Schools, Students and Adolescent Gambling in Ontario: Two Studies

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Abstract

The recent legalization of gambling in Canada has resulted in an underdeveloped knowledge base regarding gambling behaviours and problems, especially among adolescents whose rate of disordered gambling appears to exceed that of adults. This study used data from the *Ontario Student Drug Use Survey (OSUDS)* – a cross-sectional survey of Ontario students – to conduct two investigations.

The first study describes the level of school variation in gambling problems, identifies the school-level factors associated with gambling problems, and describes the characteristics of elementary and secondary schools with varying levels of gambling problems. Results were based on student-aggregated (N=1,968) and census-derived data for 39 elementary and 72 secondary schools from the 1999 *OSDUS*. Results showed that school-level variation in gambling problems was statistically significant for secondary schools (SOGS2+ varying from 0 to .39, mean=.14) but not among elementary schools (varying from 0 to .36, mean=.11). About 10% of elementary schools had 20% or more of students reporting gambling problems, compared to 24% of secondary schools. School-level gambling problems increased with: the percentage in the local community moving five or more times; the percentage with no high school education; casino proximity; mean student violence; and lower mean school climate. For both elementary and secondary schools, four school clusters were identified: (1) *"normative"* schools, characterized by average or below average risk indicators (53% of elementary schools and 54% of secondary schools); *"ecologically-advantaged"* schools, characterized by below average risk indicators (29% of elementary schools and 20% of secondary schools); *"vulnerable"* schools, characterized by above average indicators of community disorganization (13% of elementary schools and 19% of secondary schools); and "*remote"* schools, characterized by their remoteness (5% of elementary and 7% of secondary schools).

The second study examined the individual-level clustering of gambling, drug use and mental health among adolescent students. Data were derived from the 2001 *OSDUS* (N=2 243, mean age 15 years, 51% males). We conducted a cluster analysis using gambling behaviour, gambling problems, substance use, substance use problems, and psychological distress. These groups were also compared across a number of additional variables that were not used in the original cluster analysis. The analysis suggested four clusters, which were labelled as follows: Mainstreamers (65.5%); Rule-Breakers (26.5%); Dominant Drug-Takers (6.1%) and Dominant Heavy Gamblers (1.9%). *Mainstreamers* were more likely to be female (56%), were younger, and did not use drugs, drink alcohol or gamble much. *Rule-Breakers* had higher rates of alcohol, cigarettes and cannabis use and they gambled more than Mainstreamers. *Dominant Drug-Takers* were more likely to be male (60%), had the highest rates of alcohol and drug use, were the most depressed and had the highest delinquency rate. *Dominant Heavy Gamblers* were largely male (92%), had the highest gambling frequency, SOGS-RA score, and psychological distress, and reported the lowest self-esteem. The findings indicate that Heavy Drug-Takers and Heavy Gamblers formed two distinct clusters. Problem gamblers were found in all four clusters, but they were most concentrated in the heavy gambling cluster. The results suggest that troubled youths are not a single entity, but display heterogeneity in their configuration of risk behaviours.

KEY WORDS: youth gambling, problem gambling, drug use, school factors, cluster analysis.

Study 1: School-Level Variation in Gambling Problems among Ontario Students

Background & Literature Review

The recent legalization of gambling in Canada has occurred in an environment in which relatively little is known about gambling behaviour and problems, especially among adolescents, whose rates of gambling problems appear to exceed those of adults (Shaffer, Hall, & Vander Bilt, 1999). In Ontario, rates of problem gambling among students hover around 8% (Adlaf & Paglia, 2002), whereas that estimate is about 3% among adults (Adlaf & Ialomiteanu, 2002). These rates are similar to other Canadian (Gupta & Derevensky, 1998a; Jacobs, 2000; Ladouceur, 1996; Poulin, 2000) and American population estimates (Jacobs, 2000). Also worrisome is that most adult pathological gamblers begin gambling during adolescence (Volberg, 1994). In Ontario, gambling is illegal for those under age 18, except for full-scale casinos serving alcohol which have a legal age of 19. Yet we know that, while estimates do vary, at least one-in-two adolescents gambles in some form (Adlaf & Ialomiteanu, 2000; Jacobs, 2000; Stinchfield, 2000; Volberg, 1994).

The proliferation of gambling venues is a cause for concern, given the common finding that greater availability and accessibility of gambling activities is correlated with gambling-related problems among adults (Jacques, Ladouceur, & Ferland, 2000; Room, Turner, & Ialomiteanu, 1999) and youth (Jacobs, 2000; Lesieur et al., 1991). Accordingly, it can be argued that the closer in proximity a venue is, the greater the probability of patronizing it, or indirectly being influenced by its presence. Indeed, some communities have shown resistance to local gambling development over concern that problems will ensue among the constituents (Room et al., 1999). In fact, locating gambling venues away from schools has been identified by gambling researchers as a preventive measure against adolescent problem gambling (Griffiths & Wood, 2000).

Studies at the student-level show that gambling and related problems are correlated with substance use, truancy, violence, and other risk behaviour (Proimos, DuRant, Pierce, & Goodman, 1998; Stinchfield, 2000; Vitaro, Brendgen, Ladouceur, & Tremblay, 2001). Indeed, much research has shown that problem behaviours tend to cluster and share common predictors (Donovan, 1996; Farrell, Danish, & Howard, 1992; Jessor, 1984; McGee & Newcomb, 1992). However, little is known about the profile at the school-level. Does this type of clustering of problem behaviours hold?

Schools are social entities with their own cultures and contexts that can influence student outcomes such as deviance and academic achievement. School culture encompasses the beliefs and values of students and teachers that determine what is acceptable and normal behaviour among students (Welsh, Greene, & Jenkins, 1999). School disorder – problem behaviours such as violence or drug use among students – varies greatly, depending not only on a school's culture but also structural characteristics such as size, age and gender composition, and policy enforcement (Gottfredson & Gottfredson, 1985; Simons-Morton, Davis Crump, Haynie, & Saylor, 1999). Although gambling is increasingly becoming normalized in society, excessive youth gambling has been construed as problematic, akin to delinquency, since it has potentially negative consequences, such as addiction, truancy, poor grades, and theft (Gupta & Derevensky, 1998a). Given this, however, only a minority of school officials are aware of this growing problem, and few have adopted prevention curricula or policies (Shaffer, Forman, Scanlan, & Smith, 2000).

While school factors can influence student behaviour, it is important to recognize that schools are embedded in communities with their own contextual socioeconomic characteristics, which, in turn, can influence school disorder. For example, American studies have shown that poverty and unemployment in the community are associated with school violence (Hellman & Beaton, 1986; Welsh et al., 1999), although the causal chain is less understood. Others have found urban schools to be more violent than suburban or rural schools (for a review see Anderson, 1998). Unfortunately, there is a dearth of community-level research on school outcomes other than violence.

Purpose and Goal

The purpose of this study was to obtain a better understanding of school variation in gambling behaviours and problems, which would address the issue of whether gambling prevention programming should be generalized and robust, specialized and targeted, or include elements of both.

Research Questions

This study sought to answer three questions: (1) Do gambling problems in schools vary significantly?; (2) If so, what factors are related to this variation?; and (3) Is there any evidence of school typologies based on gambling problems? The third question addresses several practical issues: what types of schools require greater gambling problem prevention activities? Do schools with gambling problems also have other types of problems, such as elevated violence or drug use? What types of school and community characteristics correlate with gambling problems at the school-level?

Methods

Data Collection

Sample:

Our analysis is based on 1,968 self-administered questionnaires collected from 38 elementary schools and 70 secondary schools derived from the Centre for Addiction and Mental Health's 1999 *Ontario Student Drug Use Survey (OSDUS)* (Adlaf, Paglia, & Ivis, 1999). This cross-sectional survey employed a two-stage cluster design (school, class), and included 4,894 7^{th}- to 13^{th}-graders (OAC students) from 38 school boards, 111 schools, and 285 classes. Anonymous, self-administered questionnaires were administered on a classroom basis by staff from the Institute for Social Research, York University in the spring of 1999. The student participation rate (i.e., eligible students/completions) was 76% (reasons for non-completion included 12% for absenteeism and 12% for lack of parental consent).

To maximize questionnaire coverage, the *OSDUS* employs random half samples for selected questionnaire items. Our estimates are based on the half-sample that received the gambling-related questions: 1,968 students in 111 schools (39 elementary, 72 secondary). All *OSDUS* measures were aggregated to the school level, and therefore reflect school means. School sample sizes ranged from 18 to 2,429, and averaged 790 students.

Measures:

We employed three types of measures in our analysis: 11 mean-based variables aggregated from student responses; 7 school-level global variables; and 12 community-level measures based on the 1996 Canadian census (see Table 1 for definitions). The four minimum distances between schools and gambling venues were based on the distance in kilometres between each school and the nearest casino (of 3), charity casino (of 5), horse race track with slot machines (of 12) in Ontario, as well as the minimum distance among these three venue types. Distances were calculated by first using the Statistics Canada postal code conversion file to obtain the latitude and longitude of each venue and each school, and subsequently calculating the minimum spherical distance (StataCorp, 2001).

The community characteristics were based on the school's Forward Sortation Area (FSA), geographical areas used by Canada Post, that are based on the first 3 digits of a postal code and represent, on average, about 7,000 households. The FSA-level variables, taken from the 1996 Canadian Census public-use data file, included: proportion of population under age 25, proportion of single-parent families, proportion of immigrants, proportion Aboriginal, proportion of visible minorities, proportion with no high school education, proportion moving residence in the past 5 years, proportion of households with low income, unemployment rate, and youth unemployment rate. These were selected to reflect economic hardship and community cohesion and stability – factors known to be related to adolescent risk behaviour (Anderson, 1998; Shaw & McKay, 1969; Welsh et al., 1999; Working Group on Community Health Information Systems and S. Chevalier, R. Choiniere, M. Ferland, M. Pageau, & Y. Sauvageau, 1995).

Data Analysis

Our analysis begins by describing the extent of school-level variation in gambling problems among the 38 elementary and 70 secondary schools. We then employed weighted least squares regression to identify potential school-based and census-based predictors of gambling problems. Lastly, in order to identify and describe school-level gambling characteristics, we performed a cluster analysis using 10 variables: student problem gambling; 4 distance measures (minimum distance between the school and a casino, charity casino, race track with slots and distance from any venue); money gambled by students; student illicit drug use; frequency of binge drinking by students; violent acts and non-violent acts by students. To further describe the potential clusters and to validate them, we used 6 school-level characteristics and 10 community characteristics to assess contextual differences between the clusters. The school-level variables, derived from the *OSDUS*, were: students' age and sex, perceptions of school safety, level of school attachment, truancy, and school size.

The advantages of cluster analysis for our applications are two-fold. First, because it can reduce the complexity of multivariate data, it can provide concise descriptions of patterns of similarities and differences in data, e.g., distinguishing schools with high gambling problems versus schools with low gambling problems. Second, these descriptions can, in turn, provide a basis for research into factors that may predict membership in different clusters, e.g., what factors predict schools with high gambling problems (Everitt, Landau, & Leese, 2001).

Using SPSS 6.1 (SPSS Inc., 1994), we employed agglomerative hierarchical cluster analysis separately for elementary and secondary schools, since gambling behaviour and problems vary by age. We used squared Euclidean distance as the similarity measure and Ward's minimum-variance method for the portioning of clusters (Ward, 1963). All 10 cluster variables were first standardized to ensure equal weighting. The analytical sample size was reduced to 108 schools (38 elementary, 70 secondary) due to listwise deletion. A cluster solution was selected based on an examination of the Euclidean distance schedule for large increases in coefficients between agglomeration steps. Nonhierarchical cluster analysis was then used to refine these clusters, forcing a cluster solution based on the number derived from the hierarchical analysis. This two-stage process enhances the performance of the hierarchical cluster analysis (Sharma, 1996).

To help validate the final cluster solution, we performed analysis of variance (ANOVA) tests on the 16 external variables not employed in the cluster analysis (Aldenderfer & Blashfield, 1984). Examining differences in school and community characteristics is helpful in validating the existence of unique and meaningful school clusters.

Findings and Interpretations

School Variation in Gambling Problems

Before proceeding to address the issue of potential clusters of high risk and low risk schools, it is instructive to first examine school-level variation in SOGS scores. Among the 703 students in the 38 elementary schools, a random effect ANOVA showed non-significant school variation at the $p<.05$ level ($F=1.11$, 37, 665df; $p=0.306$) and a minimal intraclass correlation (ICC=0.006). Thus, only 0.6% of the variance in the SOGS score is at the school level. The mean of the aggregate SOGS score for the 38 schools was .59 (SD=0.367) with values ranging from 0 to 1.5. The school means for the SOGS 2+ was 0.11 (SD=0.075) and ranged in values from 0 to .36. The stem and leaf plot displayed in Figure 1 shows that 5 elementary schools had students with mean SOGS of zero, while one school had a mean of .357. This distribution shows that 45% (17/38) of elementary schools had, on average, less than 10% of their students reporting gambling problems. At the extreme end, 10% (4/38) of elementary schools had 20% or more of their students reporting problems.

Among the 1536 students in the 70 secondary schools, a random effects ANOVA showed significant school variation (F=1.39; 69,1466df; p=0.022) and that 1.7% of the variance in the SOGS was at the school level. The mean of the aggregated SOGS score was 0.72 (SD=0.457) with values ranging from 0 to 1.86. The school means of the SOGS 2+ was .14 (SD=0.088) with values ranging from 0 to .39. Figure 1 shows that 4 secondary schools had students with mean SOGS of zero, while one school had a mean of .389. This distribution shows that 34% (24/70) of secondary schools had, on average, less than 10% of their students reporting gambling problems. At the extreme end, 24% (17/70) of secondary schools had 20% or more of their students reporting problems. This suggests that, although the school homogeneity of gambling scores is low, school variation is still evident.

Factors Associated with School-Level Gambling Problems

To evaluate the potential factors related to school-level gambling problems based on the mean SOGS 2+, we estimated a weighted (by interviews per school) least squares regression using a backward stepwise approach. Preliminary data analysis showed significant skewness, and departure from normality, of the mean SOGS 2+ (skewness = 0.77, p<.007) which was resolved with a reciprocal transformation.

In total, 20 variables were assessed: *student aggregated* – mean safety, attachment, school climate, non-violent acts, age, sex; *school global* – region (3 dummy variables), school type, school size; minimum distance to casino, charity casino, race track, and to any venue; and *community census* – percentage who own dwelling, percentage with a low income, percentage moving within last 5 years, percentage visible minority, percentage immigrant, percentage single parent families, percentage with no high school education. Prior to estimation, we evaluated the independent variables for multicollinearity based on the variance inflation factor. This preliminary analysis resulted in the removal of 5 variables that were highly intercorrelated: school safety, school attachment, distance to race track, distance to charity casino and percentage visible minority. The remaining 16 independent variables (18 regressors) were then assessed with stepwise regression of which 8 variables were not retained in the model: mean violence, school size, school type, region, minimum venue distance, and the percentage who own dwelling, immigrant and low income.

The resulting model retained 8 variables and accounted for 34% of the variance in the reciprocally transformed mean SOGS 2+ scores (Table 2). Four factors, all of which are indicators of community and school disorder, dominated the regression results. School gambling problems increased with the proportion in the school area having moved in the past 5 years (b = .297, p=.011), the proportion in the school area with no high school education (b = .266, p=.008), and the mean level of student violence (b = .257, p=.007), and decreased with higher than average school climate (b= -.163, p=.045). Also significant is casino distance, which was inversely associated with greater problems (b= -.181, p=.033). The remaining variables – mean age, sex and percentage single parent family – did not reach statistical significance at the p<.05 level.

School Types

We performed a cluster analysis on elementary school and secondary schools separately, using 10 variables: student problem gambling; 4 distance measures (minimum distance between the school and a casino, charity casino, race track with slots and distance from any venue); money gambled by students; student illicit drug use; frequency of binge drinking by students; violent acts and non-violent acts by students. We evaluated 3, 4 and 5-cluster solutions. A 5-cluster solution for both school levels showed a cluster with just one school, thus these solutions were rejected. Further, the diagnostic criteria, which included scree-type plots suggested that 3-cluster and 5-cluster solutions were not as fitting as a 4-cluster solution for each school level.

Elementary School Clusters

Table 3 displays the outcome of the 4-cluster solution based on the 38 elementary schools. The most numerically dominant of the four clusters was Cluster 2, which we labelled "normative" schools. This cluster of 20 schools represents 53% of the elementary schools. Overall, normative schools were generally characterized by average or below average indicators. The key distinguishing characteristic of normative schools were being situated in an area with (1) a higher than average percentage of immigrants (32.5% vs 25%), (2) a lower percentage who are Aboriginal (0.6% vs 1.3%), and (3) a lower youth unemployment rate (16.8% vs 18.4%). School indicators were generally within average values. Regarding gambling indicators, normative schools displayed below average values, including gambling problems (SOGS score of 0.54 vs 0.59). Other behaviours, such as student alcohol and other drug use and conduct problems, were average or below average.

The next most numerous cluster (Cluster 1) involved 11 schools, representing 29% of all elementary schools. This cluster of schools we have labelled "ecologically-advantaged". Like normative schools, these schools were characterized by below average indicators. The key distinguishing characteristics were that they display a lower risk community profile, noted by the smallest percentages with no high school and low income, and lower than average student violence, antisocial behaviour, and illicit drug use. Regarding gambling indicators, these schools had below average SOGS scores and money gambled.

Cluster 3 was comprised of five schools, represented by 13% of elementary schools. This group of schools we have labelled "vulnerable" given their elevated scores across an array of indicators. The most obvious pattern of vulnerable schools was above average indicators of community disorganization, as represented by a higher percentage of single-parent families, mobility, and low income. Although the separate indicators are not statistically significant, the pattern of school characteristics showed that students in these vulnerable schools reported below average school safety and attachment and above average truancy. These schools displayed the highest rates of SOGS (1.3 vs 0.59), money gambled (1.22 vs 1.11), illicit drug use, binge drinking, nonviolent antisocial behaviour and violent behaviour.

The final elementary school cluster was comprised of only two schools (5%); thus, we describe them here for completeness, but we should be cautious in not over-interpreting their importance. We labelled this cluster as representative of "remote" schools given that their uniqueness seems to be based on their remoteness. Remote schools displayed an above average percentage of Aboriginal population in the community, large school-to-casino distances and both were in Northern Ontario.

Secondary School Clusters

Table 4 presents the outcome of the secondary school cluster analysis. Four distinct clusters emerged from the 70 schools. As with the elementary schools, the most dominant cluster of secondary schools was the "normative" schools, represented by 38 schools (54%). Overall, normative schools were characterized by average to below average indicators. Problem gambling (0.60 vs 0.72) and money gambled (1.13 vs 1.21) were also below average for these schools. In addition, student alcohol and other drug use and conduct problems had the lowest values among the four secondary school clusters.

The next most numerous cluster (Cluster 1) was labelled "ecologically-advantaged", represented by 14 secondary schools (20%). The key distinguishing characteristics of these schools were that they showed above average binge drinking, fewer males, above average school safety and below average school size. Ecologically, despite an above average youth unemployment rate, these schools displayed below average low income, mobility, visible minority immigrants and single-parent families. Regarding gambling indicators, these schools displayed average SOGS scores and money gambled, and above average venue distances.

A similar number of schools as in the previous cluster formed the "vulnerable" cluster (Cluster 3), represented by 13 (19%) secondary schools. These schools, which closely parallel the profile of the vulnerable elementary schools cluster, were also characterized by ecological vulnerability. Such schools were located in areas with high proportions of immigrants and visible minorities, mobility, and low income. As well, these schools had more males, and above average student truancy. Regarding gambling, secondary students in vulnerable schools reported the highest gambling problems (SOGS score of 1.09 vs 0.72) along with more money gambled, illicit drug use, and antisocial behaviour.

Similar to elementary schools, a small cluster of "remote" secondary schools (n=5; 7%) was identified. These schools displayed an above average percentage of Aboriginal population in the community, large school-to-casino distances and all were in Northern Ontario.

Study Limitations

Some data limitations should be highlighted. First, we do not know if this 4-cluster solution is replicable and generalizable to other elementary and secondary school samples. Second, because our definition of community is based on FSA, rather than a census tract or a census block or other smaller geographical units, we may have missed the impact of local contextual factors. Third, we had access to only a limited number of school structural variables and it was not possible to include other school information, such as prevention curricula, school policies and enforcement.

Conclusions and Implications of Study 1

One of the questions this study attempted to address was, "Do gambling problems vary significantly across schools?" Findings showed that school-level variation in gambling problems was statistically significant for secondary schools, but not significant among elementary schools. Not surprisingly, greater proportions of students in secondary schools reported gambling problems compared to elementary school students. What factors are related to this variation in secondary schools? Results showed that school-level gambling problems increased with the percentage in the community moving five or more times, the percentage in the community with no high school education, casino proximity, student violence. On the other hand school-level gambling problems seemed to decrease as school climate improved.

Another question addressed was, "Is there any evidence of school typologies based on gambling problems?" We found that, for both elementary and secondary schools, four clusters of schools were identified: (1) "normative" schools, characterized by average or below average risk indicators (53% of elementary schools and 54% of secondary schools); "ecologically-advantaged" schools, characterized by below average risk indicators (29% of elementary schools and 20% of secondary schools); "vulnerable" schools, characterized by above average indicators of community disorganization (13% of elementary schools and 19% of secondary schools); and remote schools, characterized by their remoteness (5% of elementary and 7% of secondary schools).

Appendix 1: Tables & Figure

Table 1. Description of Measures: Student Aggregated, School Global, and Community Census Variables

	Definition	Metric
Student Aggregated Variables		
Problem Gambling	The SOGS-RA12 (“South-Oaks Gambling Screen Revised for Adolescents”) was used to measure 12 gambling-related problems during the past 12 months. A second problem gambling indicator used was “SOGS 2+” which is a binary measure based on a cut-off of at least 2 out of 12.	Summed Score
Money Gambled	“What is the largest amount of money you have ever gambled in the last 12 months?” (1) 0-$49; (2) $50-$99; (3) $100-$199; (4) $200+	Ordinal scale
Illicit Drug Use	Number of illicit drugs, excluding cannabis, used in the past 12 months	Count
Frequency of Binge Drinking	“How many times in the last 4 weeks have you had 5 or more drinks of alcohol on the same occasion?” (0) no alcohol/no bingeing; (1) once; (2) twice; (3) 3 times; (4) 4 times; (5) 5+ times	Ordinal scale
Violent Acts	Assaulting someone, gang fighting, or carrying a weapon in the past 12 months	Count
Non-Violent Delinquent Acts	Theft (3 items), Vandalism (1 item), Break and Enter (1 item), Drug Selling (2 items), Family Disruption (2 items)	Count
Age	Students’ age	Years
Proportion Male	Proportion of male respondents	Percentage
School Safety	Summation of responses to 2 items: “I feel safe in my school.” (4-point scale from “strongly agree” to “strongly disagree”); and “At school, how worried are you that someone will harm you, threaten you, or take something from you?” (4-point scale from “very worried” to “not at all worried”)	Summed Score (higher indicates safer)
School Attachment	Summation of agreement to 2 items: “I feel close to people in this school” and “I feel like I am part of this school” (each 4-point scale from “strongly agree” to “strongly disagree”)	Summed Score (higher indicates stronger attachment)
School Climate	Summation of responses to the 2 school safety items, and the 2 school attachment items outlined above.	Summed Score (higher indicates positive climate)
Truancy	“During the last 4 weeks, how often have you gone to school, but skipped a class when you weren’t supposed to?” (0) never (1.5) 1-2 times (4.5) 3-5 times (7.0) 11-20 times (20) More than 20 times	Ordinal scale
School Global Variables		
Distance to Casino	Minimum distance between school and a casino (of 3)	Kilometres
Distance to Charity Casino	Minimum distance between school and a charity casino (of 5)	Kilometres
Distance to Race Track with Slots	Minimum distance between school and a race track with slots (of 12)	Kilometres

	Definition	Metric
Minimum Distance (Any)	Minimum distance among the 20 gambling venues	Kilometres
School Size	Number of students enrolled in the school	Count
School Type	Elementary school (grades 7 and 8), or Secondary school (grades 9 to 13)	
Region of Ontario	4 regions used: Toronto, North, West, East	
Community Census Variables: *		
Population aged <25 years	Total number under age 25 living in an FSA divided by the total number in the FSA	Percentage
Single-Parent Families	Proportion of Census families made up of one parent with at least one never-married child under age 18	Percentage
Immigrants	Proportion not Canadian citizens by birth	Percentage
Aboriginal	Proportion self-identifying with an Aboriginal group	Percentage
Visible Minority	Proportion belonging to a visible minority group (persons other than Aboriginal people who are non-Caucasian in race or non-white in colour)	Percentage
No High School Education	Proportion aged 15 and older with no high school education (less than grade 9)	Percentage
Moved in past 5 years (Mobility)	Proportion aged 5 and older that has moved residence at least once during the 5 years before the Census	Percentage
Low-Income	Proportion of private households with an income level below that necessary to satisfy basic needs	Percentage
Unemployment Rate	Proportion aged 15 and older not participating in the labour force	Percentage
Youth Unemployment Rate	Proportion aged 15 to 24 not participating in the labour force	Percentage
Own Dwelling	Proportion of private households that are owned and occupied by the dweller	Percentage

* based on FSA-level data from the 1996 Canadian Census

Table 2. Weighted Least Squares Regression of Mean “SOGS 2+” on various independent variables (N=108 schools)

	b	Beta	p
Community based variables			
% Single-Parent Families	-.003	-.200	.072
% No High School Education	.005	.265	.010
% Moved Residence in the past 5 years	.003	.297	.017
Casino Distance	-.000	-.181	.030
Student based variables			
Mean Violent Acts	.211	.257	.005
Mean Age	.007	.139	.099
Mean School Climate	-.026	-.163	.045
% Male	.116	.173	.099
Constant	.145		
$R^2 = .353$			

Notes: b/Beta based on raw SOGS2+; p based on reciprocal transformation

Table 3. *Unstandardized Means* for the Elementary School Clusters

	Cluster 1 **Low risk** N=11	Cluster 2 **Normative** N=20	Cluster 3 **Vulnerable** N=5	Cluster 4 **Remote** N=2	*F-value*	*Total Mean* (N=38)
Cluster Variables						
SOGS Score	0.38	0.54	1.28	0.45	16.89***	0.59
Casino Distance (km)	218.83	78.80	158.44	834.49	61.23***	169.59
Charity Casino Distance (km)	220.98	55.62	49.44	12.38	29.63***	100.40
Race Track/Slots Distance (km)	85.63	25.01	65.10	647.71	90.75***	80.61
Any Gambling Venue Distance (km)	79.53	17.73	15.78	12.38	8.41***	35.08
Money Gambled	1.09	1.09	1.22	1.06	3.14*	1.11
Illicit Drugs Used (of 12)	0.27	0.38	0.92	0.26	8.22***	0.41
Frequency of Binge Drinking	0.17	0.14	0.36	0.23	3.43*	0.18
Violent Acts (of 3)	0.13	0.17	0.25	0.33	3.36*	0.18
Nonviolent Delinquent Acts (of 9)	0.20	0.26	0.47	0.27	4.03**	0.27
School Variables						
Age	13.0	13.0	12.9	13.1	1.40	13.0
% Male	43.9	48.6	49.9	54.3	1.27	0.48
School Safety Score	6.54	6.53	6.39	6.26	0.96	6.50
School Attachment Score	6.64	6.62	6.33	6.34	1.75	6.57
Truancy	0.43	0.34	0.51	0.49	0.24	0.40
School Size	183	158	211	93	0.46	169
Community Variables						
% Population Aged <25 years	34.2	33.9	34.8	34.3	0.07	34.1
% Single-Parent Families	14.4	14.5	18.0	15.3	0.53	15.0
% Immigrants	12.6	32.5	26.8	13.3	4.56**	25.0
% Aboriginal	1.7	0.6	1.5	6.5	16.69***	1.3
% Visible Minority	6.3	21.9	17.3	2.3	2.06	15.7
% No High School Education	8.5	10.8	11.4	10.6	0.83	10.2
% Moved in past 5 years	41.2	40.9	44.6	39.7	0.44	41.4
% Low-Income	15.1	17.9	22.4	14.0	0.72	17.5
Unemployment Rate	9.6	9.3	10.7	11.0	0.38	9.6
Youth Unemployment Rate	20.3	16.8	20.2	19.9	1.66	18.4

*p<.05, **p<.01, ***p<.001

Table 4. *Unstandardized Means* for Secondary School Clusters

	Cluster 1 **Ecologically-Advantaged** N=14	Cluster 2 **Normative** N=38	Cluster 3 **Vulnerable** N=13	Cluster 4 **Remote** N=5	*F-value*	*Total Mean* (N=70)
Cluster Variables						
SOGS Score	0.78	0.60	1.09	0.57	4.72**	0.72
Casino Distance (km)	259.18	97.41	93.05	885.84	146.69***	185.27
Charity Casino Distance (km)	245.08	52.99	63.04	57.08	57.31***	93.57
Race Track/Slots Distance (km)	92.44	36.85	21.15	689.85	214.30***	91.69
Any Gambling Venue Distance (km)	92.33	20.63	18.45	57.08	10.72***	37.17
Money Gambled	1.27	1.13	1.37	1.24	8.16***	1.21
Illicit Drugs Used (of 12)	0.75	0.51	1.13	0.74	7.90***	0.69
Frequency of Binge Drinking	1.26	0.78	1.02	0.89	3.92*	0.93
Violent Acts (of 3)	0.15	0.14	0.31	0.15	15.01***	0.17
Nonviolent Delinquent Acts (of 9)	0.44	0.37	0.71	0.54	11.19***	0.46
School Variables						
Age	16.6	16.1	16.0	16.5	1.37	16.2
% Male	45.8	49.6	64.6	53.7	6.00**	52.0
School Safety Score	6.86	6.62	6.65	6.69	2.02	6.68
School Attachment Score	6.30	6.25	6.23	6.04	0.95	6.24
Truancy	1.54	1.53	2.18	2.64	4.92**	1.73
School Size	897	1210	1265	899	2.39	1135
Community Variables						
% Population Aged <25 years	34.0	34.0	34.2	34.0	0.01	34.0
% Single-Parent Families	13.3	14.6	15.8	16.6	1.02	14.7
% Immigrants	9.9	27.9	37.9	10.8	12.27***	24.9
% Aboriginal	2.2	0.9	0.5	9.6	23.44***	1.7
% Visible Minority	5.2	16.3	27.1	2.0	4.71**	15.0
% No High School Education	9.8	8.9	9.8	10.1	0.22	9.3
% Moved in past 5 years	41.6	42.8	49.0	42.1	2.94*	43.6
% Low-Income	15.0	17.3	20.8	13.4	1.68	17.2
Unemployment Rate	10.4	9.2	9.3	9.7	0.56	9.5
Youth Unemployment Rate	21.5	18.1	16.9	17.7	2.84*	18.5

*p<.05, **p<.01, ***p<.001

Study 2: A Typological Study of Gambling and Other Behaviours among Adolescent Students

Background & Literature Review

Since the 1970s, there has been an exponential expansion of gambling opportunities for adults across Canada and around the world (Ladouceur, 1996; Shaffer et al., 1999). There is little doubt that the recent expansion of legalized gambling has the potential to increase the prevalence of gambling disorders (Korn, 2000; Ladouceur, Jacques, Ferland, & Giroux, 1999; Room et al., 1999). One population that has received some attention in regards to gambling and gambling disorders has been adolescents. Today youths are bombarded with messages encouraging people to dream about big wins or achieve wealth by one form of gambling or another. In addition, gambling advertisements are common on Internet web sites and junk email. Gambling can be a fun or relaxing way of spending time and money but youths, lured by the promise of instant wealth, might be particularly vulnerable to these messages.

Given the ubiquity of gambling messages it is important to examine gambling problems among adolescents. The basis for this concern is three-fold. First, research on problem gambling among youth suggests that a substantial number endorse a wide variety of gambling problem symptoms (Adlaf & Ialomiteanu, 2000). In fact, the prevalence of problem gambling amongst youth has been found to be 2 to 3 times higher than that of adults (Shaffer & Hall, 2001). Second, it has been argued that gambling disorders tend to originate in adolescence (Griffiths, 1995; Gupta & Derevensky, 1998a; Kaminer & Petry, 1999; Shaffer & Hall, 1996). And third, many speculate that because the current cohort of adolescents are the first to become acculturated to legalized gambling, this cohort will experiences higher rates of future gambling disorders (Shaffer & Hall, 2001).

In order to develop effective prevention and treatment strategies, we first need to understand the nature of problem gambling amongst youth. In particular we need to know if youth gamblers form a single group or if they are made up of a number of different types. A second question that needs to be addressed is the relationship between problem gambling, drug use, alcohol abuse and psychological stress. Derevensky and his colleagues have found that, in general, problem gambling is correlated with other addictive behaviours (smoking, drinking, drug use/abuse), and with emotional problems such as depression, low self-esteem, and suicide ideation(Derevensky & Gupta, 2000; Gupta & Derevensky, 1998a; Hardoon & Derevensky, 2002). Gupta (Gupta & Derevensky, 1998b) and Jacobs (Jacobs, 1986) have argued that problem gambling is just another instance of a general addiction process that involves the combination of negative moods or stressful life events, use of escape coping and a physiological predisposition towards addiction.

In contrast, Blaszczynski (Blaszczynski & Nower, 2002) has argued that problem gambling is the result of a variety of different pathways that lead to three types of gamblers: (1) Normal problem gamblers who are basically normal, but have become overly involved in gambling because of positive experiences, social pressure, or erroneous beliefs. (2) Emotionally vulnerable problem gamblers are people that were depressed or overly stressed prior to their gambling. (3) Physiological vulnerable problem gamblers are people that have some kind of physiological problem with their reward system (e.g., ADHD) that makes them more vulnerable to problem gambling.

Cluster Analysis

In this paper we used cluster analytic as a method for identifying groups of individuals who are similar to each other across a variety of variables. Cluster analysis has become popular as an exploratory means of classifying individuals into relatively homogeneous groups based on their similarity across variables (Beitchman et al., 2001).

Cluster analysis is a method of identifying sub-populations or typologies and allows us to determine how disorders are patterned across individuals. The method is inherently exploratory in that it tries to discover hidden structures. Cluster-analytic typologies have several advantages over other statistical techniques such as regression and factor analysis. First, a wide variety of variables can be incorporated into a single cluster analysis. Second, contingent and non-linear relationships between variables that might be hidden in a regression analysis, become the basis for defining groups in a cluster analysis. Third, while factor analysis only estimates quantitative linear differences between people, clustering allows the researcher to find categorical distinctions between groups of individuals. Fourth, the cluster typology lends itself to the pragmatic needs of mental health service providers. Indeed, the small number of sub-populations defined by the analyses can be used as the basis for developing specific services for different clusters (Slater, Basil, & Maibach, 1999).

However, because of its exploratory nature and the possibility of finding chance results, the cluster structure must be validated (Sharma, 1996; Slater et al., 1999). In this paper we employed two methods of validating a cluster structure. The first method is replication. Does the same analysis with a different set of data produce the same sort of cluster structure? In the present study, we randomly divided the sample in half and used one half to discover the cluster structure and the other half to confirm it. This cross validation is necessary, but not sufficient to give us confidence in the reality of the cluster structure. The second method is predictive validity (Slater et al., 1999). Do the groups found through the analysis also differ on a number of other variables that were not used in the initial analysis? In the present study, we assessed group differences between clusters on a number of external variables to confirm that we had actually discovered distinct groups of people.

Research Question

High rates of comorbidity are the norm of psychiatric disorders and this is also true for problem gambling, but variable-based correlations can mask group differences (Beitchman et al., 2001). A key question in the present study is whether or not problem gamblers, problem drinkers and substance abusers are all part of the same basic deviant group or if they form a number of sub-populations.

Methods

Data Collection

Sample:

The data analysed in this paper are based on self-administered interviews with 2,243 students derived from the 2001 cycle of the *Ontario Student Drug Use Survey (OSDUS)*, a repeated cross-sectional survey of Ontario students enrolled in grades 7 to 13. The survey, conducted every two years since 1977 and funded by the Centre for Addiction and Mental Health, employed a two-stage (school, class), stratified (region and school type) cluster sample design. In elementary schools, two classes were randomly selected (one grade 7, one grade 8) and in secondary schools three classes were randomly selected regardless of grade. In total, 4,211 students from 41 school boards, 106 schools and 272 classes participated in the survey (71% of all eligible students). Reasons for non-completion included absenteeism (about 13%) and absence of parental consent (about 16%). To promote anonymity and privacy, self-administered questionnaires were administered by staff of the Institute for Social Research, York University on a classroom basis. The gambling questions were completed by a random-half sample (N= 2 243; mean age = 15 years; 51% males). More information about the survey methodology can be found in Adlaf & Paglia (2001).

Measures:

In total, our analysis employed 29 variables, 18 variables for the cluster analysis and an additional 11 external variables were used to examine the validity of the final cluster solution. For the cluster analysis we selected 18 variables based on four domains: gambling behaviour and gambling problems in the past 12 months (9 variables); substance use in the past 12 months (6 variables); psychological distress (1 variable); and substance use problems (2 variables).

The *gambling variables* included seven gambling activity frequency items, one item asking what was the largest amount of money gambled in the past 12 months and the 12-item SOGS-RA adolescent gambling screen (Winters, Stinchfield, & Fulkerson, 1993). The preface for the gambling frequency items was “How often (if ever) in the past 12 months have you done each of the following?” The seven activities included (1) played cards for money; (2) played bingo for money; (3) bet money in sports pools; (4) bought sports lottery tickets (such as Sports Select or ProLine); (5) bought any other lottery tickets, including instant lottery (such as 6-49, Scratch & Win, pull-tabs); (6) bet money on video gambling machines, slot machines, or any other gambling machines; (7) bet money at a casino in Ontario. Students were asked to indicate the number of times they engaged in the activity (range 0-99). To measure gambling problems, we used the continuous SOGS-RA score (range 0-12; mean = 0.41; sd= 1.18; a= 0.78). Scale scores were computed by summing across the 12 binary items (1=yes/ 0= no).

The *substance use measures* included six variables: use of alcohol, tobacco, cannabis, depressants, stimulants and hallucinogens in the past 12 months. Alcohol use was measured by the frequency of use (9 categories, from never to drinking almost everyday, coded 0-8); tobacco consumption was measured by the number of cigarettes smoked daily (9 categories, from 0 to more than 20 per day, coded 0-8); and cannabis use was measured by the number of times cannabis was consumed in the past 12 months (7 categories, from never to 40 or more times, coded 0-6).

Use of depressants was defined by counting the three non-medical depressants used in the past 12 months: barbiturates, heroin, and tranquillizers (from 0 to 3); use of stimulants was measured by counting the five non-medical stimulants used: methamphetamine, cocaine, crack, ice and other stimulants (from 0 to 5) and use of hallucinogens was defined by counting the 4 hallucinogens used in the past 12 months: LSD, PCP, ecstasy, and other hallucinogens (from 0-4).

Our measure of *psychological distress* was based on the General Health Questionnaire (GHQ-12) (Goldberg & Hillier, 1979), a 12-item screening instrument used to detect current psychological distress. Each item started with “Over the last few weeks” and then ended with statements such as “have you been able to concentrate on whatever you’re doing”; “felt constantly under stress” or “felt you couldn’t overcome difficulties.” Response categories were based on a 4-point scale ranging from “better (more so) than usual” to “much less than usual” (coded 0-3). Responses were scaled and summed (range 0-36) such that a higher score indicates elevated psychological distress. In our analysis the continuous overall GHQ-12 score was used (mean= 10.5; sd=5.8; a=0.88).

Substance use problems included alcohol-related problems and drug use problems. To measure alcohol-related problems we used the AUDIT (Alcohol Use Disorders Identification Test), a 10-item screening instrument developed by the WHO (World Health Organization, 1992). The AUDIT assesses hazardous drinking – an established pattern of drinking that increases the likelihood of future physical and mental health problems (e.g., liver disease), and harmful drinking – a pattern of drinking that is already causing damage to health (e.g., alcohol-related injuries; depression). Responses were scaled and summed (range 0-40) such that a higher score indicates greater likelihood of alcohol-related problems. In our analysis we used the continuous AUDIT score (mean= 3.5; sd= 4.8; a= 0.83).

Drug use problems were measured using a shortened version of the Drug Abuse Screening Test (DAST) (Skinner, 1982). The DAST yields a quantitative index of drug problems, including dependence items and other consequences resulting from the abuse of psychoactive drugs (not including alcohol). We used four binary DAST items, with the response options yes (coded 1) or no (coded 0). The wording of the 4 items was the following: (1) Are you always able to stop using drugs when you want to? (item was reverse coded); (2) Have you gone to anyone for help for a drug problem?; (3) Have you had “blackouts” or “flashbacks” due to your drug use?; (4) Have you had any medical problems as a result of your drug use? Responses were summed (range 0-4) such that a higher score indicates a greater likelihood of drug-related problems. As with the other measures, we used the continuous score for our analysis (mean= 0.15; sd=0.46; a= 0.45).

Items used as External Variables: Eleven additional external variables were included in the study to examine variation among clusters. The purpose of including these variables is to confirm if the cluster solution actually captures distinct groups above and beyond the main variables included in the clustering. The basis for selection of external variables was previous research evidence of association with problem gambling or with problem behaviours among adolescents or variables hypothesized to be related. In order to effectively display cluster differences among external variables, all items were z-standardized for plotting.

These external variables included demographic, scholastic achievement, delinquent activity, and mental health measures (self-esteem and depressive symptoms). *Demographic measures* included: age (range 12-19), gender (males=1, females=0), non-intact family (living with a single parent or neither natural parent=1, else=0), amount of money free to spend each week (more than $50=1, less than $50=0), and family's socio-economic status (a composite index, incorporating self-reported family situation, the number of automobiles and personal computers owned by the family, and level of parental education, range 1-10). *Scholastic achievement measures* included marks usually obtained at school (lower than C=1, C and higher=0), and level of school attachment. Level of school attachment was based on a summation score (range 0-8) using the level of agreement to two statements "I feel close to people at this school" and "I feel like I am a part of this school". Responses were summed such that a higher score indicates lower school attachment.

Self-esteem was measured with six items derived from Rosenberg's Self-Esteem Scale (Rosenberg, Schooler, & Schoenbach, 1989). The items were based on the following statements: (1) I feel good about myself; (2) I feel that I'm a person of worth; (3) I am able to do most things as well as other people can; (4) sometimes I feel that I can't do anything right; (5) I feel I do not have much to be proud of; (6) sometimes I think I am not good at all. The response options were based on a 5-point scale, ranging from "never true" to "almost always true." The summated 6-item scale resulted in values from 1-30 (mean=23.9; sd=4.7; a= 0.83). A higher score indicates higher self-esteem.

Depression was measured using a shortened 4-item version of the CES-D (Center for Epidemiological Studies Depression Scale) (Radloff, 1977). The following four CES-D items were asked: (1) how often have you felt sad? (2) How often have you felt lonely? (3) How often have you felt depressed? (4) How often have you felt like crying? The time referent was the "past 7 days". The response options were based on a 4-point scale, ranging from "never or rarely" (scored as 0) to "always" (scored as 3). The summated score resulted in values from 0-12 (mean= 2.4; sd= 2.7; a= 0.88). A higher score indicates greater likelihood of being depressed.

Delinquent activity included violent delinquency and non-violent (property-related) delinquency. Violent delinquency included three items measuring (1) the number of times the students engaged in gang fights, (2) the number of times they carried a weapon (e.g. gun or knife), and (3) the number of times they assaulted anyone (beat up or hurt). Non-violent delinquency included two items measuring the (1) number of times the student took things worth $50 or less, or (2) worth more than $50.

Data Analysis

We used a two-stage procedure to determine the number of clusters. First, prior to the data analysis, the sample was randomly divided into an exploration sample and a cross-validation sample.

Findings and Interpretations

Initial Clustering with Exploration Sample.

In the first stage, the exploration sample (n=1004) was used to explore clusters. We implemented SPSS's version of hierarchical cluster analysis, using Ward's method between groups as the merging criterion and squared Euclidian distance as the similarity measure to form the initial cluster solution. In hierarchical clustering, clusters are formed by grouping cases into larger and larger clusters until all cases are members of a single cluster. Ward's method, which constructs clusters by minimizing within-cluster sums of squares, has been found to provide reasonable cluster solutions in empirical studies (Sharma, 1996). All 18 variables employed in the cluster analysis were first z standardized to ensure equal weighting. We used two strategies to determine the number of clusters: first, we examined the Euclidian distance schedule for large increases in coefficients between agglomeration steps; second, we examined cluster profiles for meaningful cluster differences. We evaluated 3, 4 and 5-cluster solutions. The three-cluster solution did not separate heavy gamblers from moderate gamblers. As well, the 5^{th} cluster produced by the five-cluster solution only included 4 people and the cluster did not replicate across samples. In sum, the four-cluster solution provided the best conceptual clarity of the clusters.

Cross-Validation Clustering

In the second stage, we used the cross validation sample (N=1028) to confirm the cluster structure. We conducted the same analysis of 3-, 4- and 5- cluster solutions on the cross validation sample. The goal was to select the largest number of distinct clusters that could be replicated across samples. The 3 and 4 cluster solutions were replicated across the samples, but the fifth solution did not (details available from authors). Thus, we chose the 4-cluster solution as the best fit to the data.

Final Cluster Derivation

Because the cluster solution appeared to be robust producing very similar results on the validation sample, we decided to re-merge the two half samples and re-estimate the clustering process again on the total sample as a double check on the validity of the 4-cluster solution. Again, the 4-cluster solution was the best fit to the data.

The analytical sample size was reduced to 2032 due to listwise deletion. In the second phase of the analysis, the 4-cluster solution derived from the total sample was further refined using non-hierarchical methods (K-means) as suggested by current practice (Sharma, 1996). An advantage of the K-means method is its capability to analyze group membership iteratively and reallocate any cases mis-assigned by the hierarchical methods to the more appropriate cluster. Thus, we used the cluster centroids derived from our hierarchical solution to perform a non-hierarchical iterative clustering. The outcome of this analysis is our final 4-cluster solution. We then used analyses of variance (ANOVA) to compare the clusters on the variables used in the cluster solution as well as the validation variables not employed in the cluster analysis.

Description of Clusters

The profiles of the four clusters are displayed in Figure 1. These groups were assigned names based on their modal behaviour. These names are mainly a mnemonic device and not intended to over simply the differences or similarities between the groups or within groups (Slater et al., 1999). The solution revealed four clusters of differing size and behavioural configurations: (1) "Mainstreamers" (N=1331, 65.5%); (2) "Rule-Breakers" (N=539; 26.5%) (3) "Dominant Drug-Takers" (N=124, 6.1%); and (4) "Dominant Heavy Gamblers" (N=38; 1.9%). In Table 1 we present data on the 18 variables employed in the cluster analysis. To understand better the character of the four clusters and to provide further evidence of meaningful cluster differences, we also present data for the 11 variables not employed in the selection of the cluster solution (Table 2). The rest of the results section will illustrate the profiles of the clusters across both cluster and external variables. Although one of the groups was defined as Dominant Heavy-Gamblers, and another group was defined as Dominant Drug-Takers, it should be pointed out that alcohol and drug use and gambling problem occurred in all four groups. As such we will examine the drug, alcohol and gambling in each of the four groups.

Mainstreamers

Mainstreamers account for about 66% of the sample. They are more likely to be female (56%), and are the youngest group with an average age of 14.4 years. They have the lowest rate of alcohol, cigarettes and drug use, lowest gambling frequency and lowest SOGS-RA score, and the highest self-esteem. They are less likely to have poor marks and low school attachment. They have the lowest delinquency and are the least depressed. None of the mainstreamers had a drinking problem and only two scored 2 or more on the DAST indicating a drug problem. Nearly a quarter (22.6%) of the mainstreamers reported some psychological distress.

Rule-Breakers

Rule-Breakers account for about 27% of the sample. They consist of about 53% males, and are more likely to be older compared to Mainstreamers but not significantly older from the other two groups. Compared to Mainstreamers, they have higher rates of alcohol, cigarettes and cannabis use, and higher AUDIT scores. In addition they gamble more frequently (mostly cards and lotteries), spend more money on gambling, have a higher SOGS-RA score, have poorer marks, lower self-esteem, higher psychological distress, and higher delinquency. However compared to Dominant Drug-Takers, they report lower rates of substance use, lower AUDIT, lower DAST scores, are less likely to come from a non-intact family, less likely to have poor marks, and are less likely to be involved in delinquent activities. Compared to Heavy Gamblers, Rule-Breakers gamble significantly less. Twenty-one percent of the Rule-Breakers scored 11 or more on the audit indicating a drinking problem, however, only 1.5% of the Rule-Breakers reported a drug problem as measured by a score of 2 or more on the DAST.

Dominant Drug-Takers

Dominant Drug-Takers account for about 6% of the sample. They consist of about 60% male; have the highest rates of alcohol, cigarettes, cannabis and other drug use, and the highest AUDIT and DAST scores. Compared to Rule-Breakers, they gamble more frequently (but this reaches significance only for lotteries and money spent), and have a higher SOGS-RA score. However, compared to Dominant Heavy Gamblers (see below) they gamble less frequently, spend less money on gambling, and score lower on the SOGS-RA. They have the highest delinquency, and compared to Rule-Breakers and Mainstreamers they are more likely to be from a non-intact home, and more likely to report lower marks. Most of the Drug-Takers group reported some alcohol related problems and 52.4% scored above 11 on the Audit. The majority of people in this group (73.4%) endorsed at least one drug related problem on the DAST, and 36.1% endorsed 2 or more of the DAST items. In contrast the majority of the people in the Mainstream (97.1%), Rule Breaker, (87.3%) and Heavy Gambler (73.3%) groups endorsed none of the DAST items. Almost half (49.2%) of the Drug-Takers group reported psychological distress. as measured by a GHQ-12 score of 3 or more.

Dominant Heavy Gamblers

Dominant Heavy Gamblers account for about 2% of the sample. They have the highest proportion of males (92%), highest gambling frequency (mostly on sports and lotteries), highest SOGS-RA score, and the most money to spend freely. In terms of substance use, they have lower cigarettes and cannabis use than Rule-Breakers, and lower substance use and lower non-violent delinquency than Dominant Drug-Takers. However compared to Rule-breakers no difference was found in alcohol consumption and abuse. They have the lowest self-esteem, and report the highest psychological distress compared to other groups. However according to a post hoc analysis their self-esteem and distress only differed significantly from Mainstreamers. This cluster is defined mainly in terms of frequency of gambling, but this group also includes a substantial number of people that score above the criterion on the SOGS-RA for problem gambling (34.2%). Nearly a third (31.6%) of the Heavy Gamblers scored above 11 on the Audit indicating a drinking problem. Thirteen percent (13.2%) of the heavy gamblers reported drug problems, but interestingly all of the drug-using heavy gamblers also scored in the problem gambling range on the SOGS. Within this sample of frequent gamblers, those that have a problem (+4 on the SOGS) are more likely to have a drug, alcohol or mental health problem compared to those that do not meet the criterion for gambling problems.

Breakdown of Problem Gambling across the Four Groups

Figure 2 shows a breakdown of the groups in terms of problem gamblers. Although we have labelled cluster 4 “heavy gamblers” based on their gambling behaviour, it is important to emphasize that problem gamblers appear in all 4 of the clusters – they do not form a distinct or unified group. A number are found in the heavy gamblers group, but some problem gamblers are found in the Drug-Takers group, some in the Rule-Breakers, and even small number are found in the mainstream group. This suggests that problem gamblers are not a homogeneous group, but can span various behavioural configurations.

Conclusions and Implications of Study 2

These results revealed several interesting facts about the nature and distribution of problem gambling among a non-clinical community-derived sample of youths. First, we found and replicated a cluster solution that found 4 distinct clusters. Second these clusters were different on a number of other validation variables in addition to their differences on the cluster variables. Heavy Drug-Takers and heavy gamblers formed two separate clusters. Problem gamblers were found in all four clusters, but they were mostly concentrated in the heavy gambling cluster. Some also have drug problems; some just break rules and a small number are otherwise mainstreamers. Youth with co-morbid gambling, drug and alcohol abusers are only one segment of the overall gambling population. While a large number of problem gamblers also have a drinking or drug use problem, the majority do not.

The *OSDUS* has provided us with a unique opportunity to examine the interrelationship of problem gambling, drug use, alcohol abuse and psychological distress. The results of this analysis suggest that problem gamblers are not a single unified group, nor do they all simply fall into a single deviate subgroup with the Drug-Takers. Instead problem gamblers were found to fall into a variety of different groups. Some seem to be set apart from other groups and defined in and of themselves as heavy gamblers. This group actually makes up a minority of the people that are problem gamblers, and is primarily made up of males who bet on sports. Some appear to be primarily Drug-Takers for whom a gambling problem might be a secondary issue. Others seem to be more part of a general group of Rule-Breakers, but are not particularly delinquent. Finally, a small number appear to have no other problem at all. The upshot of these findings is that no single universal statement about adolescent problem gamblers is likely to be true of all. Rather we need to examine the individual and try to understand what broad group he or she might fall into.

Turning now to the broader context, today's youth are amongst the first to ever to be exposed to ready access to gambling opportunities (Gupta & Derevensky, 1998a; Hardoon & Derevensky, 2002; Jacques et al., 2000). As stated earlier, the results of this study suggest that youth who gamble are not a single unitary group, but are made up of different sub-groups. Some problem gamblers appear to also be involved in other problem behaviours, but other problem gamblers (e.g., those in the Heavy Gamblers group) are defined primarily in terms of their gambling and some do not appear to be involved in any other problematic behaviour.

In order to develop effective prevention and treatment strategies we first need to understand the nature of problem gambling amongst these youths. The findings of the current study suggest that messages targeted at identified high-risk groups (e.g., dominant Drug-Takers), would in fact miss a large percentage of problem gamblers. Co-morbidity of drug and alcohol use is high among problem gamblers, but still accounts for less than half of the problem gamblers.

The data found that problem gamblers occurred in all four clusters. The data are consistent with the general addiction model (Gupta & Derevensky, 1998b; Jacobs, 1986) in that we found evidence in support of a fairly high co-morbidity between problem gambling, and drug and alcohol use. Furthermore, problem gambling was related to psychological distress.

However, the advantage of cluster analysis over correlational analyses is that we can find different subpopulations and the data suggest strongly that problem gamblers are not a single group, but are manifest in a variety of groups. The data are also consistent with the pathways model (Blaszczynski & Nower, 2002) since the results suggest that not all problem gamblers are also involved in drugs or are under psychological distress. In fact, as predicted by Blaszczynski, some problem gamblers do not appear to have any problem other than their gambling problem.

Appendix 2: Tables & Figures

Table 1. Profile of Variables Employed in the Cluster Solution (raw score means and 95% CI)

			Clusters								
Variables	Total Sample		**Mainstreamers**		**Rule Breakers**		**Dominant Drug-Takers**		**Dominant Heavy-gamblers**		Overall group significance
(N=)	(2032)		(1331)		(539)		(124)		(38)		
	M	95% CI	M	95% CI	M	95% CI	M	95% CI	M	95% CI	
SOGS-RA (range 0-12)	0.39	(±0.05)	0.19	(±0.03)	0.59	(±0.11)	0.95	(±0.34)	2.97	(±1.05)	***
Cards	1.61	(±0.30)	0.60	(±0.02)	2.74	(±0.83)	3.45	(±1.76)	15.1	(±6.62)	***
Bingo	0.63	(±0.17)	0.29	(±0.01)	0.63	(±0.17)	1.17	(±0.67)	11.1	(±7.17)	***
Sports Pools	1.13	(±0.22)	0.31	(±0.01)	1.27	(±0.25)	1.95	(±0.69)	25.2	(±7.86)	***
Sport Lottery	1.08	(±0.25)	0.19	(±0.01)	1.06	(±0.33)	1.86	(±0.78)	30.0	(±7.57)	***
Any lottery	2.00	(±0.31)	0.75	(±0.29)	2.93	(±0.60)	4.57	(±1.79)	24.5	(±9.22)	***
Video/Slots	0.63	(±0.23)	0.13	(±0.07)	0.76	(±0.29)	0.90	(±0.44)	15.5	(±10.34)	***
Casino (in Ontario)	0.12	(±0.07)	0.01	(±0.01)	0.21	(±0.16)	0.20	(±0.20)	2.61	(±2.52)	***
Money spent gambling	1.20	(±0.07)	0.73	(±0.06)	1.90	(±0.14)	2.30	(±0.32)	4.01	(±0.58)	***
Alcohol	1.86	(±0.09)	0.82	(±0.06)	3.71	(±0.12)	4.57	(±0.28)	3.26	(±0.71)	***
Cigarettes/day	0.99	(±0.08)	0.24	(±0.03)	2.15	(±0.18)	4.01	(±0.42)	1.21	(±0.6)	***
Cannabis	0.89	(±0.08)	0.09	(±0.02)	1.92	(±0.17)	4.93	(±0.29)	1.26	(±0.66)	***
Depressants	0.07	(±0.01)	0.01	(±0.01)	0.07	(±0.02)	0.63	(±0.14)	0.24	(±0.19)	***
Stimulants	0.16	(±0.02)	0.03	(±0.01)	0.12	(±0.03)	1.61	(±0.02)	0.37	(±0.22)	***
Hallucinogens	0.22	(±0.03)	0.02	(±0.01)	0.26	(±0.05)	2.19	(±0.20)	0.42	(±0.35)	***
GHQ_12 (range 0-36)	10.51	(±0.26)	9.59	(±0.29)	12.14	(±0.54)	12.56	(±1.09)	12.95	(±2.71)	***
AUDIT (range 0-40)	3.48	(±0.21)	0.99	(±0.07)	7.48	(±0.40)	11.49	(±0.96)	7.89	(±2.63)	***
DAST (range 0-4)	0.15	(±0.02)	0.03	(±0.01)	0.18	(±0.03)	1.19	(±0.16)	0.47	(±0.32)	***

Note: M=mean; CI = confidence interval; significance (F-test): *** p<.001
Legend: Cards, Bingo (average number of times played); Sport Lottery, Any Lottery (avg. no. of times bought); Sports Pools, Video/Slots, Casino (avg. no. of times bet); Alcohol, Cannabis (avg. frequency of use); Cigarettes (avg. no. of cigarettes smoked daily); Depressants (count of all depressants used), Stimulants (count of all stimulants used), Hallucinogens (count of all hallucinogens used).

Table 2. Profile of External Variables (raw score means or percentages, and 95% CI)

Variables	Total sample		Clusters: Mainstreamers		Clusters: Rule-Breakers		Clusters: Dominant Drug-Takers		Clusters: Dominant Heavy-Gamblers		Overall group significance
(N=)	(2032)		(1331)		(539)		(124)		(38)		
	M or %	95% CI	M or %	95% CI	M or %	95% CI	M or %	95% CI	M or %	95% CI	
Age (range 12-19)	14.93	(±0.09)	14.36	(±0.10)	16.07	(±0.14)	15.91	(±0.26)	15.78	(±0.65)	***
% Male	48%	(±2%)	44%	(±3%)	53%	(±4%)	60%	(±8%)	92%	(±9%)	***
CES-D (range 0-4)	2.40	(±0.12)	2.16	(±0.14)	2.78	(±0.25)	3.12	(±0.50)	2.92	(±1.12)	***
Self-esteem	23.77	(±0.21)	24.17	(±0.25)	23.26	(±0.41)	22.19	(±0.82)	21.97	(±2.12)	***
SES	6.75	(±0.07)	6.74	(±0.09)	6.80	(±0.13)	6.55	(±0.29)	7.13	(±0.48)	NS
Money free to spend (% >50$)	22%	(±2%)	15%	(±2%)	33%	(±4%)	36%	(±9%)	47%	(±15%)	***
% Non-intact family	24%	(±2%)	22%	(±2%)	25%	(±4%)	40%	(±9%)	34%	(±15%)	***
% Poor marks (<C)	16%	(±2%)	11%	(±2%)	21%	(±3%)	38%	(±8%)	37%	(±14%)	***
Low school attachment	3.43	(±0.05)	3.35	(±0.07)	3.53	(±0.12)	3.83	(±(0.24)	3.72	(±0.62)	***
% Theft	14%	(±2%)	7%	(±2%)	22%	(±4%)	45%	(±9%)	29%	(±14%)	***
Violence (range 0-4)	0.42	(±0.04)	0.24	(±0.03)	0.59	(±0.09)	1.41	(±0.24)	1.03	(±0.41)	***

Note: M=mean; % =percentage; CI = confidence interval; significance (F-test): *** p<.001; NS = not significant.

Figure 1. **Final "4 Cluster Typology" based on the Total Sample (N=2032) (cluster variables and external variables included)**

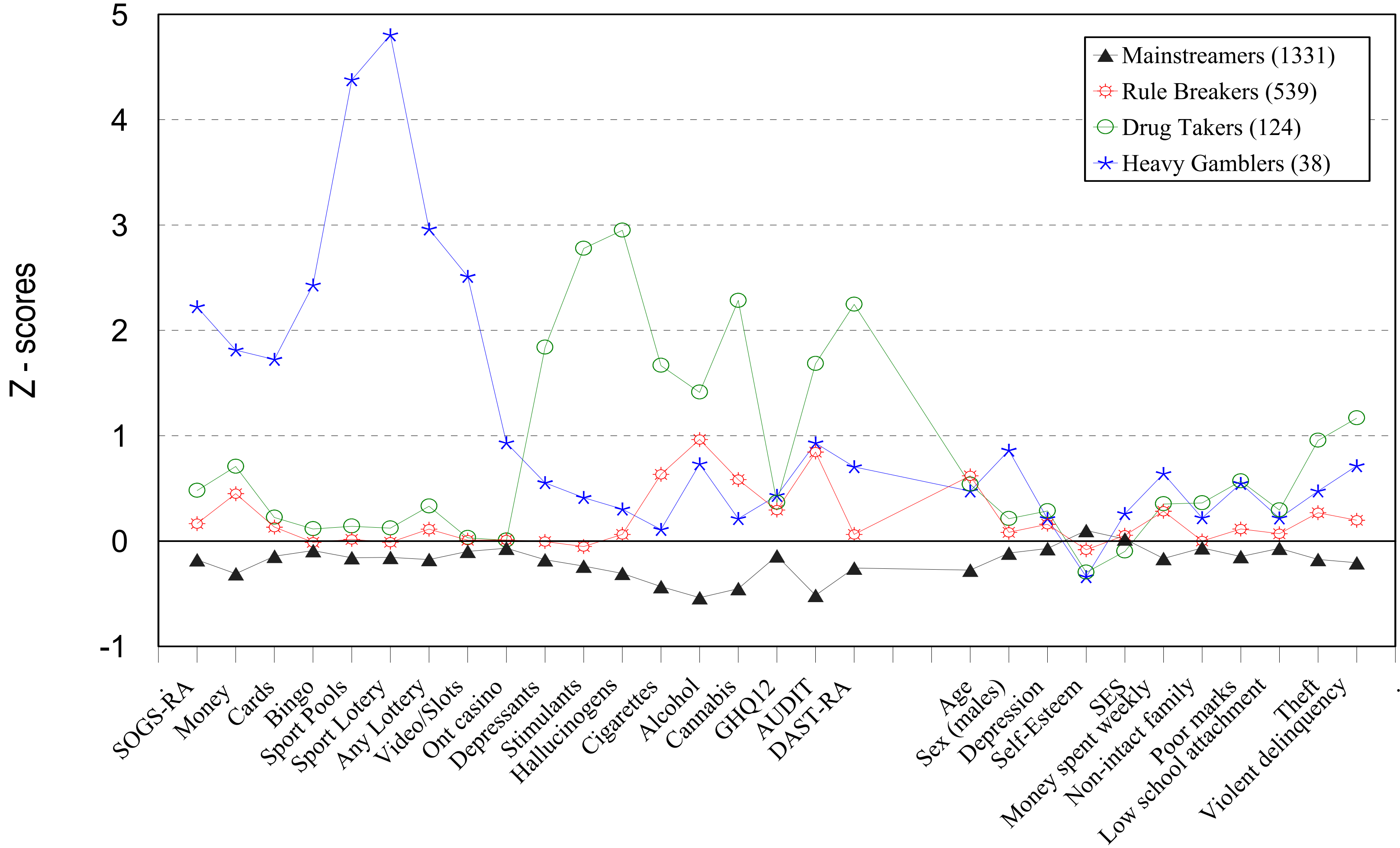
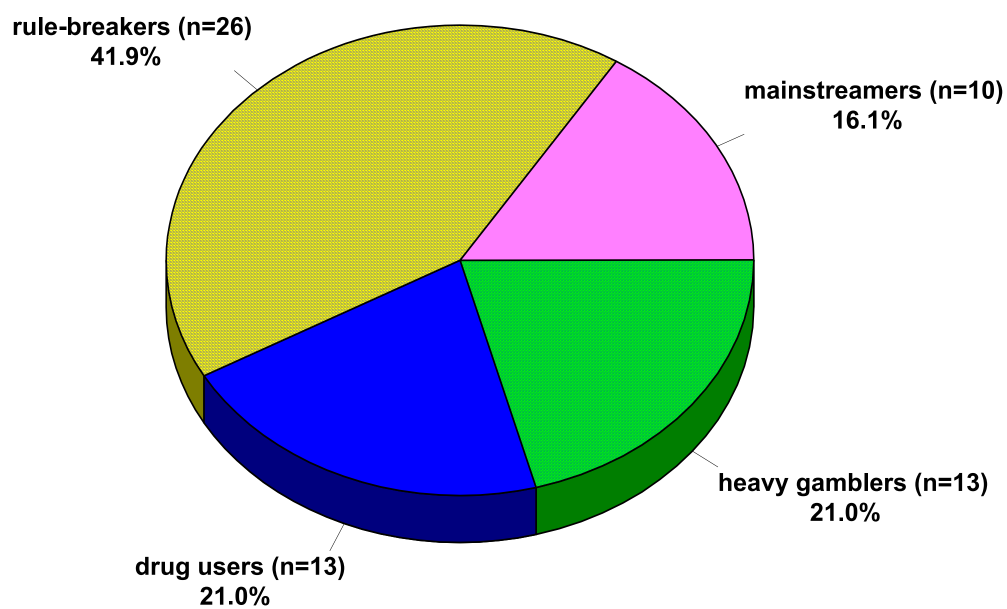


Figure 2. Problem Gamblers (SOGS-RA 4+) by Cluster Typology



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