>
</tr>
<tr>
<td>Parent university-educated</td>
<td>1.2 (1.0, 1.3)</td>
<td>Referent</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Referent</td>
<td>0.09</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>1.2 (1.0, 1.3)</td>
<td>0.09</td>
</tr>
<tr>
<td>Area material deprivation</td>
<td>1.1 (0.9, 1.4)</td>
<td>0.2d</td>
<td>0.1 (–0.1, 0.3)</td>
</tr>
<tr>
<td></td>
<td>Low</td>
<td>Referent</td>
<td>0.2d</td>
</tr>
<tr>
<td></td>
<td>Moderate</td>
<td>1.1 (0.9, 1.4)</td>
<td>0.2d</td>
</tr>
<tr>
<td></td>
<td>High</td>
<td>1.4 (0.9, 2.0)</td>
<td>0.2d</td>
</tr>
<tr>
<td>Interaction terms</td>
<td>Impulsivity × parent university-educated</td>
<td>—</td>
<td>0.1 (–0.1, 0.3)</td>
</tr>
<tr>
<td></td>
<td>Impulsivity × moderate area material deprivation</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>Impulsivity × high area material deprivation</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

impulsivity. Among participants with impulsivity scores of 5, not having a university-educated parent was associated with a 70% higher hazard (95% CI 1.1–2.7) for gambling onset relative to having at least one university-educated parent. A dose–response pattern was apparent, evidenced by the progressively stronger hazards across participants with increasing impulsivity scores. Impulsivity also modified the relationship between area material deprivation and gambling onset, and a dose–response pattern was apparent. Among participants with impulsivity scores of 5, those living in highly deprived areas had a hazard for gambling onset that was five times higher (95% CI 2.6–9.6) than participants living in advantaged areas. Among participants with impulsivity scores of 3, the hazard was 79% higher. No association between area material deprivation and gambling was present among participants with impulsivity scores of 2 or less. A dose–response pattern across impulsivity levels was apparent for participants living in moderately deprived areas relative to advantaged areas, although the associations were not statistically significant.

**DISCUSSION**

In this analysis of factors influencing gambling onset in a cohort of youth, interactions were observed between each of impulsivity and parental education, and impulsivity and area material deprivation. Self-reported impulsivity was associated with retrospective self-report of gambling onset among disadvantaged but not advantaged youth. Further, both low parent education and high area material deprivation were associated with gambling onset among impulsive youth only. To our knowledge, this study is the first to demonstrate synergy between self-reported impulsivity and socio-economic conditions of life as determinants of gambling onset in youth. These data suggest that impulsivity may be associated with gambling behaviours principally when the socio-economic conditions of life are unfavourable, and that impulsivity traits may not be important determinants of gambling in socio-economically advantaged youth. Furthermore, low parental education and high area material deprivation appear to be stronger risk factors for gambling onset among youth with a propensity towards high self-reported impulsivity.

Few studies have evaluated both impulsivity and SES in relation to gambling onset in youth. Our results do not align with at least one previous study, which reported that neither impulsivity nor maternal education relate to gambling [11]. However, the data in the study were cross-sectional, evaluated problem gambling (not gambling onset) and did not examine interaction [11]. Furthermore, the relationship between SES and gambling onset is unclear in the literature. Some research suggests that

### Table 4
Adjusted hazard ratios (HR) and 95% confidence intervals (CI) for the effect of a 1 or 4-unit increase in impulsivity on gambling onset according to indicators of socio-economic status.

<table>
<thead>
<tr>
<th></th>
<th>Parent(s) university-educated HR (95% CI)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Area material deprivation HR (95% CI)&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>1-unit</td>
<td>4-unit</td>
</tr>
<tr>
<td>Increase in impulsivity score</td>
<td>1.1 (0.9, 1.3)</td>
<td>1.4 (0.8, 2.7)</td>
</tr>
</tbody>
</table>

<sup>a</sup>HR adjusted for area material deprivation, sex and ethnicity.  
<sup>b</sup>HR adjusted for parent education, sex and ethnicity.

### Table 5
Adjusted hazard ratios (HR) and 95% confidence intervals (CI) for the effect of socio-economic status on gambling onset according to impulsivity score.

<table>
<thead>
<tr>
<th>Impulsivity score HR (95% CI)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent(s) university-educated&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>Yes</td>
<td>1.0 (0.7, 1.4)</td>
<td>1.1 (1.0, 1.3)</td>
<td>1.3 (1.1, 1.5)</td>
<td>1.5 (1.1, 2.0)</td>
<td>1.7 (1.1, 2.7)</td>
</tr>
<tr>
<td>No</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>Area material deprivation&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>Low</td>
<td>0.9 (0.7, 1.2)</td>
<td>1.1 (0.9, 1.3)</td>
<td>1.2 (0.9, 1.7)</td>
<td>1.5 (0.8, 2.6)</td>
<td>1.7 (0.8, 3.9)</td>
</tr>
<tr>
<td>Moderate</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
<td>Referent</td>
</tr>
<tr>
<td>High</td>
<td>0.6 (0.4, 1.1)</td>
<td>1.1 (0.7, 1.6)</td>
<td>1.8 (1.2, 2.6)</td>
<td>3.0 (1.8, 4.8)</td>
<td>5.0 (2.6, 9.6)</td>
</tr>
</tbody>
</table>

<sup>a</sup>HR adjusted for area material deprivation, sex and ethnicity.  
<sup>b</sup>HR adjusted for parent education, sex and ethnicity.
low parent education/occupational status is associated unfavourably with problem gambling (not gambling onset) in youth [40], while other studies report no association for parent education [6] or financial security [41].

The literature is relatively more consistent in adults, however, and does provide evidence to support the associations we observed. Low income [42] and an income/education/occupation composite score [43] predict more frequent gambling in adults. Researchers have suggested that disadvantaged people may gamble more than advantaged ones, using small amounts of money in more frequent gambling experiences, resulting in relatively higher spending due to their lower income [4,6,44–46]. Our results suggest that SES may be linked not only to gambling frequency, but also to gambling onset.

Our results also suggest that area material deprivation was associated more strongly with gambling onset among impulsive youth than was parent education. Greater access to gambling venues in disadvantaged areas may be one route facilitating gambling onset in youth [18,47]. This is a tenable hypothesis, given that neighbourhood disadvantage in the United States was associated with higher gambling frequency in adults, and that gambling venues were more common in such neighbourhoods [23]. In Montréal, accessibility by foot to places with permits for video lottery games was greater in deprived areas compared with wealthy ones [48]. Differential enforcement of laws banning gambling across neighbourhoods in youth under age 18 is unlikely to explain our findings, as the hazards were proportional over the duration of the study. In other words, HRs for the influence of area material deprivation on gambling onset before age 18 were similar to those after age 18. Our findings, however, do not suggest that gambling laws do not prevent youth from initiating gambling, but rather that they are unlikely to explain the relationship between SES and gambling onset.

Although not measured in this study, psychosocial stress originating from the perception of low SES may be one mechanism through which gambling may occur. It is possible that individuals who are less well off in society compare themselves relative to those who are better off, generating stress that manifests in maladaptive coping strategies and behavioural effects [49], such as gambling. Evidence from prospective studies suggests that stress is linked to other addictive behaviours such as substance use [50]. Alternatively, underinvestment in material resources of disadvantaged or less equal communities may lead to lost opportunities and adoption of harmful behaviours [51]. Further research is needed to determine if stress-related mechanisms underlie the relationships between SES, impulsivity and gambling onset in youth.

The relationships we observed between impulsivity, SES and gambling in youth are reminiscent of those underpinning genes, social stress and depression. Although data are conflicting [52], some research suggests that the relationship between genes and depression may be modified by environmental life stress [53–57]. Depression may occur more frequently among genetically susceptible individuals who are exposed to life stress, while individuals with similar genotypes not exposed to stress are spared. Further research is warranted to determine whether similar factors underlie our findings, especially as impulsivity may have a genetic component, and is linked to stress [50,58].

Study limitations

Data on age at gambling onset were collected in retrospective self-reports when participants were adults. The associations observed may be attenuated by non-differential recall-related misclassification. Impulsivity was measured at ages 15.8 and 16.7, which may be problematic if gambling onset preceded the time at which impulsivity was measured and if impulsivity changed substantially over time. However, there was no change in impulsivity from grades 10–11 among participants, suggesting that impulsivity was relatively stable over at least 1 year. We evaluated self-reported impulsivity and do not know if the findings are generalizable to other impulsivity measures, including behavioural ones, or other personality traits. We did not evaluate which specific dimension of impulsivity, if any, may be at play. Similarly, parent education as a marker of SES may not fully capture individual SES, although it is reassuring that similar results were obtained using an indicator of area-level SES. Other measures of SES such as household income were not collected, as youth may not report such data accurately. Parent education is a useful measure, as it is unlikely to have changed substantially over time. This is also the case for area material deprivation, because research suggests that individuals who move tend to relocate in areas with characteristics similar to the area in which they lived previously (i.e. the relative ranking of area material deprivation tends to remain stable despite residential mobility) [59]. Data on covariates such as parental gambling behaviours were not available [60], which may have affected the estimates, although such factors may be intermediate variables not needing to be accounted for.

CONCLUSION

Opportunities to gamble are increasing [1–4], and heavy marketing of gambling makes prevention in youth challenging. Recent frameworks for youth gambling prevention have not considered SES as a determinant of gambling behaviours [61]. While it is established that personality traits such as impulsivity influence youth...
gambling behaviours, our results demonstrate that SES may also influence gambling onset among youth and may even modify the influence of personality traits (and vice versa). Additional research is needed to determine if the findings observed herein are similar for problem and pathological gambling in youth. Youth gambling prevention strategies may need to account for potential interaction between impulsivity and socio-economic disadvantage.

**Declarations of interest**

The authors have no connection with the tobacco, alcohol, pharmaceutical or gaming industries, and declare no conflicts of interest.

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