A Multivariate Regression Analysis of Adolescent Multiple Drug Use in Two Western Canadian Provinces

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ABSTRACT

This article reports on the results of a multiple regression analysis of an adolescent multiple drug use index on 17 predictor variables from the PRIDE CANADA Drug survey with 18,685 Grades 9 through 12 students in two Western Canadian provinces in 1995-96. The predictor variables represent eight familial, five school and peer, and four individual level attributes and behaviours.

The regression analysis is used to estimate the combined effects along with the relative importance of the predictor variables on the students’ self-reported use of 11 drugs in a multiple drug use index. Separate analyses are conducted for the male and female students.

The results indicate that two of the most important predictor variables are the frequency with which both the female and male students report getting into trouble at school and the frequency of the students’ participation in worship. The relative importance of these two variables and other variables in relation to the students’ multiple use of drugs differ to some extent for the two genders.

A B R É G É

L’objectif de cet article est de rendre compte des résultats obtenus à l’aide d’une équation de régression multiple d’un index d’utilisation de plusieurs drogues par un adolescent sur 17 variables explicatives provenant du sondage sur la drogue “PRIDE CANADA”. Ce sondage a été mené auprès de 18 685 élèves de la neuvième à la douzième année dans deux provinces de l’ouest canadien en 1995-96. Les variables explicatives sont : la famille (8), l’école et les pairs (5) ainsi que les qualités personnelles et les comportements de l’individu (4).

Cette analyse a pour but d’étudier les effets combinés et l’importance relative des variables explicatives en relation avec l’auto-déclaration des étudiants de l’utilisation de 11 drogues combinées dans un index multiple. Des analyses séparées ont été faites tant pour les étudiants que pour les étudiantes.

Les résultats indiquent que les deux plus importantes variables explicatives sont la fréquence à laquelle les étudiants et les étudiantes rapportent avoir de la difficulté à l’école et la fréquence à laquelle les deux genres participent dans une religion. L’importance relative de ces deux variables ainsi que des autres variables en relation avec l’utilisation multiple de drogues diffère, jusqu’à un certain degré, pour les deux genres.

Adolescent drug use is a complex phenomenon affected by multiple variables representing familial, peer, school and other interpersonal relationships and individual attributes. The present study examines the multivariate relationships between 17 predictor variables and a multiple drug use index.

The study extends previous studies, which have examined the effects of a more limited number of independent variables to the simultaneous consideration of the 17 predictor variables. It will thus be possible to estimate the relative contribution or importance of the independent variables on adolescent drug use.

The article also examines further the results of previous studies1-18 which indicated that the use of any particular drug correlates with the concurrent or subsequent use of other drugs as part of the adolescent drug progression7,14-16 or propensity to use drugs.10

This study is based on the results from the PRIDE (Parent Resources Institute for Drug Education) CANADA Drug Prevalence Questionnaire completed by 18,685 Grades 9 through 12 students in two Western Canadian provinces in the fall of 1995-96.

PRIDE CANADA DRUG PREVALENCE SURVEY AND RELATED METHODOLOGY

PRIDE CANADA Inc. was formed in 1983 and is part of the PRIDE International network. PRIDE’s objective is to provide young people, parents, educational, and community organizations with current information on adolescent drug utilization. PRIDE also works closely with schools, communities, and interested organizations to develop groups and activities working toward reducing drug use by young people.

Questionnaire design and administration

One of PRIDE CANADA’s major roles in this process has been developing and coordinating the administration of a Drug Prevalence Questionnaire for Grades 6 to 12. The survey instrument utilized in this study was specifically designed for Canadian students in conjunction with PRIDE International, which was responsible for field testing, internal consistency and test-retest reliability and concurrent validity evaluation of the questionnaire. These assessment procedures indicated that the PRIDE Drug Usage Prevalence Questionnaire is a stable and reliable instrument.19,20

The questionnaire consisted of 11 parts and 105 questions. The 11 parts included questions on personal and family characteristics; student characteristics and activities; 6 parts on 11 different drugs in relation to the frequency of use, age of first use, effects experienced, where and when they are used, and how easy it is to obtain the drugs; 3 parts of the questionnaire concerned weapon use (guns, knives, etc.) as to the frequency of carrying and where the weapons are carried.

The 11 drugs included in the survey were: cigarettes, beer, wine, liquor, marijuana, cocaine (crack), uppers, downers, inhalants (glue, etc.), hallucinogens (PCP, LSD, etc.), and other drugs.

PRIDE CANADA provides questionnaires to schools and community organiza-
Information on the prevalence (percent using the drug at least once in last year) rates is also reported to supplement the results from the multiple drug use index. The operational definitions, coding schema and related information for the 17 predictor variables appear in Table I.

**Analytical procedures**

The combined and net effects of each of the 17 predictor variables on the adolescents’ multiple drug use was estimated by a multiple regression equation. The relative importance or contribution of the independent variables on the dependent variable was determined from the standardized (beta) regression coefficients.

An important consideration in multiple regression analyses is the order of entry for the independent variables into the equation. The 8 family-related variables were entered into the multiple regression equation first, followed by the 5 school-related variables. The remaining 4 variables representing community and religious activities, the students’ employment status and metropolitan/non-metropolitan place of residence were then entered.

Two criteria are used to determine the retention of variables for inclusion in the final equation. First, variables for which the regression coefficients were not statistically significant (\( \alpha = 0.05 \)) were excluded. Due to the
large sample size a number of these coefficients were statistically significant, but were relatively small from a substantive or predictive perspective. A second criterion was, therefore, introduced for the retention of predictor variables in the final equation. Independent variables that did not account for a minimum of 1% of the variance on the multiple index were also excluded from the final equation. The regression equations were estimated separately for the female and male students.

The size of the zero-order correlation matrix for the 1 dependent variable and the 17 independent variables did not permit its inclusion here. (It is available upon request). Where relevant, correlations for the relationships between the independent variables are included in the discussion of the results.

RESULTS

Participation rates

The average participation rates of eligible students were 67.3%. The participation rate for Grade 9 students was 79.0%; for Grade 10 students, it was 70.6%; for Grade 11 students, 66.7%; and for Grade 12 students, 56.0%. The participation rates for metropolitan and non-metropolitan students varied by plus or minus 2 to 3% for each of the grades.

Non-participation resulted from student absences or non-consent by the student or the student’s parents or guardians. No reliable information was available to determine the distribution of non-participants.

Obviously missing from the results and analysis are the high school dropouts who may be at the greatest risk for drug use.

Student response characteristics

Respondents were almost equally divided between female (49.6%) and male (50.4%). Similar gender distributions were evident for each of the grades and for metropolitan and non-metropolitan residents.

Of the respondents, 43.9% resided in metropolitan centres; 56.1% resided in centres of fewer than 100,000 population. The participants were approximately equally distributed across the grades: Grade 9 (23.5%), Grade 10 (24.5%), Grade 11 (23.5%), and Grade 12 (28.5%).

Multiple drug use index

In the previous 12 months, approximately one out of six students (16.6%) reported they had not used any of the drugs (Figure 1), while 0.9% reported using all 11 drugs at least once.

The overall mean and standard deviation for the multi-drug index were 3.28 and 2.45 respectively. The respective means and 95% confidence intervals (in brackets) for the female and male students were 3.17 (3.12 to 3.21) and 3.39 (3.34 to 3.44).

Prevalence rates

Alcohol-related substances were undeniably the drugs of choice for students (Figure 2). Over 60% reported using wine
(64.4%), hard liquor (66.4%) and beer (69.8%) at least once during the previous year. 52.7% of the students reported smoking cigarettes with less than one out of three (30.8%) reporting marijuana use.

These five drugs constituted the majority of the multiple drugs students used, especially for the first five levels of the multiple drug scores. Coincident with using more drugs as reflected in the multi-drug scores, the results (not shown) also indicated that the students used the five most prevalent drugs more frequently – weekly to daily – in comparison to more casual (once to six times per year) usage.

The prevalence and frequency of usage rates for cigarettes and wine were roughly the same (± 2-3%) for male and female students. Male students reported greater usage of beer and marijuana, and reported using beer, liquor, and marijuana more frequently than did females.

### Multiple regression results

The standardized regression (beta) coefficients and the R² values reported in Table II include 10 variables, which met the 2 inclusion criteria out of the initial 17 predictor variables. The most important predictor variables for both female (beta=0.38) and male (beta=0.32) students was their reported frequency of getting into trouble at school.

Frequency of participating in worship was the second most important predictor for the female students and the third most important determinant of the male students’ multiple drug use. Frequency of parental discipline for breaking rules was the second most important predictor for male students followed by living with both the parents and students’ grade of enrollment.

The relative ranking of these latter variables differed somewhat for females.

The frequency of receiving good grades at school was the seventh most important variable for both females and males, followed by the mother’s employment status (part, full time or none), and the frequency of participating in school activities and talking to friends about the problems of alcohol/drugs. The direction of the effects of the 10 predictor variables on the multiple drug index were consistent for both female and male students.

### DISCUSSION

The results from the multiple drug index and prevalence rates indicate that sizable percentages of Grades 9 through 12 students used alcohol-related substances, cigarettes and marijuana at least once during the previous year. The results (not included here) also indicated that students used some or all of these drugs at frequent (weekly to daily) intervals.

The multiple regression results indicated that the frequency of experiencing trouble at school was the most important determinant of multiple drug use. Information was not obtained as to the reasons for or causes of the students’ trouble at school: it is impossible to determine the extent to which trouble at school was due to drug usage.

The uni-directional nature of the ordinary least squares regression analysis, along with the cross-sectional nature of the survey, limited the ability to determine the “true” direction of the above and other relationships. For example, trouble at school resulting from drug use may result in further drug use and further trouble at school, in a cyclical or reciprocal relationship. The estimation of a two-way relationship between variables was beyond the scope of this study but will be pursued in future analyses.

The relative contribution of the three blocks of variables to the R² values for both genders differed somewhat (Table II). The 10 variables accounted for 35% of the variability in the females’ multiple drug use. The 4 family-related variables and the frequency of worship each accounted for 22.8% of the total explained variance. The 5 school-related variables contributed 54.3% of the total explained variance for the female students.

In comparison, the 10 predictors for the male students accounted for a total of 29% of the variability on the dependent variable, with 34.5%, 55.2%, and 10.3% of this total being contributed respectively by the family-related, school-related and frequency of worship variables.

### TABLE II

<table>
<thead>
<tr>
<th>Predictor Variable</th>
<th>Female (n=9258)</th>
<th>Gender†</th>
<th>Male (n=9401)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family-related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Live with</td>
<td>-0.18</td>
<td>-0.17</td>
<td></td>
</tr>
<tr>
<td>Moth job</td>
<td>0.09</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Ptds disc</td>
<td>-0.15</td>
<td>-0.21</td>
<td></td>
</tr>
<tr>
<td>Ptds rules</td>
<td>-0.17</td>
<td>-0.15</td>
<td></td>
</tr>
<tr>
<td>Family R²</td>
<td>0.08</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Frndslik</td>
<td>0.06</td>
<td>0.10</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td>0.15</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Goodgrds</td>
<td>-0.12</td>
<td>-0.13</td>
<td></td>
</tr>
<tr>
<td>Schlacts</td>
<td>-0.08</td>
<td>-0.12</td>
<td></td>
</tr>
<tr>
<td>Schltrlbl</td>
<td>0.38</td>
<td>0.32</td>
<td></td>
</tr>
<tr>
<td>School R²</td>
<td>0.19</td>
<td>0.16</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Worship</td>
<td>-0.29</td>
<td>-0.19</td>
<td></td>
</tr>
<tr>
<td>Other R²</td>
<td>0.08</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Total R²</td>
<td>0.35</td>
<td>0.29</td>
<td></td>
</tr>
</tbody>
</table>

* Listwise deletion was used for missing values.
† Gender was missing for 25 students

Note: All variables meet two (2) inclusion criteria.

The ranking and relative contribution of the three blocks of variables to the R² values for both genders differed somewhat (Table II). The 10 variables accounted for 35% of the variability in the females’ multiple drug use. The 4 family-related variables and the frequency of worship each accounted for 22.8% of the total explained variance. The 5 school-related variables contributed 54.3% of the total explained variance for the female students.

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The relative contribution of the three groups of variables to the total explained variance (R²) indicated that school-related variables were approximately equal for male and female students. Family-related variables account for a larger percentage (34.5%) of the total variance for male students in comparison to 22.8% for female students. Within the family-related variables, the frequency with which parents disciplined students for violating parental rules was the second best predictor of multiple drug use for males.

The reported frequency of participating in worship contributed 22.8% of the total variability explained for female students, in comparison to 10.3% for males. These results together with the means in Table I
indicate that females participate in worship more frequently than do males, and that the experience is more salient for female students.

Only one of the four parental employment and educational variables had a meaningful effect on students multiple drug use. The mothers’ employment on a full or part-time basis was positively related to the dependent variable for both groups.

Parental levels of education had no meaningful direct effect on the dependent variable, but may affect the multiple drug index indirectly. These two variables indicative of the family’s socioeconomic status were, for example, positively related to the frequency at which the students reported receiving good grades which was inversely related to multiple drug use.

A number of the predictor variables in the present analysis are not amenable to policy and other types of intervention to reduce adolescent drug use. The results do indicate it is a complex phenomenon resulting from familial, school, religious, peers and individual attributes, and therefore educational and other anti-drug initiatives are not the sole responsibility of family, school, church or any other organization. Programs should involve all groups to potentially increase their effectiveness.

ACKNOWLEDGEMENTS

The author wishes to acknowledge Eloise Opheim, Executive Director, PRIDE CANADA for permission to use the PRIDE survey results for the article. The interpretations and views expressed in the article are those of the author and do not necessarily reflect those of Eloise Opheim or PRIDE CANADA. Gratitude is also extended to Dr. Bob Russell and two anonymous reviewers for their constructive criticisms and suggested revisions to an earlier draft of the article.

REFERENCES


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LETTER/CORRESPONDANCE

On the Right Track


Dear Editor:

The editorial by Wigle and Mowat on health surveillance was an exceedingly important one. Historically, the societal value of public health has related to its ability to effectively respond to the major health problems of the day. In simpler times past, when plagues were limited to only a few at a time, it was easier to understand what the most important problems were. In the current world, with everyone clamouring that their issue is the most important one, surveillance becomes crucial if we are to avoid diluting our efforts over the myriad issues presented daily.

While the reportability of events is only one component of surveillance, it is a key one. It is therefore unfortunate that while communicable diseases in Canada now play a significantly lesser role in our health status than other conditions, the reportability of events continues to focus predominately, if not exclusively, on infectious diseases. For example, in Ontario, of 68 reportable diseases, only 3 may involve a non-infectious cause.

While “what gets measured may get done,” what isn’t counted, doesn’t count.

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