

# Consumption of energy drinks among Québec college students

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## ABSTRACT

**OBJECTIVES:** Consumption of energy drinks (ED) raises concerns because of adverse health effects possibly linked with high levels of caffeine and sugar intake. The study looks at the scope of ED consumption as well as some of the associated characteristics.

**METHODS:** Thirty-six public colleges in the Canadian province of Québec agreed to participate in a descriptive cross-sectional study ( $n = 36$ ). In February 2013, participating colleges invited their students to answer an online questionnaire on consumption of ED, alcoholic ED (AED), and ED in combination with other psychotropic drugs. A descriptive and correlational analysis was carried out. Logistic regressions explored associations between ED consumption and associated characteristics.

**RESULTS:** Of the students who successfully completed the questionnaire and participated in the study ( $n = 10,283$ ), a low proportion consumed ED (9.1%;  $n = 935$ ) and/or AED (1.1%;  $n = 109$ ) at least once a week in the previous month. Although low in proportion, a number of participants reported having used ED with other stimulant psychoactive substances ( $n = 247$ ) and  $\geq 3$  ED/day ( $n = 193$ ) or  $\geq 3$  AED/occasion ( $n = 167$ ), which can pose a risk for serious adverse effects. Weekly ED consumption was associated with consumption of  $\geq 20$  cups of coffee/week, smoking, excessive use of alcohol and past use of cannabis, glues or solvents and amphetamines.

**CONCLUSION:** A majority of respondents are not heavy users of ED, AED, or ED with drugs. Yet, the profiles of ED consumption potentially harmful to health that characterize some participants indicate that the potential health consequences of such behaviour are of concern.

**KEY WORDS:** Adolescent; young adult; energy drinks; caffeine; alcoholic beverages; psychotropic drugs

La traduction du résumé se trouve à la fin de l'article.

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The energy drink (ED) phenomenon is an emerging public health issue. Over the past few years, the ED market has been booming.<sup>1</sup> Advertising suggests that ED can be consumed in significant quantities and trivializes their frequent use. However, the composition of energy drinks poses potential health risks. The high caffeine content can cause heart palpitations, abdominal pain, nausea and insomnia;<sup>2</sup> the sugar added to many ED promotes obesity and dental caries.<sup>3,4</sup> Some researchers also report that ED are among the substances consumed by individuals with polysubstance use profiles.<sup>5–9</sup> Alcoholic energy drinks (AED) seem to reduce perceptions of being drunk,<sup>10</sup> which leads to increased alcohol ingestion<sup>6,11,12</sup> and adoption of risky behaviours such as drinking and driving.<sup>6,12</sup> Use of ED together with other psychotropic drugs also presents health risks. This behaviour raises concerns, especially because of the synergic effects of combining stimulants (e.g., ED and amphetamines).<sup>13</sup> Despite the potentially harmful effects, to our knowledge, simultaneous use of ED and illicit drugs has not been studied (except for AED).

Although several studies on ED among American university students have been conducted over the past several years, very few Canadian studies have focused on the issue of ED and AED. To date in Québec, no study has looked at ED use and its associated characteristics. Students in public colleges – institutions that offer two- or three-year programs between high school and university – are a particularly interesting group to study. Since they are of legal drinking age and thus allowed to go to bars, use of AED can be easily explored. They also fit the profile of the group targeted by ED

marketing.<sup>14</sup> The objective of this study was to draw a profile of ED consumption among public college students in the Canadian province of Québec. More specifically, the investigation was designed to examine frequency of consumption; amounts of ED, AED, and ED combined with other psychotropic drugs; and associations between consumption and socio-demographic characteristics. Associations between weekly ED consumption and consumption of other psychoactive substances were also explored.

## METHODS

### Participation and recruitment

The study uses a descriptive cross-sectional design. All public colleges in Québec ( $N = 51$ ) were contacted by e-mail, and 36 agreed to participate in the research project (70.6%). The sample was composed of a subgroup of college students who agreed to participate in the study. Respondents had to be students registered

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in a French or English public college during the winter 2013 session, and be able to understand the questionnaire, which was in French. The recruitment process was conducted with the public college federation, which includes 90% of college institutions in Québec.<sup>15</sup> Private and government colleges were excluded from the study because they are not included in this federation. In February 2013, participating colleges invited all their students to answer a 20-minute online questionnaire. The invitation e-mail included a short description of the research project and a link to the questionnaire hosted on LimeSurvey®, a website not linked to public college computing platforms, and supported by the Faculty of Medicine and Health Sciences at Université de Sherbrooke.

Data were collected over a period of one month. To increase participation, a reminder e-mail was sent to all students in participating colleges a week after the initial invitation e-mail. In addition, respondents were eligible to win an iPod Touch® or an iPad®. The research project was approved by the Comité d'éthique de la recherche en santé chez l'humain du Centre Hospitalier Universitaire de Sherbrooke (CHUS).

### Measures

The data collection instrument was a self-administered questionnaire, tailor-made to meet the study objectives. Several questions were based on four self-administered questionnaires used in previous studies dealing with the same theme.<sup>6,16-18</sup> The questionnaire was pretested with a sample of the target population to ensure respondents clearly understood it. A few participants found that some questions had repetitive answer choices and that the questionnaire was too long. Thus, following the pretest, some questions were removed to shorten the questionnaire. For example, questions relating to sports were removed since they were not directly linked to the research questions.

The survey assessed three broad classes of variables. In the first section, questions were asked regarding demographic characteristics, such as sex and age group. The second and third section explored frequency of use of psychotropic drugs. Psychotropic drugs are defined as substances that act "on the psyche of an individual changing his mental functioning".<sup>13</sup> The term "psychoactive substance" is synonymous with "psychotropic drug".

The second section assessed coffee, tobacco and alcohol consumption during the past month, as well as use of cannabis, cocaine, glues or solvents, hallucinogens, heroin, amphetamines, methylphenidates, tranquilizers and opiates in the past year. The question: "Over the last 12 months, how often did you use each of the following drugs?" was asked. Consumption was defined as  $\geq 1$  time in the past year if the participant reported having consumed "just once", "<1 time/month", "about 1/month", "the weekend or 1-2 times/week", " $\geq 3$  times per week but not everyday" or "everyday".

A third and final section focused on use of ED, AED, and ED combined with other psychotropic drugs on the same occasion. The questionnaire specified that ED refers to regular and concentrated ED, and AED to premixed AED or ED to which alcohol is added. To assess frequency of ED and AED use, students were asked, "During the past 30 days, how often did you drink ED (or AED)? ... Every day or almost every day, 3-4 times/week,

1-2 times/week or <1 time/week". Responses were recoded into consumption at least once a week ( $0 = <1$  time/week;  $1 = \geq 1$  time/week) and defined as "regular" ED or EAD consumption.<sup>16</sup> The amount of ED consumption was assessed by asking, "During the past 30 days, what is the maximum number of ED that you had in one day ...  $\geq 7$ /day, 5-6/day, 3-4/day, 1-2/day or <1/day?". The amount of AED consumption was explored with the same question but consumption per occasion was assessed instead of daily consumption. Responses were recoded into consumption of at least  $\geq 3$  ED per day (or  $\geq 3$  EAD per occasion) ( $0 = \leq 2$  ED per day [or  $\leq 2$  EAD per occasion];  $1 = \geq 3$  ED per day [or  $\geq 3$  EAD per occasion]). Even though the questions asked are not sufficient for determining the size of the product or amounts of caffeine and other substances consumed, intake of  $\geq 3$  ED/occasion was considered high since Health Canada recommends a maximum consumption of two cans of ED a day.<sup>19</sup>

Because of the potential health risk of combining two stimulants, consumption of ED with amphetamines, ED with cocaine or ED with stimulant medications taken without a prescription (e.g., Ritalin®, Concerta®, etc.) on the same occasion in the past year were specifically assessed.

### Data analysis

Descriptive analyses were used to describe the scope of the energy drink phenomenon, as well as some of the associated characteristics. Demographic differences between all Fall 2009 college students and the Winter 2013 sample of public college students were evaluated with a chi-square test. Fall 2009 data were used because no more recent data were available to compare the sample. Associations between frequency or amount of drinks consumed and socio-demographic characteristics were explored using a univariate logistic model to determine the strength of the relationship between variables. We used multivariate logistic regression analysis to examine the associations between regular ED consumption and consumption of various psychotropic drugs. We examined two models: model 1 covariates included sex and age and model 2 added coffee consumption, smoking, daily alcohol intake, number of times  $\geq 5$  alcoholic drinks were consumed on one occasion in the month preceding the survey, as well as use of cannabis, cocaine, glues or solvents, hallucinogens, heroin, amphetamines, methylphenidates, tranquilizers and opiates in the past year. The level of statistical significance was set at 0.05. Data were analyzed using IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.

## RESULTS

### Descriptive analyses

#### Study Participants

In all, 100,050 students received the questionnaire on February 11, 2013. Among the 10,891 students who participated in the survey (response rate of 10.9%), 10,290 completed the entire questionnaire. Six hundred and eight respondents were excluded from the analyses: 601 because of incomplete answers, 6 because they attended a college that was not participating in the study, and 1 because of missing data when answers were transferred to SPSS. The final sample included 10,283 individuals, which corresponds to a participation rate of 10.3%.

**Table 1.** Demographics of all college students registered in Fall 2009 in comparison with survey respondents in Winter 2013

Demographics	All college students registered in Fall 2009 <sup>15</sup> (%)	Survey respondents registered in Winter 2013 (%)
Sex*		
Female	57.8	67.4
Male	42.2	32.6
Age group (years)*		
≤17	83.7	15.7
18–24		73.2
≥25	16.3	11.1

\* Statistically significant difference in chi-square for all indicators ( $p < 0.05$ ).

Table 1 provides background characteristics of the population of all Québec college students (public and private colleges) enrolled in Fall 2009<sup>15</sup> compared to survey respondents registered in Winter 2013. Caution is necessary in interpreting these data since they differ by semester, year and inclusion of private colleges or not. However, these analyses give an idea of differences between the sample and all Québec colleges' demographics. These analyses show that a statistically significant higher proportion of women and individuals aged 24 years and under answered the survey in comparison to the proportions for all colleges in Québec.

#### Portrait of Consumption

Table 2 presents frequency of ED and AED consumption, as well as maximum number of ED and AED consumed in a day or on one occasion. Frequency of ED consumed in combination with other psychotropic drugs on the same occasion is shown in Table 3.

**Table 2.** Frequency and amount of ED and AED consumed

	ED, n (%)	AED, n (%)
≥1 time/lifetime	6535/10,283 (63.6)	3910/10,283 (38.0)
≥1 time in the last month	2230/10,283 (21.7)	652/10,283 (6.3)
• Maximum number consumed in the last month: ≥3 ED/day or ≥3 AED/occasion	193/2230 (8.7)	167/652 (25.6)
≥1 time/week (regularly)	935/10,283 (9.1)	109/10,283 (1.1)

**Table 3.** Frequency of ED consumed in combination with other psychotropic drugs on the same occasion ( $n = 10,283$ )

	ED and other psychotropic drugs (other than alcohol) on the same occasion, n (%)
≥1 time in the last year	519 (5.0)
• ED and amphetamines	144 (1.4)
• ED and cocaine	72 (0.7)
• ED and stimulant medications taken without a prescription (e.g., Ritalin®, Concerta®, etc.)	31 (0.3)
Total number of consumers of ED and amphetamines or cocaine or stimulant medications taken without a prescription (e.g., Ritalin®, Concerta®, etc.)	247 (2.4)

Overall, only a small proportion of respondents used these various products. Proportionately more AED users consumed large quantities of those drinks per occasion than those who drank ED only (25.6% vs. 8.7%).

#### Correlational analyses

Table 4 presents the socio-demographic profiles for regular ED users in the past month and users of ED and other psychoactive substances on the same occasion in the past year. These two types of consumption were more likely to be reported by males and older individuals. Frequency of AED intake was not associated with sex or age group. Neither does sex appear to be associated with maximum number of ED consumed per day or AED per occasion. However, individuals aged 17 and under were more likely to have drunk ≥3 AED per occasion compared with those aged 25 and over.

Table 5 shows that regular consumers of ED tend to use other psychoactive substances. Individuals who drank >20 cups of coffee a week, smokers and people who had consumed ≥5 alcoholic drinks per occasion in the past month were more likely to have consumed ED ≥1 time a week in the past 30 days, regardless of age, sex and use of other types of psychotropic drugs.

As for associations between use of illicit drugs in the past year and regular ED consumption, three associations remained significant independent of age, sex and use of other psychotropic drugs. The risks of consuming ED ≥1 time a week are higher among users of cannabis (OR: 1.41, 95% CI: 1.20–1.66), glues or solvents (OR: 4.20, 95% CI: 1.40–12.65) and amphetamines (OR: 2.23, 95% CI: 1.76–2.84).

#### DISCUSSION

Study results show that relatively small proportions of young people in Québec colleges consume ED and AED regularly. This finding is consistent with the results of other Québec studies.<sup>16,20,21</sup> Compared with results of several investigations conducted outside the province, a lower proportion of study respondents reported having consumed ED or AED in the past month.<sup>6,7,9,22</sup> In our study, the total proportions of consumers of ED, AED, and ED with drugs may be underestimated because of the high number of female participants. It is well known that females are less likely to use psychotropic drugs.<sup>23</sup> Moreover, in our survey, regular users of ED and ED with illicit drugs were more likely to be male. These observations coincide with the findings of earlier studies.<sup>5,7,16,20,24–26</sup> They are also consistent with ED marketing, which especially targets young men.<sup>27</sup>

Similar to data on frequency of consumption, data on quantity of ED and AED consumed are relatively reassuring. Most respondents who consumed ED and AED had ≤2 drinks on average in one day or on one occasion in the month preceding the study. Other studies conducted outside Québec report similar data.<sup>7,28</sup> However, it is interesting to note that a greater proportion of AED consumers declared a high consumption (≥3 per occasion) compared to ED consumers. In addition, individuals aged 17 and under were more likely than those aged 25 and over to have consumed ≥3 AED per occasion. Consumption of AED in festive contexts could partly explain their use on occasional bases and in greater amounts on one occasion, compared with ED use. This finding is worrisome, from a public health perspective, since this type of consumption can decrease perception of intoxication, and increase alcohol

**Table 4.** Univariate logistic regressions of regular consumption, maximum number consumed and consumption of ED and other psychotropic drugs on the same occasion by socio-demographic characteristics

Socio-demographic characteristics	Regular consumption (≥1 time/week) (n = 10,283)		Maximum number consumed		Consumption of ED and other psychotropic drugs on the same occasion (n = 519)
	ED	AED	≥3 ED/day (n = 2230)	≥3 AED/occasion (n = 652)	
Sex					
Female	1.00		1.00		1.00
Male	1.83 (1.60–2.09)*	1.11 (0.75–1.65)	1.36 (1.01–1.83)	1.11 (0.76–1.61)	1.79 (1.50–2.14)*
Age (years)					
≤17	1.00		1.00		1.00
18–24	1.73 (1.38–2.16)*	0.95 (0.57–1.59)	0.86 (0.55–1.36)	0.83 (0.51–1.37)	1.49 (1.12–1.97)*
≥25	1.97 (1.49–2.61)*	0.86 (0.41–1.83)	1.05 (0.58–1.90)	0.26 (0.10–0.66)*	1.65 (1.15–2.36)*

\* Significant at  $p < 0.05$ .**Table 5.** Associations between regular consumption of ED and consumption of other psychotropic drugs

	ED consumption frequency over the past 30 days				
	Regular consumption (≥1 time/week) n = 935 (%)	Occasionally or never (<1 time/week) n = 9348 (%)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	
				Model 1	Model 2
<b>Psychotropic drug use in the past month</b>					
Cups of coffee consumed per week					
≤20	898 (8.9)	9210 (91.1)	1.00		
>20	37 (21.1)	138 (78.9)	2.75 (1.90–3.98)*	2.43 (1.66–3.56)*	1.63 (1.08–2.45)*
Smoking					
Non-smokers	607 (6.9)	8247 (93.1)	1.00		
Smokers	328 (23.0)	1101 (77.0)	4.05 (3.49–4.70)*	3.99 (3.42–4.64)*	2.62 (2.21–3.10)*
Frequency of alcohol consumption per week					
Never or not daily	913 (9.0)	9245 (91.0)	1.00 (ref.)		
Daily	22 (17.6)	103 (82.4)	2.16 (1.36–3.44)*	1.74 (1.09–2.79)*	0.76 (0.46–1.28)
Number of times ≥5 drinks of alcohol consumed at one time					
None	354 (6.0)	5503 (94.0)	1.00		
≥1 time	581 (13.1)	3845 (86.9)	2.35 (2.05–2.70)*	2.24 (1.95–2.58)*	1.60 (1.38–1.86)*
<b>Number of times consuming various illicit drugs in the past year</b>					
Cannabis (e.g., marijuana, pot, hashish, etc.)					
None	403 (6.1)	6173 (93.9)	1.00		
≥1 time	532 (14.4)	3175 (85.6)	2.57 (2.24–2.94)*	2.46 (2.15–2.82)*	1.41 (1.20–1.66)*
Cocaine (e.g., coke, snow, crack, free base, powder, etc.)					
None	833 (8.4)	9029 (91.6)	1.00		
≥1 time	102 (24.2)	319 (75.8)	3.47 (2.74–4.38)*	3.06 (2.41–3.87)*	0.95 (0.71–1.28)
Glues or solvents					
None	924 (9.0)	9336 (91.0)	1.00		
≥1 time	11 (47.8)	12 (52.2)	9.26 (4.08–21.05)*	9.74 (4.21–22.52)*	4.20 (1.40–12.65)*
Hallucinogens (e.g., LSD, PCP, MESS, mushrooms, acid, mescaline, ecstasy, blotters, etc.)					
None	791 (8.3)	8770 (91.7)	1.00		
≥1 time	144 (20.0)	578 (80.0)	2.76 (2.27–3.36)*	2.61 (2.16–3.21)*	0.92 (0.71–1.19)
Heroin (e.g., smack, etc.)					
None	929 (9.0)	9335 (91.0)	1.00		
≥1 time	6 (31.6)	13 (68.4)	4.64 (1.76–12.23)*	4.11 (1.54–10.99)*	0.48 (0.12–1.96)
Amphetamines (e.g., speed, uppers, etc.)					
None	745 (7.8)	8787 (92.2)	1.00		
≥1 time	190 (25.3)	561 (74.7)	4.00 (3.33–4.79)*	4.00 (3.33–4.80)*	2.23 (1.76–2.84)*
<b>Number of times various drugs or medications taken without a prescription in the past year</b>					
Stimulants (e.g., methylphenidates [Ritalin <sup>®</sup> , Concerta <sup>®</sup> , Adderal <sup>®</sup> , Dexedrine <sup>®</sup> ], etc.)					
None	907 (9.0)	9226 (91.0)	1.00		
≥1 time	28 (18.7)	122 (81.3)	2.34 (1.54–3.54)*	2.13 (1.40–3.24)*	0.72 (0.45–1.16)
Tranquilizers (e.g., benzodiazepines [Valium <sup>®</sup> , Librium <sup>®</sup> , Dalmane <sup>®</sup> , Halcion <sup>®</sup> , Xanax <sup>®</sup> , Rivotril <sup>®</sup> , Ativan <sup>®</sup> ], etc.)					
None	905 (8.9)	9249 (91.1)	1.00		
≥1 time	30 (23.3)	99 (76.7)	3.10 (2.05–4.69)*	3.27 (2.15–4.98)*	1.41 (0.86–2.32)
Opiates (e.g., hydromorphone [Dilaudid <sup>®</sup> ], Oxycodone [Supeudol <sup>®</sup> , Percocet <sup>®</sup> , etc.], morphine [Statex <sup>®</sup> ] and codeine)					
None	905 (8.9)	9248 (91.1)	1.00		
≥1 time	30 (23.1)	100 (76.9)	3.07 (2.03–4.64)*	2.98 (1.97–4.53)*	1.00 (0.61–1.64)

Note: CI = confidence interval, OR = odds ratio. Model 1 includes sex and age. Model 2 added coffee consumption, smoking, daily alcohol intake, number of times ≥5 drinks of alcohol consumed on one occasion, and use of cannabis, cocaine, glues or solvents, hallucinogens, heroin, amphetamines, methylphenidates, tranquilizers and opiates in the past year.

\* Significant at  $p < 0.05$ .

intake as well as risk behaviours<sup>6,9,12</sup> such as drinking and driving,<sup>6,12</sup> and being more likely to get into a car with someone who has been drinking.<sup>6</sup> ED should not be consumed with alcohol. Efforts to raise young people's awareness about the possible effects of AED are needed. For example, an awareness campaign addressing the potentially harmful effects of AED consumption could be conducted.

Our findings indicate that ED are among the substances consumed by participants who are multiple psychoactive substance users. Our study results align with those of other studies linking ED consumption to smoking,<sup>5,7,26,29</sup> heavy alcohol use<sup>5,7,25,26</sup> and cannabis use.<sup>7,29</sup> Our investigation also shows associations between ED consumption at least once a week and amphetamine use. Indeed, many survey participants reported using ED with other stimulants (amphetamines, cocaine, and stimulant drugs taken without a prescription). The mix of stimulants is not advised because of the risks of elevated heart rate and blood pressure.<sup>13</sup> In this context, ED labelling should be changed and a warning added that states, "Consuming ED with other stimulants is not recommended."

### Limitations and strengths

The low rate of participation (10.3%) is the main limitation of this study, since it introduces a selection bias. Indeed, there is a difference between the characteristics of study participants and those of non-participants. Of note, the predominance of women among participants might underestimate the extent of psychoactive substance use determined in our study since females are less likely to use psychotropic drugs.<sup>23</sup> Also, several sensitive questions (especially about drug use) may have introduced a degree of response bias, although respondents were informed about the anonymous nature of the questionnaire. Furthermore, certain potential confounding factors may not have been controlled for, causing a bias. For instance, the tendency toward risky behaviours, which could be a common risk factor associated with use of different psychoactive substances,<sup>26</sup> was not measured and could limit data interpretation. Indeed, the propensity of individuals to undertake risky behaviour,<sup>30</sup> regardless of age or gender, can influence the associations between ED consumption and consumption of other psychotropic drugs. Another limit is that analyses regarding participants' socio-economic status have not been performed. These analyses would be of interest for further research. Finally, extrapolation of our result to other populations is limited. For example, working young adults of the same age who are not attending school anymore could have a greater tendency to consume ED and AED since they may have more money to buy them.

Nonetheless, our study shows various strengths. The large study population ( $n = 10,283$ ) allowed for analysis of less frequent behaviours (e.g., psychotropic drug use) since there were enough users. Our study also stands out due to its innovative character. It is the first-ever study to examine concomitant use of ED with certain illicit drugs. It is also the only one in Québec to draw up a profile of ED consumption and associated characteristics.

## CONCLUSION

Our survey of young Québécois attending college draws a reassuring portrait, showing that a very large majority of respondents are not heavy users of ED, AED, or ED combined with drugs. Yet, although low in proportion, a significant number of participants reported having used ED together with other stimulants ( $n = 247$ ),  $\geq 3$  ED/day ( $n = 193$ ) or  $\geq 3$  AED/occasion ( $n = 167$ ), which can pose a risk for serious adverse effects in young users. In addition, an association between ED and psychoactive substance polyconsumption indicates that interventions targeting multisubstance users should perhaps include this product. Finally, the effects associated with the recent energy drink phenomenon are unknown. For instance, more research is needed to explore the potential role of ED in the development of problematic psychoactive substance use. Also, the health effects of ED, especially the long-term effects, should be better monitored.

## REFERENCES

1. Reissig CJ, Strain EC, Griffiths RR. Caffeinated energy drinks – A growing problem. *Drug Alcohol Depend* 2009;99(1-3):1-10. PMID: 18990513. doi: 10.1016/j.drugalcdep.2008.08.001.
2. Clauson KA, Shields KM, McQueen CE, Persad N. Safety issues associated with commercially available energy drinks. *J Am Pharmacists Assoc* 2008;48(3):e55-67. doi: 10.1331/JAPhA.2008.07055.
3. Ismail AI, Burt BA, Eklund SA. The cariogenicity of soft drinks in the United States. *J Am Dent Assoc* 1984;109(2):241-45. PMID: 6590604. doi: 10.14219/jada.archive.1984.0346.
4. Olsen NJ, Heitmann BL. Intake of calorically sweetened beverages and obesity. *Obes Rev* 2009;10(1):68-75. PMID: 18764885. doi: 10.1111/j.1467-789X.2008.00523.x.
5. Arria AM, Caldeira KM, Kasperski SJ, O'Grady KE, Vincent KB, Griffiths RR, Wish ED. Increased alcohol consumption, nonmedical prescription drug use, and illicit drug use are associated with energy drink consumption among college students. *J Addict Med* 2010;4(2):74-80. PMID: 20729975. doi: 10.1097/ADM.0b013e3181aa8dd4.
6. Brache K, Stockwell T. Drinking patterns and risk behaviors associated with combined alcohol and energy drink consumption in college drinkers. *Addict Behav* 2011;36(12):1133-40. PMID: 21840130. doi: 10.1016/j.addbeh.2011.07.003.
7. Miller KE. Energy drinks, race, and problem behaviors among college students. *J Adolesc Health* 2008;43(5):490-97. doi: 10.1016/j.jadohealth.2008.03.003.
8. O'Brien MC, McCoy TP, Rhodes SD, Wagoner A, Wolfson M. Caffeinated cocktails: Energy drink consumption, high-risk drinking, and alcohol-related consequences among college students. *Acad Emerg Med* 2008;15(5):453-60. doi: 10.1111/j.1553-2712.2008.00085.x.
9. Snipes DJ, Benotsch EG. High-risk cocktails and high-risk sex: Examining the relation between alcohol mixed with energy drink consumption, sexual behavior, and drug use in college students. *Addict Behav* 2013;38(1):1418-23. PMID: 23006245. doi: 10.1016/j.addbeh.2012.07.011.
10. Ferreira SE, de Mello MT, Pompeia S, de Souza-Formigoni ML. Effects of energy drink ingestion on alcohol intoxication. *Alcohol Clin Exp Res* 2006;30(4):598-605. doi: 10.1111/j.1530-0277.2006.00070.x.
11. Price SR, Hilchey CA, Darredeau C, Fulton HG, Barrett SP. Energy drink co-administration is associated with increased reported alcohol ingestion. *Drug Alcohol Rev* 2010;29(3):331-33. PMID: 20565526. doi: 10.1111/j.1465-3362.2009.00163.x.
12. Thombs DL, O'Mara RJ, Tsukamoto M, Rossheim ME, Weiler RM, Merves ML, Goldberger BA. Event-level analyses of energy drink consumption and alcohol intoxication in bar patrons. *Addict Behav* 2010;35(4):325-30. PMID: 19954894. doi: 10.1016/j.addbeh.2009.11.004.
13. Ben Amar M. *La polyconsommation de psychotropes et les principales interactions pharmacologiques associées*. 2004. Available at: <http://www.santecom.qc.ca/Bibliothequevirtuelle/Cqld/0978079760.pdf> (Accessed December 4, 2015).
14. Allard P, Bélanger H, Paquin P. Boissons énergisantes prendre le taureau par les cornes! *Médecin du Québec* 2011;46(6):67-70.
15. Ministère de l'éducation, du loisir et du sport (MELS). *Statistiques de l'éducation – Enseignement primaire, secondaire, collégial et universitaire (Édition 2011)*. Québec, QC: Gouvernement du Québec, 2013.
16. Hovington J. *Enquête sur la malbouffe : 10 000 jeunes se prononcent!* 2012. Available at: <http://ll.rseq.ca/download/attachments/15958040/Rapport>

- +d/enquete-FRA-1-page.pdf?version=1&modificationDate=1328122709903 (Accessed December 4, 2015).
17. Institut de la statistique du Québec (ISQ). *Enquête québécoise sur le tabac, l'alcool, la drogue et le jeu chez les élèves du secondaire*. 2008. Available at: <http://www.stat.gouv.qc.ca/statistiques/sante/enfants-ados/alcool-tabac-drogue-jeu/tabac-alcool-drogue-jeu-2008.pdf> (Accessed December 4, 2015).
  18. Marczynski CA. Alcohol mixed with energy drinks: Consumption patterns and motivations for use in U.S. college students. *Int J Environ Res Public Health* 2011;8(8):3232–45. doi: 10.3390/ijerph8083232.
  19. Health Canada. *It's Your Health – Caffeine*. 2010. Available at: [http://publications.gc.ca/collections/collection\\_2011/sc-hc/H13-7-2-2010-eng.pdf](http://publications.gc.ca/collections/collection_2011/sc-hc/H13-7-2-2010-eng.pdf) (Accessed December 4, 2015).
  20. Gaudreault M, Gagnon M, Arbour N. *Être jeune aujourd'hui : habitudes de vie et aspirations des jeunes des régions de la Capitale-Nationale, du Saguenay – Lac-Saint-Jean et des Laurentides*. 2009. Available at: <https://educ.info/xmlui/handle/11515/19008> (Accessed December 4, 2015).
  21. Pérusse-Lachance É, Drapeau V. Enquête sur les habitudes de vie des étudiants (es) et du personnel de l'Université Laval. Université Laval, Québec (Québec), 2009.
  22. Velazquez CE, Poulos NS, Latimer LA, Pasch KE. Associations between energy drink consumption and alcohol use behaviors among college students. *Drug Alcohol Depend* 2012;123(1–3):167–72. PMID: 22391133. doi: 10.1016/j.drugalcdep.2011.11.006.
  23. Canadian Centre on Substance Abuse. *Levels and Patterns of Alcohol Use in Canada*. Ottawa, ON: CCSA, 2012. Available at: <http://www.ccsa.ca/Resource%20Library/CCSA-Patterns-Alcohol-Use-Policy-Canada-2012-en.pdf> (Accessed December 4, 2015).
  24. Morin P. *Portrait des jeunes Sherbrookoïses de 4 à 17 ans en matière d'alimentation et d'activité physique et sportive*. 2009. Available at: [http://www.ccss-iugs.ca/c3s/data/files/CSSS\\_IUGS\\_brochure\\_saines\\_%20habitudes.pdf](http://www.ccss-iugs.ca/c3s/data/files/CSSS_IUGS_brochure_saines_%20habitudes.pdf) (Accessed December 4, 2015).
  25. Reid J, Hammond D, McCrory C, Dubin J, Leatherdale S. Use of caffeinated energy drinks among secondary school students in Ontario: Prevalence and correlates of using energy drinks and mixing with alcohol. *Can J Public Health* 2015;106(3):e101–8. doi: 10.17269/cjph.106.4684. PMID: 26125234.
  26. Trapp G, Allen K, O'Sullivan T, Robinson M, Jacoby P, Oddy W. Energy drink consumption among young Australian adults: Associations with alcohol and illicit drug use. *Drug Alcohol Depend* 2014;134:30–37. PMID: 24120855. doi: 10.1016/j.drugalcdep.2013.09.006.
  27. Agriculture et Agroalimentaire Canada. *État du marché: les boissons énergisantes en Amérique du Nord*. 2009. Available at: <http://www.agrireseau.qc.ca/Marketing-Agroalimentaire/documents/Boissons%20%C3%A9nergisantes%20-%20Am%C3%A9rique%20du%20Nord%20-%20AAC%2008-2009.pdf> (Accessed December 4, 2015).
  28. Buxton C, Hagan JE. A survey of energy drinks consumption practices among student-athletes in Ghana: Lessons for developing health education intervention programmes. *J Int Soc Sports Nutr* 2012;9(1):9. PMID: 22444601. doi: 10.1186/1550-2783-9-9.
  29. Azagba S, Langille D, Asbridge M. An emerging adolescent health risk: Caffeinated energy drink consumption patterns among high school students. *Prev Med* 2014;62:54–59. PMID: 24502849. doi: 10.1016/j.ypmed.2014.01.019.
  30. Nees F, Tzschoppe J, Patrick CJ, Vollstädt-Klein S, Steiner S, Poustka L, et al. Determinants of early alcohol use in healthy adolescents: The differential contribution of neuroimaging and psychological factors. *Neuro-psychopharmacology* 2012;37(4):986–95. PMID: 22113088. doi: 10.1038/npp.2011.282.

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## RÉSUMÉ

**OBJECTIFS :** La consommation des boissons énergisantes (BÉ) préoccupe en raison des effets sur la santé potentiellement liés à l'ingestion de grandes quantités de caféine et de sucre. Cette étude examine l'ampleur du phénomène de la consommation de BÉ ainsi que certaines caractéristiques associées.

**MÉTHODES :** Trente-six collèges publics du Québec ont accepté de participer à une étude descriptive transversale ( $n = 36$ ). En février 2013, les collèges participants ont invité leurs étudiants à répondre à un questionnaire en ligne concernant la consommation de BÉ, de BÉ alcoolisées (BÉA), et de BÉ pris en combinaison avec d'autres psychotropes. Une analyse descriptive et corrélative a été effectuée. Des régressions logistiques ont exploré les associations entre la consommation de BÉ et certaines caractéristiques associées.

**RÉSULTATS :** Des étudiants ayant complété avec succès le questionnaire et participé dans l'étude ( $n = 10\ 283$ ), une faible proportion a consommé des BÉ (9,1 %;  $n = 935$ ) et/ou des BÉA (1,1 %;  $n = 109$ )  $\geq 1$  fois/semaine dans le dernier mois. Bien que faible en proportion, nombre de participants ont rapporté avoir ingéré des BÉ de façon concomitante avec d'autres substances psychoactives stimulantes ( $n = 247$ ) et  $\geq 3$  BÉ/jour ( $n = 193$ ) ou  $\geq 3$  BÉA/occasion ( $n = 167$ ). L'ingestion hebdomadaire de BÉ était associée à une consommation de  $\geq 20$  tasses de café/semaine, de tabac, de consommation excessive d'alcool, de cannabis, de colles ou de solvants et d'amphétamines.

**CONCLUSION :** La majorité des répondants ne sont pas d'importants consommateurs de BÉ, de BÉA, et de BÉ avec drogues. Tout de même, les profils de consommation de BÉ potentiellement à risque pour la santé, qui caractérisent certains participants, imposent de se préoccuper des conséquences sanitaires potentielles de ce comportement.

**MOTS CLÉS :** adolescent; jeunes adultes; boissons énergisantes; caféine; boissons alcoolisées; psychotropes