

**Killing the Buzz:
Reducing Youth Consumption of Energy Drinks
in British Columbia**

by

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Abstract

Recent medical studies and international prevalence data on energy drink consumption indicate that children, adolescents and teenagers are at risk of serious short and long term negative health effects due to the high amounts of caffeine in energy drinks. Current research demonstrates that energy drink consumption may cause exacerbated mood and behavioural disorders, seizures, and serious cardiovascular problems. Research into the long term health effects is nascent but warrants further research and precaution due to the possible severity of these effects and because youth consumption of energy drinks is rising quickly. This study investigates policies and research pertaining to energy drink safety in jurisdictions inside and outside of Canada, and then evaluates strategies to reduce youth consumption of energy drinks in British Columbia. A ban on consumption by persons below 19 years old and educational and media campaigns are determined to be the most effective feasible policy options.

Keywords: Energy drinks; caffeine; health; regulations; British Columbia; Canada

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Executive Summary

Preliminary studies published in the last three years show evidence of a possible link between energy drink consumption and negative health outcomes in children, adolescents and teenagers. Outcomes include serious cardiovascular problems such as cardiac arrhythmia, seizures, and neurological and developmental interference resulting in exacerbated mood and behavioral disorders. Consumption with alcohol by youth has been shown to result in an increased likelihood of impaired driving and susceptibility to injury.

Caffeine is the principal ingredient in energy drinks, present in high amounts. Currently, little to no conclusive data exists on the long term health effects of high caffeine intake on youth. Medical experts concur that more research is needed, and that youths should not consume energy drinks, at least until there is certainty about safety issues.

However, youth consumption of energy drinks is prevalent and rising in Canada and internationally. The Canadian energy drink market rose from nearly \$200 million in 2007 to more than \$430 million in 2012. Consumption prevalence surveys, although scarce, indicate that British Columbian youth are consuming a significant amount of energy drinks. Notably, Health Canada's recommended limits on caffeine intake can be surpassed with a single energy drink, especially by young adolescents, children, and individuals particularly sensitive to caffeine. Incidence of adverse reactions to energy drinks is also rising. In the United States, emergency room visits for energy drink consumption increased from 1,128 in 2005, to 13,114 in 2009, to over 21,000 in 2011.

Health Canada issued new energy drink regulations in 2011, including maximum caffeine concentrations, increased labelling requirements, a ban on alcoholic energy drinks, a ban on advertising to persons under 12 years old, and a plan to continue to assessing energy drink safety. Medical experts consider these policy changes inadequate given the risks to youth. In 2011, an article published in the Journal of the American Medical Association called for the enactment of policies to reduce youth consumption due to the lack of research on health effects, especially with respect to

adolescents. In 2013, the Canadian Medical Association began advocating for a ban on the sale of energy drinks in Canada to persons below the legal drinking age.

Policy Problem and Methodology

The policy problem researched in this study was: medical research demonstrates that energy drinks may cause serious short and long term health consequences in young consumers. Given the potential risks for children, adolescents and teenagers, youth consumption of energy drinks in British Columbia should be reduced.

Two methodologies were used in this study. First, I conducted a literature review where I researched caffeine dosages of energy drinks, prevalence and promotion of youth consumption, health risks for youth, and provincial and federal regulation. I also performed a cross-jurisdictional analysis to assess policy approaches and regulatory environments in domestic and international jurisdictions. I examined government documents, medical studies, and stakeholder publications in Canada at the federal and provincial levels, and in high-income countries that have or have had energy drinks regulations.

Policy Options and Recommendations

Four policy options were the key findings of my cross-jurisdictional analysis:

- Taxation of energy drinks has been used to disincentivize the purchase of these products by raising the cost of consumption;
- Bans have been implemented in an attempt to prevent access to either specific energy drinks or to prevent youth consumption;
- Product labels have been regulated in order to better convey health concerns to consumers and to prevent vulnerable groups such as pregnant women and children from consuming energy drinks; and
- Educational campaigns are being used in many jurisdictions.

The ability of each option to reduce youth consumption of energy drinks in British Columbia was assessed using the measures of four criteria:

- Effectiveness
- Cost
- Anticipated stakeholder acceptance
- Implementation complexity

Given the lack of data on these policies with respect some of the criteria, the analysis included extrapolation from studies on policies to prevent youth consumption of alcohol, tobacco and junk food.

Recommendations

My analysis found that the tax and ban were the two most effective options. However, a tax is likely to encounter opposition from political parties and the general public because it would be levied on all energy drink consumers rather than targeting only youth. A ban on youth purchasing and consumption was therefore recommended, along with an education campaign. Implementing both of these options was found to reduce their overall cost and increase their respective effectiveness. Additional recommendations include a sunset provision for the ban, incremental implementation of the educational campaign to monitor its effectiveness, and surveys on consumption prevalence and the reasons why youth consume energy drinks.

Introduction

Preliminary studies published in the last three years show evidence of a possible link between energy drink consumption and negative health outcomes in children and adolescents. Outcomes include exacerbated mood and behavioral disorders, seizures, and serious cardiovascular problems such as cardiac arrhythmia (Arria et al., 2013; Kristjansson et al., 2013; Seifert et al., 2011; Worthley et al., 2010). At the same time, youth consumption of energy drinks is rising in Canada and internationally (Euromonitor International, 2013a). The Canadian energy drink market rose from nearly \$200 million in 2007, to \$303 million in 2009, to \$433 million in 2012 (Euromonitor International, 2013b). Incidence of adverse reactions to energy drinks is also rising. In the United States, emergency room visits for energy drink consumption increased from 1,128 in 2005, to 13,114 in 2009 (Substance Abuse and Mental Health Services Administration, 2011), to 21,000 in 2011 (Substance Abuse and Mental Health Services Administration, 2013). Moreover, nearly half of reported US caffeine overdoses in 2007 occurred in persons under 19 years old (Seifert et al., 2011) yet adolescents and young adults are the primary target market of energy drink producers (Government of Canada, 2008). In light of such reports, medical experts are calling for a ban on the sale of energy drinks to youth, at least until health outcomes are more clearly determined (Canadian Medical Association, 2013).

Various policies have been undertaken across developed countries with respect to energy drink consumption by adolescents and children. France, Italy, Denmark, Turkey and Uruguay have all banned either specific energy drinks or energy drinks that exceed a threshold caffeine concentration. Stringent labelling requirements exist in the European Union, and the governments of many developed countries are currently assessing energy drink consumption by youth, including the Food and Drug Administration in the United States, where the American Medical Association has endorsed a ban on youth-aimed energy drink marketing. Although Canadian energy

drink regulation is considered outstanding by nations such as Australia and New Zealand (Food Regulation Standing Committee, 2013), energy drinks are readily available across Canada for youth to purchase.

Last year, Health Canada changed its policy regarding energy drinks, in part as a response to a report by an expert panel convened to discuss adverse drug reactions¹ associated with energy drinks. Both the expert panel and Health Canada's own assessment found information gaps in data related to potential long and short term effects of energy drink consumption. The panel determined that energy drink regulation was inadequate with respect to protecting public health. The policy changes included a limit on caffeine content of energy drinks, increased labelling requirements, and reclassifying energy drinks as a common food rather than a natural health product (Health Canada, 2011a). Many of these changes fell short of, or even opposed the panel's recommendations (Health Canada, 2011b). At the moment, caffeinated energy drinks have a Temporary Marketing Authorization so that they may be sold across Canada while data is gathered to answer questions pertaining to health effects (Health Canada, 2011a). Health Canada has stated that further policy changes may occur, including cancellation of the Temporary Marketing Authorization, if new adverse information is made available (ibid.).

Critics see these policy changes as inadequate given the risks to children and adolescents. At the moment, little to no data exists based on completed studies on the long and short term health effects of energy drinks on youth (Arria & O'Brien, 2011; Temple, 2009; Meltzer, et al., 2008; Seifert et al., 2011). Such studies are currently being conducted (Health Canada, 2011a; U.S. Food and Drug Administration, 2013). Experts and medical associations, including Health Canada's expert panel on energy drinks and the Canadian Medical Association, have argued for a ban on energy drink consumption by youth.

This report investigates studies and policies regarding energy drinks in Canada at the federal and provincial levels, the United States, Australia, New Zealand,

¹ An adverse drug reaction is the undesirable effect of one or more health products.

Argentina, Uruguay, Mexico and selected European Union countries. The goal of this research is to explore the issue of British Columbian children, adolescents and teens consuming energy drinks despite a lack of conclusive evidence on the health effects of doing so, and to create policy options for the provincial government to reduce youth consumption. The cross-jurisdictional analysis was used to identify policy options and recommend the most appropriate ones.

This study examines youth consumption of energy drinks in the jurisdiction of British Columbia for two reasons. Firstly, Health Canada has already determined its policies regarding energy drinks for the next few years (EU Food Law, 2013). The department has also stated that it will consider regulatory changes if and when new scientific evidence warrants such actions (Health Canada, 2011a). Secondly, with its provincial focus, this study's findings may provide guidance to actors at the provincial level who are seeking to address youth energy drink consumption as the federal government pursues its national policy. Much is being done across Canada in attempts to deal with youth consumption of energy drinks at the provincial level. Stakeholders in many provinces are attempting to increase energy drink regulation. In 2013, the New Brunswick Department of Health hosted a dialogue session with stakeholders (2013a) at the behest of the Provincial Health Officer (2013b). The provincial government is now reviewing feedback from stakeholders to develop a plan to address the issue. In Ontario, public health agencies are calling on the provincial government, as well as Health Canada, to ban the sale and advertising of energy drinks to youth and increase warning label requirements (Association of Local Public Health Agencies, 2012).

The following research is organized into eight parts. Following the introduction, Section 1 discusses the concerns regarding British Columbian youth consuming energy drinks. Section 2 describes the methodology that was be used, and its limitations. Section 3 is a report on the results of the cross-jurisdictional data gathering. Sections 4 and 5 outline policy options and criteria and measures that are applied to them, and contain an evaluation of each option. Finally, Section 6 outlines the final policy recommendation and Section 7 contains the conclusion to the paper.

1. Literature review: Youth consumption of energy drinks

1.1. Caffeine consumption, dosages

Energy drinks are beverages with caffeine as the main active ingredient and present in high amounts. Additives such as taurine, creatine, and guarana, a plant product with concentrated caffeine, are also often present (Substance Abuse and Mental Health Services Administration, 2013). As of 2011, energy drinks in Canada are sold in sizes up to approximately half a liter and contain up to 180 mg of caffeine, the legal limit for a single serving (Health Canada, 2011). If the container is resealable and has a volume of 591 mL or less, more caffeine may be added up to a concentration of 400 mg/L (ibid.). For example, an approximately 700 mL resealable can of Monster energy drink contains 240 mg of caffeine. For comparison, a cup of coffee has over 100 mg and a cup of tea has around 40 mg (Health Canada, 2012a). Across British Columbia, energy drinks are available in grocery and convenience stores, bars, nightclubs and vending machines. There are no age limits on buying them, although schools in BC have banned the sales of energy drinks because they have higher amounts of sugar and caffeine than school nutritional criteria allow (HealthLink BC, 2013).

Health Canada (2012a) has established the following recommended daily caffeine intake limits for children 12 and younger:

Table 1. Health Canada’s recommended maximum daily caffeine intake for children

Age in years	Maximum daily caffeine intake
4 - 6	45 mg
7 - 9	62.5 mg
10 - 12	85 mg

Although there are no definitive guidelines for caffeine consumption by adolescents aged 13 and older due to a lack of data, Health Canada has a general suggestion of a maximum of 2.5mg per kilogram of body weight, stating that the majority of adolescents aged 13 and older will not suffer adverse effects. However, experts disagree with Health Canada's recommendations. According to many American medical experts, low body mass is not the only reason children and adolescents are sensitive to caffeine; they usually have not developed tolerance from regular caffeine consumption and are therefore more sensitive to caffeine than adults (Arria et al., 2013). Moreover, the American Academy of Pediatrics (2011) has stated that caffeine-containing beverages should be avoided by youth, and energy drinks "should never be consumed by children or adolescents". The American Journal of Pediatrics published a study stating that 100 mg per day is the threshold of caffeine toxicity in a healthy person aged 12 – 18 (Seifert et al., 2013). In particularly sensitive individuals, agitation and a faster heartbeat can occur as a result of ingesting only 50 mg (Gunja & Brown, 2012).

When caffeine toxicity begins, a person may experience jitteriness, difficulty concentrating, upset stomach, headaches, problems sleeping, and increased heart rate and blood pressure (Rose, 2010). To compare this threshold amount with current portion sizes, a 250 mL can of Red Bull contains 80 mg of caffeine, while a 473 mL can of Monster Energy contains around 160 mg of caffeine (ibid). Hence, just one can of Monster Energy may result in caffeine toxicity in a teenager, while the caffeine in a single, smaller, 250 mL can of Red Bull surpasses the recommended maximum daily caffeine intake for children under ten years old, and contains nearly the recommended limit for children aged 10 – 12. Both portion sizes are widely available in British Columbia.

1.2. Prevalence

In the United States, energy drink sales have increased by 60% from 2008 to 2012 (Journal of Mixed Methods Research, 2013). Moreover, the 12.5 billion dollars in sales for 2012 is expected to double by 2017 (ibid.). A comparable market expansion is predicted for Canada (Euromonitor International, 2013b). The domestic energy drink market rose from nearly \$200 million in 2007, to \$303 million in 2009, to \$433 million in

2012 (ibid.). This trend indicates that energy drink consumption is prevalent and increasing in Canada.

Table 2. Summary of youth consumption prevalence studies

Jurisdiction in which study was conducted	Year	Prevalence of energy drink (ED) consumption	Sample size
British Columbia	2008	11% of students in Grades 7 to 12 had drunk an ED the day before the survey. 8% had consumed an ED that day.	Unknown
Canada	2012	In the month before the survey, 14% of adolescent students drank EDs 5-12 times, and 12% had consumed ED's 13≤ times.	Unknown
Quebec	2012	Of teens aged 13 to 17, 17.4% consume 1 ED per week, 2.6% consumed 2-6 EDs per week, and 1.5% consumed 1≤ EDs per day.	60,000
USA	2007	28% of adolescents aged 12 – 14 and 31% of youth aged 12 to 17 drank EDs “regularly”.	Unknown
Michigan, USA	2011	10%, 11% and 18% of eighth, tenth, and twelve grade students drink one or more EDs per day, respectively.	47,000
Italy	2013	16.5% of eighth graders and 6.21% of sixth graders consumed 1≤ EDs per week.	1000
Estonia	2012	Of grade school students, 7% consumed EDs every day, 20% consumed EDs 2≤ times per week, and a third of students consumed EDs “a few times a month” or less often.	Unknown
UK	2013	5% of teens aged 12 to 18 stated that they replace their morning meal with an energy drink.	2,000
USA	2012	18% of eighth graders consume 1≤ EDs per day.	Unknown
Germany	1996	23% drank 1≥ ED per week, 3% drank 1 to 7 EDs per week, and 5% of girls and 23% of boys aged 10 to 13 drank them “on a regular basis” less than once per week.	1265
16 countries in the European Union	2013	<p>Of adolescents aged 10 to 18, 68% consume EDs. Average monthly consumption is 2.1L of ED and average daily caffeine consumption is 23.5 mg. 12% of adolescent consumers drink EDs 4 to 5 times or more per week, and an average volume of 7L per month, for an average daily caffeine consumption of 75.1 mg. Approximately 12% of adolescent consumers drank at least 1.065 liters of energy drinks each time they consumed energy drinks.</p> <p>Of children aged 3 to 10, 18% consume EDs. Average monthly consumption is 0.49L of ED and average daily caffeine consumption is 22 mg. 16% of child consumers drink EDs 4 to 5 times or more per week, and an average volume of 3.8L per month, for an average daily caffeine consumption of 42.9 mg.</p>	52,000

Regarding younger consumers, multiple studies claim that youth consumption prevalence is under-documented (Azagaba et al., 2014; Réseau du sport étudiant du Québec, 2012; Rotstein et al., 2013). The scarcity of studies found in this literature review supports this claim. Nonetheless, some reports exist which support the claim that youth are consuming energy drinks. A 2008 McCreary Centre Society survey of BC youth found that 11% of youths in Grades 7-12 had drunk an energy drink the day prior to responding to the survey, and another 8% consumed an energy drink that day. It should be noted that overall energy drink consumption in Canada has increased since then. A 2012 government survey reported that 14% of adolescent students drank energy drinks 5 to 12 times in the past month, and 12% had consumed energy drinks 13 times or more in the past month (Office of the New Brunswick Chief Medical Officer of Health, 2013). In 2012, the Institut de la Statistique du Québec published a study involving 60,000 teens aged 13 to 17. 4% of these teens reported consuming energy drinks once a week, 2.6% of teens reported consuming 2-6 per week, and 1.5% reported consuming 1 or more per day. A 2007 US study found that 28% of adolescents aged 12 – 14 and 31% of youth aged 12 – 17 regularly drank energy drinks (Marin Institute, 2007). This study did not define what was meant by “regular consumption”. According to self-report surveys examined by the authors of an article in the American Journal of Pediatrics, 30%-50% of adolescents and young adults consume energy drinks (Seifert et al., 2011). A 2011 survey from the University of Michigan surveyed 47,000 eighth, tenth, and twelve grade students (Johnston, O'Malley, Bachman, & Schulenberg, 2011). 10%, 11% and 18% of eighth, tenth, and twelve grade students reported drinking one or more energy drinks per day, on average, respectively. A 2013 study in the European Journal of Pediatrics showed that energy drink consumption has become common, and was increasing, among 11 to 13 year olds (Gallimberti, et al., 2013). In that study's sample of nearly 1000 Italian students, 16.5% of eighth graders and 6.2% of sixth graders drank energy drinks at least once a week. A 2012 Estonian study found that 7% of grade school students consumed energy drinks every day, 20% consumed them more than twice a week, and a third of students consumed them “a few times a month” or less often (Ilves, 2012). In August 2013 in the United Kingdom, 5% of respondents in a poll of 2,000 teenagers aged 12 to 18 stated that they replace their morning meal with an energy drink (make mine Milk, 2013). A 2012 American report on teen drug use found

that 18% of eighth graders consume one or more energy drinks per day (Wadley, 2011). When energy drinks began selling in Germany nearly 20 years ago, a study involving 1265 adolescents found that 23% drank less than one can per week, 3% drank between one and seven cans per week, and 5% of girls and 23% of boys aged 10 – 13 stated that they drank them on a regular basis less than once per week (Seifert et al., 2011).

In the fall of 2013, the European Food Safety Authority released a study that investigated the energy drink consumption habits of 52,000 participants across 16 EU countries. The researchers found that 68% of adolescents aged 10-18 years old consumed energy drinks, as did 18% of children aged 3-10 years old. The average volume consumed each month was 2.1 litres for adolescents and 0.49 liters for children. About 12% of adolescent consumers drank energy drinks 4-5 times or more per week, and an average volume of 7 liters per month. Approximately 12% of adolescent consumers drank at least 1.065 liters of energy drinks each time they consumed energy drinks. The average exposure to caffeine from energy drinks was 23.5 milligrams per day, and 75.08 milligrams per day for the 12% that drank 7 liters each month. Regarding child consumers, 16% drank energy drinks 4-5 times or more per week, and an average volume of 3.8 liters per month. The average exposure to caffeine from energy drinks was 21.97 milligrams per day, and 42.9 milligrams per day for the 16% that drink 3.8 liters each month. Considering the caffeine that these youth likely consume in other food sources, the children and adolescents that consume high amounts of energy drinks consume more than the maximum daily intake of caffeine as suggested by Health Canada. Moreover, if the youth interviewed consume energy drinks less than once a day, then the amount they consume in one sitting may far surpass the average daily amount.

Given differences among countries, such as dietary habits, it is difficult to extrapolate youth consumption rates from these jurisdictions to British Columbia. However, there is almost no prevalence data for British Columbia. Therefore, in this study it is assumed that youth energy drink consumption prevalence in British Columbia at least approaches EU-wide prevalence rates. In any case, the results of most of these studies indicate that youth are consuming significantly more than Health Canada's recommended daily intakes of caffeine, as discussed in Section 1.1.

1.3. Promotion

65% of American energy drink consumers in the US are between the ages of 13 and 35 (Somogyi, 2010). These products usually contain claims that they increase alertness and improve athletic performance (Markey, 2013). This kind of advertising may be interpreted as targeting all age groups. Nonetheless, most of the marketing promoting energy drinks is designed to appeal to youth (Heckman et al., 2010). Other inducements include sweetening of energy drinks makes them more palatable to youth who do not drink bitter, caffeinated products such as coffee. Mimicking advertisements for alcoholic beverages, energy drinks companies use exciting brand names, edgy product art, and extreme sports sponsorships to entice young people (Marin Institute, 2007). Brand names include “Red Bull”, “Monster”, “Full Throttle”, “Amp”, and “NOS”, the latter of which invokes images of “nitrous oxide systems” used in high speed, Hollywood movie car chases. One energy drink sold in the United States, banned in Canada (CityNews, 2007) but available through online purchase is called “Cocaine” and markets itself as “the legal alternative” (Wolf, 2013). Product art includes bright colors, exciting fonts, claw marks, and vignettes written on the cans about how exciting the product is. Red Bull, one of the largest and oldest energy drink manufacturers, sponsored the highest parachute jump ever in 2012 and a very popular backcountry snowboarding documentary in 2011. Monster Energy often sponsors widely televised motorbike racing and BMX events.

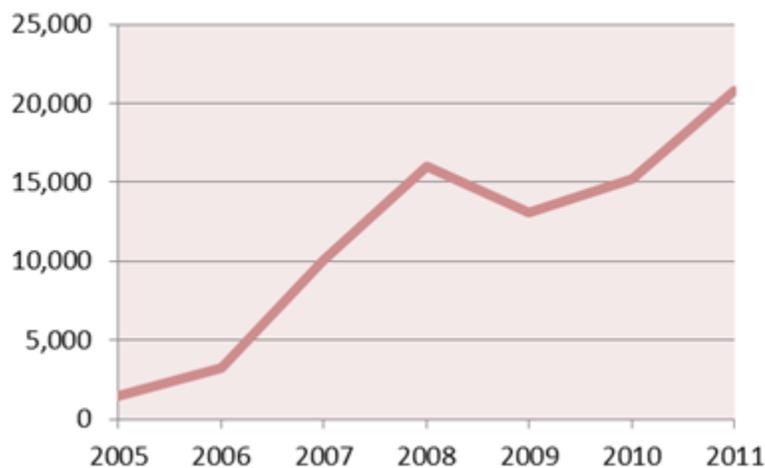
The success of such advertising is reflected not only in youth consumption rates, but also in the fact that the American Medical Association adopted a policy at their June 2013 annual general meeting to ban the marketing of energy drinks to persons under the age of 18 in order to “protect the health of American kids” (Reuters, 2013). One month later, the Canadian Medical Association followed suit and advocated a ban on energy drink sales to youth because young children and adolescents were consuming the products despite warning labels against doing so (Rich, 2013). A U.S. Senate commerce hearing held in July 2013 resulted in three companies, Red Bull, Rockstar, and Monster Beverage Corp., promising not to market to children less than 12 years old, despite disputed claims that they were already not doing so (Durbin, 2013). This occurred despite urgings by senators to go beyond these “baby steps” (Markey, 2013) and

increase the age limit to 18, in support of the American Medical Association's decision (Durbin, 2013).

1.4. Health risks

As consumption levels increase, so does the incidence of adverse reactions to energy drinks. In the United States, emergency room visits for energy drink consumption increased from 1,128 to 13,114, between 2005 and 2009 (Substance Abuse and Mental Health Services Administration, 2011). 56% of these visits were for energy drinks only (i.e. not in combination with other drugs). After 2009, such visits nearly doubled again to 20,783 in 2011 (Substance Abuse and Mental Health Services Administration, 2013). The number of serious reactions to energy drink consumption is increasing drastically. Data was not presented regarding the exact reasons for emergency room admittances.

Figure 1. Emergency room visits in the United States related to energy drink consumption, 2005 to 2011



Source: Substance Abuse and Mental Health Services Administration

Although data regarding patient age was not collected in this study, another study reported that half of the 5448 reported US caffeine overdoses in 2007 occurred in persons under 19 year old (Seifert et al., 2011). In 2011 and 2012, American poison control centers received over 3,000 reports each year regarding exposure to energy drinks (American Association of Poison Control Centers, 2014). Of the 2,577 such reports received between January 1st and October 31st, 2013, 1,563 (61%) involved

youth under 18 years old (ibid). Furthermore, an Australian study showed that, as energy drink consumption increased from 2003 to 2010, caffeine overdoses reported by poison control centers and hospitals also increased significantly, especially among adolescents (Gunja & Brown, 2012). The average age of subjects was 17 years old, and in 70% of the call subjects had not used alcohol or other drugs in combination with energy drinks (Wolf, 2013). When considering the rising market share of energy drinks and reported levels of youth consumption, these statistics indicate a significant potential risk to teenagers, adolescents and children.

It is important to note that a scan of the characteristics of energy drinks available in both Canada and USA found that, for the drink sizes we have in Canada, the ratio of caffeine content to drink volume is often very similar (Seifert, et al., 2013; Wolk et al., 2012). In other words, an approximately half-litre serving of Monster in Canada has similar caffeine content to that of a half-litre serving of Monster in the US. Therefore, the American caffeine-related ER visits and overdose reports may be indicative of the risks to Canadian youth.

Health Canada's caffeine intake recommendations for youth are based on a 2003 study by a Health Canada research team (Nawrot et al., 2003). They state that data on adolescents is lacking, but data on pre-adolescents led them to conclude that 2.5mg per kg was a dosage that would not lead to short-term behavioural changes such as anxiety. The team also suggested a cautious approach in caffeine recommendations given the lack of data on longer-term effects of caffeine in children, and because children's nervous systems are continually developing. These recommendations have been criticized by pharmacological experts as being justified by statistical averages in populations that ignore the variance in individual tolerance of caffeine (Wolf, 2013). One study showed that persons with a certain common gene began feeling anxious after consuming 150 mg of caffeine, while those without the gene began feeling anxious after consuming 450 mg of caffeine (Childs et al., 2008). In 2011, authors of an article published in the Journal of the American Medical Association called on the National Institutes of Health to recognize the "the lack of systematic research on the health and safety effects of energy drink consumption, especially among adolescents" (Arria & O'Brien, 2011). The authors stated that policies are urgently needed to protect public

health by reducing consumption of energy drinks by adolescents, among other at-risk groups (ibid.).

Currently, little to no conclusive data exists on the long term health effects of energy drinks on youth (Meltzer, et al., 2008; Seifert et al., 2011; Temple, 2009). Some studies exist that observed associations between high caffeine intake and negative health outcomes, but few if any have confirmed a causal link. In these studies, scientists concur that there is little research and thus little data about the effects on youth (Higgins et al., 2010; James et al., 2011; Temple, 2009; Wolk et al., 2012). Such studies have been called for (Wolk et al., 2012) and are now being conducted. In May of 2013, the US Food and Drug Administration stated that they would investigate the effects of caffeine on children to determine acceptable dosage amounts (U.S. Food and Drug Administration, 2013). This was triggered by the recent, large increase of added caffeine in foods that children and adolescents consume, including energy drinks (ibid.). The Canadian Medical Association has also stated that it would conduct a study on energy drink consumption by youth (Doctors Nova Scotia, 2014). Health Canada is also conducting research that was explored in subsequent sections.

In 2011, the American Journal of Pediatrics published a study that examined research on energy drink consumption published between 2000 and 2009. The authors found that energy drinks do not have therapeutic benefits, that long-term consequences for children are still unknown, that high consumption by children is underdocumented but suggested by self-report surveys, and that many energy drinks contain ingredients such as guarana that act as stimulants and whose physiological effects are understudied (Seifert et al., 2011). The researchers also found that it is possible, but unknown if, caffeine interferes with bone mineralization in growing youth (ibid.). To avoid exacerbation of certain health problems, the authors of this report (ibid.) and others (Higgins et al., 2010) suggest screening children who intend to even occasionally consume energy drinks and have health conditions such as anxiety, poor nutrition, seizures or cardiac abnormalities, sleep disturbances or behavioral abnormalities for which they take anti-depressants or ADHD medication. A recent study in the American Journal of Medicine found that young adults who are susceptible to the effects of caffeine are at increased risk of experiencing severe cardiac events (Worthley et al.,

2010). This finding shows how the effects of caffeine on a youth's heart rate may result in hospitalization, especially for at-risk children (Arria et al., 2013). Other studies have also found that the high caffeine content in energy drinks poses health risks to at-risk populations (Clauson et al., 2008; Norwegian Scientific Committee for Food Safety, 2005); the American Heart Association (2013), the Radiological Society of North America (2013), and the Australian Medical Association (Waterford, 2013) have published reports suggesting energy drink consumption can both instigate and exacerbate cardiac arrhythmias. Seizures in persons who never had seizures before have also been reported (Arria et al., 2013). Multiple studies have associated high caffeine intake by children with aggressive behaviour, attention problems, reduced sleep, anxiety and poor academic performance (James et al., 2011; Kristjansson et al., 2013; Martin, et al., 2008). Authors of a different literature review on sports and energy drink consumption by children and adolescents determined that children and adolescents should never drink energy drinks because of these risks, as well as possible risks to their developing cardiovascular and neurologic systems (American Academy of Pediatrics, 2011). Pediatricians have argued that the youth-aimed marketing of energy drink companies, combined with risk-taking behaviors in adolescents, increases caffeine overdose potential (Seifert et al., 2011). Other medical researchers argued that energy drink consumption alone may increase the risk for caffeine toxicity and overdose in children and teenagers (Bigard, 2010).

Authors of a study published in the journal of the Canadian Medical Association reported that in 2010 to 2011, nearly 26% of British Columbian high school students reported consuming energy drinks with alcohol in the past year (Azagba et al., 2013). This was the highest reported prevalence of this behaviour of all Canadian provinces (ibid.). Such consumption is problematic because increased feelings of alertness cause underestimation of one's own level of inebriation (ibid.). This has been shown to be associated with higher volumes of alcohol consumption and an increased likelihood of impaired driving, risk-taking and susceptibility to injury. Health Canada introduced a ban on alcoholic energy drinks in 2012 in an attempt to reduce such consumption (Health Canada, 2012b). Future research may yield prevalence data that would show how effective this policy has been.

Another study pointed to the need for research to test the hypothesis that caffeine is a significant risk factor for later drug use (Temple, 2009). There is evidence that caffeine may increase the psychological and physiological effects of stimulant drugs such as nicotine and cocaine (ibid.). This enhanced experience may result in a higher likelihood of a young person continuing to use such drugs after first trying them.

Studies on animals have shown negative, long-term health outcomes for young rats after caffeine exposure. In one study, rats that were given caffeine during adolescence were significantly more emotionally reactive in later life than rats that had not been given caffeine during adolescence (Anderson & Hughes, 2008). Researchers in another study investigated whether caffeine interfered with a specific kind of sleep that is postulated to be very important to brain development during adolescence (Olini et al., 2013). Their findings showed that caffeine had long lasting effects on the maturation of young, developing rat brains by interrupting normal sleep patterns. Notably, the period of brain maturation that was investigated is associated with mood and psychiatric disorders in humans (ibid.).

At their 2013 annual general meeting, the Canadian Medical Association adopted a resolution advocating a ban on the sale of energy drinks in Canadian jurisdictions to persons below the legal drinking age. One of the main reasons for passing the resolution was that doctors had found that youth were often consuming energy drinks despite warning labels against doing so (Rich, 2013).

Many medical researchers have stated that further research is required on the effects of energy drinks on children, adolescents and teenagers, especially in frequent consumers and at-risk populations (Seifert et al., 2011; Wolk et al., 2012). This will enable better determination of the maximum safe dosage. Until then, medical experts strongly discourage youth consumptions of energy drinks.

1.5. Counterarguments

While Canadian, American (EU Food Law, 2011), and European (British Soft Drinks Association, 2013) beverage associations have stated that energy drinks are not

recommended or suggested for children, at the same time, many of these organizations have also been arguing that it is not unsafe for youth to consume these beverages. In response to criticism from medical, news, and government organizations, companies and associations of the energy drink industry have been publicly defending the safety of their products in Canada and internationally. The Canadian Beverage Association has repeatedly cited Health Canada as stating that only 10% to 20% of the caffeine consumed by youth comes from energy drinks, while the rest comes from foods and drinks such as tea, coffee and chocolate (Canadian Beverage Association, 2013a; CBC News, 2013). Importantly, these are averages that apply to all youth, regardless of whether they drink energy drinks or not. As indicated by the previously discussed prevalence studies, some youths drink a great deal more energy drink than others. Moreover, as the amount of energy drinks consumed in Canada grows rapidly, youth may begin to substitute regular soft drinks that contain between 0 and approximately 40 mg of caffeine in a single can (Schardt, 2012) for much more highly caffeinated energy drinks. Regarding coffee and tea, a scan of medical literature shows no indication that coffee and tea consumption levels by youth have warranted a public health concern. A spokesperson for the American Food and Drug Administration stated that she had no recollection of adverse event reports in 2011 involving coffee, but 2,000 adverse event reports pertained to energy drinks (Wilmore, 2012a). Moreover, tea and coffee are not commonly directly marketed to young persons as are energy drinks. Energy drink consumption levels have risen during the period that youth-oriented advertising for such products has been increasing. As consumption levels have risen, so have hospitalizations for consuming these products (Substance Abuse and Mental Health Services Administration, 2013).

These facts also address both the Canadian and American Beverage Associations' argument that caffeine levels in energy drinks are safe because the caffeine content of energy drinks and coffee are comparable (American Beverage Association, 2013a; Canadian Beverage Association, 2013b). Coffee consumption by youth may be an issue, but current research does not show it to be a problem.

In 2012, after five deaths were linked to the consumption of Monster brand energy drinks, the city attorney of San Francisco requested that the company Monster

Beverage substantiate its claims that their energy drinks are safe for consumption (Meier, 2012). In response, Monster Beverage stated that multiple medical studies support their claim that energy drinks do not contain a dangerous amount of caffeine. In addressing the death of a 14 year old with a severe heart condition whose family blamed her death on consumption of Monster Energy drinks, Monster Beverage cited two studies (Monster Beverage Corporation, 2013). The first was done by the US Military and showed that the fatal dose of caffeine for a person is between 10,000 and 14,000 milligrams, which is the equivalent of about 30 litres of Monster Energy Drink. Notably, this study only demonstrates the lethal dosage of a drug. This does not mean that other complications will not arise from smaller dosages, such as those that led to the tens of thousands of emergency room visits in the United States in recent years. Furthermore, there are news reports of young people dying after consuming less than ten energy drinks, and sometimes less than five (Hoflander, 2011). Assuming these energy drinks contained approximately 200 mg (Seifert, et al., 2013) of caffeine each, these deaths may have been caused after consumption of only 1,000 to 2,000 mg of caffeine, well below the US military study's lower bound of 10,000 mg. The second study found that 200 mg of caffeine did not lead to complications for persons with arrhythmia, or irregular heartbeats (Graboyes, Blatt, & Lown, 1989). Although this study was conducted in 1989, a 2011 literature review in the American Journal of Evidence confirmed that there is no reason to restrict moderate doses of caffeine for persons with arrhythmia (Pelchovitz & Goldberger, 2010). However, the review found that patients who are sensitive to caffeine, and patients who stated that caffeine triggers their arrhythmia, ought to abstain from consumption. Importantly, Monster Beverage's response did not address the fact that children likely have different responses to caffeine than the adults that were studied. As many medical experts have stated, the effects of caffeine on youth are still unknown. Furthermore, some studies indicate possible negative health outcomes for children, and so both precaution and more research are warranted regarding young people consuming energy drinks.

The American Beverage Association has made similar statements, arguing that less than half of the caffeine consumed by youth between the ages of 14 and 21 comes from energy drinks (2013b). The study cited was based on a survey that tracked 2,000 households over a two week period (Somogyi, 2010). The findings of this study included

that persons aged 2 to 13 consumed an average of 17.9 mg of caffeine per day from beverages other than tea and coffee, while persons aged 14 to 21 consumed an average of 33.2 mg of caffeine per day from beverages other than tea and coffee (ibid.). One concern about the reported amount of caffeine consumed by children aged 2 to 13 is under-reporting. Parents and data collectors for the study did not necessarily know what their children regularly consumed, since older children often have discretionary spending money that can be used outside their parents' purview. If a child makes decisions against their parents' wishes, such as purchasing and consuming energy drinks, the child may have the means to do so and will not necessarily tell their parents and/or data collectors when they do so. Furthermore, the averages discussed in this report give no indication if there are some children that consume high levels of caffeine. As argued by Health Canada medical experts, these children are at particular risk due to excessive consumption (Rotstein et al., 2013).

Finally, in arguing that energy drinks are safe, the Canadian Beverage Association has been citing an August 2013 publication by Health Canada employees who found that it is very unlikely that adults or most children would exceed the Health Canada recommended daily intake of caffeine, based on current consumption patterns (Rotstein et al.). The study acknowledged the lack of data on health hazards of energy drinks. Instead, it contains a hazard assessment for the individual ingredients found in most energy drinks. This comprehensive report contains a review of studies on the immediate physiological and psychological outcomes of caffeine consumption by adults. It also found that there is insufficient evidence to conclude that it is harmful to consume energy drink ingredients other than caffeine, such as taurine and guarana, at least in the short term. Previous studies have reached similar conclusions (Clauson et al., 2008). However, the authors of this study do not consider unknown, long term health effects on youth. Regarding short term health effects, the authors found that adolescents aged 12-14 may be at risk of significantly exceeding their recommended daily intake of caffeine (Rotstein et al., 2013). To investigate the risk of excessive consumption by youth, given lack of data on youth consumption, the researchers assumed that youths drink the same amount of energy drink as they do soda in a single sitting. The researchers found that, for adolescents aged 12 to 14 who have an average body mass of slightly below 50 kilograms, they are at risk for adverse effects to caffeine if they drink a standard 473 mL

energy drink, which may contain up to 180 mg of caffeine. Moreover, children under 12 years old have an even lower recommended daily intake of caffeine and so a 250 mL drink containing 80 mg of caffeine could result in excessive caffeine intake. However, the authors decided that this age cohort is significantly less likely to consume energy drinks because, unlike adolescents aged 12 to 14, children under 12 are less likely to use discretionary income without parental supervision. The authors also stated that marketing to youth increases the risk that such incidents will occur. As with other academic medical reports, this study also contains a recommendation for more research to address knowledge gaps about this subject.

In sum, the Health Canada report endorsed by the Canadian Beverage Association does not conclude that energy drink consumption is universally safe for Canadian youth. Instead, the authors found that certain age cohorts of children are at risk of negative short term health outcomes as a result of consuming energy drinks. Gender differences were not stated as significant. Furthermore, the age parameters of the cohort described by Health Canada should not be considered as set. Many children ages 11 years and younger have discretionary income they can use without parental supervision, and many adolescents aged 15 and older have a low body mass because they have not grown as much as their peers. The study also did not address the lack of research on long term negative health outcomes for youth drinking energy drinks. Nor did the researchers discuss medical literature which suggests possible adverse effects of energy drinks on youth, such as potential long term effects.

1.6. The Health Canada panel report

In 2010, Health Canada assembled a panel of experts to study safety issues surrounding energy drinks with high levels of caffeine available for sale in Canada at the time (Macdonald et al., 2010). This was in response to data on adverse reactions in Canada associated with energy drinks. The data was collected by the Canada Vigilance Program, a reporting system that detects potential safety problems for health products in the post-market period (ibid.). The panel consisted of experts in fields ranging from food science and drug safety to epidemiology. They issued a report answering four questions raised by Health Canada:

- Whether evidence exists indicating that Health Canada's requirements for energy drinks are inadequate.
- Whether specifically youth consumption of energy drinks ought to be regulated.
- Whether energy drinks ought to contain cautionary labelling or other risk mitigation strategies with respect to cardiovascular issues, such as arrhythmia or palpitations.
- Whether Health Canada ought to mitigate potential risks of energy drinks by taking steps to help consumers make informed choices when purchasing these drinks.

The panel found that energy drinks essentially constitute a stimulant drug that is sold in beverage form, often to children and adolescents. The panel's recommendations include reclassifying energy drinks as a regulated drug (NAPRA Schedule III) to be sold under the supervision of pharmacists, to make labelling stricter and more informative, and that single servings contain no more than 80 mg of caffeine, and energy drinks contain no more than 320 mg of caffeine per litre. The panel also recommended that Health Canada ensure that those who are under 18 years old do not consume energy drinks. The panel's reasoning behind the age limit was that, in the adverse drug reactions reported to Health Canada by the Canada Vigilance Program, a disproportionate amount of the most serious cases involved adolescents. It is unknown if these reactions were due to the large amount of young consumers, if they indicate that adolescents are at a relatively greater risk of experiencing dangerous effects, or if these events were a result of excessive consumption due to current dosages. Echoing the conclusion of the American Journal of Pediatrics' medical literature review, the panel stated that not enough evidence yet exists to allow the under 18 population to consume the current dosage, nor to provide a safe dosage amount for children or adolescents. Therefore the panel recommended a ban for persons under 18 years old.

Health Canada published a response to the panel's report (Health Canada, 2011b) outlining the actions it would take in light of this new information. These changes included a limit on the caffeine from all sources in energy drinks (400 mg/L, and 180 mg in a single serving container), increased labelling requirements due to a change in food classification, a mandate that containers state they should not be consumed by children and pregnant women, and a statement that the organization will continue to assess

energy drink safety for those under 18 years old. Regarding the reclassification from “natural health product” to “food” (Health Canada, 2011a), a food classification indicates that all ingredients of the product have a known food purpose, and that this is reflected in the quantities of ingredients (Health Canada, 2010). Canada’s Health Minister at the time stated that consumers think of energy drinks as soft drinks rather than health products (Schmidt, 2011a). Caffeinated energy drinks abiding by these regulations received a Temporary Marketing Authorization. This means that they can be sold across Canada under the new rules set out by Health Canada for five additional years while the government gathers data to assess these drinks (Health Canada, 2012b). In British Columbia, the only additional regulation is that energy drinks cannot be sold in schools, although they are available at nearby stores (HealthLink BC, 2013).

Critics, including panel members, see these policy changes as inadequate given the risks to children and adolescents. Claims have been made that regulations are not being enforced. In a 2013 interview, the president of the Canadian Medical Association stated that the amount of caffeine listed on a can of energy drinks does not include caffeine from all sources (Tenneriello, 2013). The president also restated his association’s support for an outright ban for youth below the legal drinking age, and compared the energy drink industry’s defence of its products to how the tobacco industry claimed that there was nothing wrong with their product (ibid.). Until more is known about the effects on adolescents and children, experts and medical associations such as the American and Canadian Medical Associations, the American Academy of Pediatrics, medical experts of the British Medical Journal (Oddy & O’Sullivan, 2009), the National Collegiate Athletic Association and the National Federation of State High School Association (Durbin, 2013) argue that further steps ought to be taken to reduce energy drink consumption by children and adolescents.

1.7. Conclusions

The literature review describes why youth consumption of energy drinks in British Columbia is a problem, and why the precautionary principle should be applied and youth energy drink consumption be reduced. When deciding whether or not to apply the

precautionary principle, Health Canada adheres to the following five principles (Government of Canada, 2003):

- The application of precaution is a legitimate and distinctive decision-making approach within risk management;
- It is legitimate that decisions be guided by society's chosen level of protection against risk;
- Sound scientific information and its evaluation must be the basis for applying precaution; the scientific information base and responsibility for producing it may shift as knowledge evolves;
- Mechanisms should exist for re-evaluating the basis for decisions and for providing a transparent process for further consideration; and
- A high degree of transparency, clear accountability and meaningful public involvement are appropriate.

The medical studies and expert views outlined thus far are meant to address the first three principles: health experts and authorities are familiar with society's chosen level of protection with respect to youth health, and are trusted with appraising and producing sound scientific information on the matter. Regarding the last two principles, the analysis and recommendations of this study include provisions for re-evaluation of these decisions, and their rationale is clearly outlined. Health Canada also has five principles for precautionary measures. Two of these principles are similar to principles two, three and four in the above list. As for the remaining three principles, the analysis in this study attempts to ensure that recommended policies are consistent with measures chosen in similar situations, that measures are cost-effective and generate a net benefit for society, and that among measures that meet all of the aforementioned characteristics, the least trade-restrictive measure is applied.

Children are a particularly vulnerable group in any society. Not only do they have less wisdom and cognitive ability to make good decisions when compared to adults, but the effects of children's bad decisions can be much more deleterious with respect to health (Seifert et al., 2011). The relatively small size of their bodies makes children more susceptible to factors that cause poor health outcomes. The effects of these factors often have a more severe impact and are experienced over a longer period of time because their bodies are still developing. Our society therefore has an obligation to take special precautions to protect children. Their vulnerability is reason enough to raise the

threshold of safety when considering limiting their behaviors. Adults may decide how much caffeine they choose to consume, but marketing a potentially dangerous product to children is much more questionable. In most developed nations, alcohol and tobacco use is restricted for youth for exactly these reasons. Young people often unwisely over-consume alcohol and other prohibited substances, the use of which can lead to long term negative health outcomes for children. Medical literature indicates that we have only a nascent understanding of what energy drinks can do to children, especially when consumed excessively. The literature points to the need for much more research to determine safe consumption levels for children. As energy drink consumption has increased significantly, so has the number of severe adverse reactions to consuming them, many of which involve youth. Considering how recently energy drink consumption has become widespread among youth, it may be some time until the long term negative effects that medical researchers find plausible are confirmed or disproven. Medical literature also indicates that future research may yield deleterious effects that have not yet been considered. For these reasons, energy drink consumption by youth ought to be reduced to protect public health until we are certain about safety issues.

Specifically, energy drink consumption by persons under 19 years old should be reduced as much as possible. Although adolescents and younger teens may be more vulnerable to the effects of caffeine than older, more physically developed youth, older youth can influence the behaviour of younger teens and adolescents when associating in places such as high schools. A study of tobacco use in Canada found that a third of smokers aged 15-18 and most smokers in grades 6 to 9 obtained their cigarettes through social sources (Reid et al., 2013). A comparison of schools in United States jurisdictions with a minimum legal drinking age of 18 versus schools in jurisdictions with a minimum legal drinking age of 21 found that the latter schools had lower consumption of alcohol among high school seniors (O'Malley & Wagenaar, 1990). Hence, targeting youth under 19 in consumption reduction efforts may be more effective than choosing a lower age. Furthermore, older teenagers should also be disincentivized from consuming energy drinks since many are much less physically developed than their peers. These beverages may contain up to 180 mg of caffeine in an average 473 mL container. According to Health Canada's recommendations, someone between the ages of 12 and 18 should not consume this amount of caffeine in a day unless they weigh over 72 kg.

Moreover, caffeine comes from many sources other than energy drinks, and therefore even one such energy drink may not be suitable for a 72 kg teenager. Given that older teenagers and adolescents often weigh far less than 72 kg, policies ought to be aimed at reducing youth consumption of energy drinks by persons under 19 years old.

2. Methodology

This study requires only gathering of secondary data. A cross-jurisdictional analysis examines the policies currently or previously employed in dealing with this issue in Canada, its provinces, and in other countries. Data collection included reports by, and transcripts from, governmental committees and panels that have investigated this issue. This determined the reasons for, and effectiveness of, past, present, and future policies regarding energy drink consumption by youth. Scanning medical journals and related publications revealed the stances of the relevant professionals on the policy problem, how pressing the issue is, and policy suggestions. Finally, publications by stakeholder groups with an interest in this issue were examined to understand the acceptability and thus feasibility of different policy options.

The cross-jurisdictional analysis encompassed studies and policies regarding energy drinks in Canada at the federal and provincial levels, the United States, the European Union, the United Kingdom, Australia, New Zealand, Argentina, Mexico and Uruguay. Canadian jurisdictions were examined to see whether other provinces interpret this issue as a problem, and to discuss how the issue is discussed and possible policy responses. High-income countries have been chosen because they have or have had bans on energy drinks, or have proposed regulations, and because of their similarity to Canada as developed nations with similar public health authorities. Hence, the different policies found in these case studies, and their justifications, may be applicable in Canada. Other European Union and Latin American countries were researched because they have bans on energy drinks, or have proposed regulations. Policy discussions in these countries may also be relevant to forming policy approaches to the energy drink issue in Canada. A high number of countries was examined because a preliminary scan indicated that there are many countries with little available data on energy drink regulation. Only four jurisdictions were found to have published a substantial amount of information on the subject: Canada, the United States, France and Australia.

Data collection included reports by, and transcripts from, governmental committees and panels that have investigated this issue. This divulged past, present, and upcoming policies regarding energy drink consumption by youth. Government regulatory documents such as those published by Health Canada and the American Federal Drug Administration were examined to understand current regulation processes regarding energy drinks and the justification behind them. Medical journals and related publications, such as the Journal of Pediatrics and the Canadian, American, and British Medical Association Journals were examined. These sources have been chosen because such publications have been cited in government inquiries and other debates on this issue.

The positions of stakeholders were determined by examining their publications and public statements, such as those made in committee hearings. Stakeholders include groups related to the energy drink industry, such as energy drink producers and the Canadian Beverage Association, energy drink distributors and their associations, public health associations such as doctors' groups and the Public Health Association of BC, the BC health authorities, the BC Ministry of Health, the Provincial Health Officer, the federal government including the Health Products and Food Branches Inspectorate, and the BC NDP and Liberal parties. Similar organizations were researched in other jurisdictions, such as the American Beverage Association, to investigate possible responses to policies by stakeholders.

Findings from the cross-jurisdictional analysis as well as the literature review were used to determine which policies are more effective in reducing the number of British Columbians under 19 consuming energy drinks.

3. Cross-jurisdictional findings

The cross-jurisdictional analysis yielded a variety of approaches taken to regulate energy drinks in the jurisdictions examined. Different governments assessed the issue of energy drink consumption safety in different ways². For example, in the United Kingdom, government authorities decided that no regulations are required beyond those that apply to all European Union countries. On the other hand, France has repeatedly attempted to ban or otherwise reduce the consumption of energy drinks. The need for ongoing research is a common theme in most jurisdictions. This research also yielded a common set of policy options that have been used with varying degrees of success. In France, an outright ban on Red Bull was successfully challenged in court. There is also some evidence regarding a lack of effectiveness of self-regulation in the United States. Moreover, government and stakeholder deliberation on chosen policies was examined for some jurisdictions.

This section examines these findings in detail and provides context for potential policy recommendations and their efficacy in reducing energy drink consumption among youth in British Columbia.

3.1. In BC and across Canada

3.1.1. Federal findings

In January 2013, all caffeinated energy drinks transitioned from being regulated as natural health products to being regulated as food (Canadian Food Inspection

² Research on policy approaches in Hungary, Estonia, Latvia, Mexico, Uruguay, Argentina and Turkey is found in Appendix A. The policies researched in these jurisdictions were not exceptionally different from policies included in this section. Also, the government structure of these seven countries is different from those of the countries included in this section.

Agency, 2013). Current regulations stipulate a maximum caffeine concentration in energy drinks of 400 mg/L, and no more than 180 mg of caffeine per serving (Health Canada, 2012b). Resealable containers only need to comply with this limit if their volume is over 750 mL (ibid.). Furthermore, energy drinks may not contain alcohol, and must contain additives such as taurine and guarana at specified levels (ibid.). Companies cannot market energy drinks or provide samples of them to children (ibid.). Notably, the Canadian Beverage Association Drink containers must have the following cautionary statements: “Do not mix with alcohol”, “Not recommended for children, pregnant or breastfeeding women and individuals sensitive to caffeine”, and “Do not consume more than [X] container(s)/serving(s) daily” or “Usage: [X] container(s)/serving(s) maximum daily”, where (X) pertains to Health Canada’s stipulated daily maximum intake of energy drink ingredients such as taurine (ibid.). The containers must also show total caffeine content from all sources and a statement of the maximum daily intake of the product (ibid.). It is recommended that caffeinated energy drinks display the required statements prominently (ibid.). Finally, claims implying health benefits from long term consumption have been designated as “not appropriate” (ibid.). It is not clear whether such claims are allowed. Claims about the product also cannot convey the idea that energy drinks are suitable for daily consumption (ibid.). The labelling requirements had to be met by December 2013 (ibid.).

In January of 2013, a Health Canada spokesperson stated that Health Canada is still considering a final risk-management approach (i.e. regulations) which will be decided in, at most, five years’ time (EU Food Law, 2013). At that point, Health Canada expects to have addressed information gaps regarding the safety of energy drinks, consumption patterns and caffeine exposure in consumers, the effectiveness of labelling as a tool for risk-mitigation, and consumers’ use and understanding of labeling information (Health Canada, 2012b). Health Canada has been conducting its own studies and solicited outside research to obtain data on these topics (ibid.). However, Health Canada has stated that details of research must be clearly outlined, and that research protocols must be agreed upon with Health Canada before outside studies intended for submission to Health Canada are undertaken (ibid.). Until the final regulations are decided, caffeinated energy drinks must have a Temporary Marketing Authorization to be sold in Canada. This licence requires meeting the above regulations,

as well as having to submit reports regarding any consumption incidents (ibid.). Although “consumption incidents” has not been clearly defined, it likely refers to adverse reactions to energy drinks about which manufacturers or distributors become aware.

In 2011, after Health Canada responded to the panel report, Health Minister Leona Aglukkaq stated the following: “I firmly believe that it’s up to individuals and parents to make their own decisions when it comes to what they eat and drink... Today’s announcement will ensure that parents have the information to make the best choice for themselves and their families” (Health Canada, 2011c). This indicates that, when the federal government finalizes its risk-management approach, it may be averse to proscriptive regulation such as a government ban on youth purchasing energy drinks. Such reticence is similar to regulatory responses in the United States.

3.1.2. Provincial findings

In April 2012, a Liberal MLA in New Brunswick introduced a bill that would require energy drink vendors to warn every customer about the hazards of consuming energy drinks (Government of New Brunswick, 2012). No indication of the bill’s progress was found except for a committee review one month later (Legislative Assembly of New Brunswick, 2012). Also in 2012, a provincial government survey found that 14% of adolescent students drank energy drinks 5 to 12 times in the past month, and 12% had consumed energy drinks 13 times or more in the past month (Office of the New Brunswick Chief Medical Officer of Health, 2013). In the report, the province’s Chief Medical Officer of Health states that energy drinks are associated with negative health risks, more research is needed regarding effects on youth, and therefore adolescents and children should not consume them. Energy drinks are not sold in New Brunswick schools (Canadian Beverage Association, 2013c). In May 2013, the provincial Health Minister publicly requested that the Chief Medical Officer discuss energy drink consumption by children with stakeholders (New Brunswick Department of Health, 2013b).

The following October, the Department of Health hosted a dialogue session involving health authorities, government departments, school districts, and professional

associations (New Brunswick Department of Health, 2013a). The provincial government is now reviewing feedback from stakeholders to develop a plan to address the issue. Although a report on the meeting has not yet been published, the presentations of Health Canada, the Canadian Beverage Association, and the provincial government, have been made public. Health Canada's presentation outlines current regulations, while the provincial government's presentation discusses concerns that were first raised with its 2012 report. The Canadian Beverage Association's presentation focused on youth consumption prevalence, which was described as unproblematic, and what manufacturers were doing to abide by and exceed regulation, such as voluntarily providing more information to consumers, being willing to work with authorities to continue doing so, and not selling their products in schools (Canadian Beverage Association, 2013c). Notably, energy drinks are already banned in many schools across Canada. The Nurses Association of New Brunswick reported that a ban on the sale of energy drinks to persons under 19 years old is one of the recommendations being reviewed by the provincial government.

In Nova Scotia, the provincial doctors' association supports a ban on the sale of energy drinks to persons below the legal drinking age (Doctors Nova Scotia, 2014). The association found that Nova Scotia youth were often consuming energy drinks despite warning labels against doing so (ibid.). In July 2013, Doctors Nova Scotia persuaded the Canadian Medical Society to adopt a similar resolution but for all of Canada (ibid.). The province's schools do not allow sales of energy drinks on their premises (Hammer, 2011). In Prince Edward Island, the province's chief medical officer has stated support for restrictions on minors buying energy drinks in response to concerns voiced by parents, teachers (CBC News, 2008) and medical associations (Globe and Mail, 2008). Similar to Nova Scotia, doctors' groups are in favour of a ban on minors purchasing energy drinks (ibid.) The president of the Prince Edward Island's medical society has stated that young people are vulnerable to advertising given that minors care less about their health than do adults (ibid.). In Newfoundland and Labrador, the federation of school councils called on the provincial government to not allow persons under 16 years old to purchase energy drinks (CBC News, 2008).

In Quebec, commercial advertising directed at youth aged 12 and under is prohibited under provincial law (Endossez la Coalition Poids, n.d.). The Quebec Federation of Home and School Associations (2011) supports the restriction of energy drink sales to persons under the age of majority. Almost no schools permit the sale of energy drinks (Institut national de santé publique du Québec, 2013). The Quebec Association of Sports Doctors supports a ban on selling energy drinks to persons under 14 years old (Association Québécoise des Médecins du Sport, 2010). In its response to Health Canada's 2011 regulatory announcements, the association (2011) stated that Health Canada was wrong to make the maximum amount of caffeine in a single serving 180 mg since Health Canada also states that 12 year olds should consume no more than 85 mg per day.

In Ontario, a 2011 survey conducted by the Centre for Addiction and Mental Health found that 19% of students had consumed at least one energy drink in the seven days prior to responding to the survey (Paglia-Boak et al., 2011). This number dropped to 12% in 2013 (Boak et al., 2013). Also in 2011, the province banned caffeinated beverages in school cafeterias (Hammer, 2011). In 2012, the Association of Local Public Health Agencies passed a resolution that the organization urge Health Canada and the provincial government to ban the sale and advertising of energy drinks to children and adolescents, to add a warning label that states "Energy drinks are not recommended for use during exercise or to rehydrate following exercise", and to allocate at least 25% of total packaging area to warning labels. In 2013, the City of Ottawa announced it would no longer sell energy drinks at city sports centers and arenas due to the concerns voiced by the Canadian Medical association regarding consumption by minors (CBC News, 2013).

Alberta Health Services (2010) has prepared a presentation kit for school teachers that aims to have students understand energy drink labeling, the effects of caffeine, and alternate strategies to increase and maintain energy levels. In British Columbia, energy drinks cannot be sold in schools (HealthLink BC, 2013). The provincial government has stated that children and teens should not drink energy drinks due to high caffeine content, and that caffeine has no place in a healthy diet for children (ibid.). A 2008 survey found that 8% of youth drank an energy drink the day before responding

to the survey, while 3% had drunk energy drinks twice or more (McCreary Centre Society, 2008).

As with many international jurisdictions, the regulation of energy drinks in Canadian provinces is in flux. Most provinces have either government or medical organizations calling for stricter regulation with respect to minors, with many calling for a ban on energy drinks sales to youth. Some prevalence data has been found. Many elementary, middle and high schools have banned the sale of energy drinks.

3.2. United States

In the United States, the Food and Drug Administration (FDA), the main public health regulatory agency, does not endorse a recommended maximum daily intake of caffeine. The agency recognizes the variability in people's sensitivity to caffeine, and thus only states that "Experts agree that 600 mg (four to seven cups of coffee) of caffeine or more each day is too much" (Wolf, 2013). Foods classified as beverages by the FDA may contain up to approximately 6 mg of caffeine per 30 mL (Wolf, 2013), which translates to a 355 mL soda containing a maximum of approximately 71 mg of caffeine. However, the FDA classifies energy drinks as dietary supplements rather than beverages and so this limitation does not apply (*ibid.*). Food products that contain caffeine must indicate this on the label, but the amount of caffeine does not have to be listed (Food Regulation Standing Committee, 2013). These are the only labelling requirements that apply to energy drinks (*ibid.*). Also, any serious adverse events resulting from consumption of dietary supplements must be reported to the FDA (Markey, 2013).

In response to five deaths and the increasing number of hospitalizations attributed to energy drinks, two senators began lobbying the FDA in April of 2012 to make regulation of energy drinks stricter (Durbin, 2013). The FDA responded to the senators' first letter by stating that it would look into violations of current regulations if they occurred, and that the agency was conducting a review of safety studies on caffeine but had not found new risks that may result in regulatory changes (Ireland, 2012). The senators sent another letter in September of 2012 since the FDA did not directly respond

to the senators' concern about the safety of young persons (ibid.) (Durbin, 2012). The FDA then stated that it was conducting an investigation into the five deaths attributed to energy drinks that had occurred over the past three years, since many of these people were minors (Mital, 2012). An FDA spokesperson was quoted as saying that the ongoing investigation occurred due to an influx of journalistic enquiries and the FDA wanting to appear transparent (Wilmore, 2012a). The FDA also stated that the medical literature it had reviewed indicated that, although American children and adolescents were, on average, not consuming excessive amounts of caffeine, variation in both caffeine consumption and sensitivity to caffeine in these populations would be considered in the FDA's ongoing review (ibid.).

In January of 2013, a third senator joined the original two to begin lobbying energy drink companies to include the total amounts of caffeine on their product labels (Meier, 2013a). In April, the three senators published a report suggesting policies for energy drink companies to better inform child and teenage consumers of energy drinks (Markey E. , 2013). These recommendations include listing total amounts of caffeine, to cease marketing to persons under 18 years old, and to prominently display the statement "This product is not intended for individuals under 18 years of age, pregnant or nursing women or for those sensitive to caffeine. Consult with your doctor before use if you are taking medication and/or have a medical condition" (ibid.). By April, the American Beverage Association had recommended to its members that they list caffeine content on their products (Wilmore J. , 2013). At least some companies have complied, such as Monster Beverage Corp. and Rockstar (Meier, 2013b). However, many of the most popular brands do not belong to the association (Pomeranz et al., 2013). Furthermore, Monster decided to disclose caffeine content on labels but sell the product in a category other than dietary supplements, which results in the company not being required to inform the FDA about serious adverse reactions to the product (ibid.).

According to the director of the FDA's Division of Dietary Supplement Program, to limit an ingredient such as caffeine in dietary supplements, the FDA must demonstrate that there is a significant or reasonable risk of injury or illness under normal conditions of use (Wolf, 2013). In May of 2013, the US Food and Drug Administration stated that they would investigate the effects of caffeine on children to determine acceptable dosage

amounts (U.S. Food and Drug Administration, 2013). This was triggered by the recent, large increase of added caffeine in products consumed by children and adolescents (ibid.). Regarding predicted outcomes of the FDA review, a former regulatory counsel for the FDA has stated that the FDA generally attempts to get manufacturers to change policy on their own, without implementing government regulation (EU Food Law, 2013). Another high ranking FDA official stated that age restrictions may be unlikely, whereas limits on caffeine are preferred, and that voluntary actions by the industry are preferred over regulations imposed by the agency (U.S. Food and Drug Administration, 2013).

In June, the American Medical Association adopted a resolution supporting the ban being placed on marketing energy drinks to persons under the age of 18 (American Medical Association, 2013) in order to “protect the health of American kids” (Reuters, 2013). In July, three companies, Red Bull, Rockstar, and Monster Beverage Corp., were criticized by four senators at a U.S. Senate commerce hearing for marketing to children under 12 years old, despite stating that they had not done so (Durbin, 2013). The senators urged the companies to go beyond these “baby steps” (Markey, 2013) and increase the age limit to 18, in support of the American Medical Association's decision (Durbin, 2013).

Some US states have seen lawmakers attempting to limit energy drink consumption by youth. In 2010, a bill in the state of Louisiana containing a ban on selling energy drinks to persons under 16 was rejected because it reportedly singled out energy drinks when other drinks contain similar amounts of caffeine (just-drinks.com, 2010). In August of 2012, the New York attorney general announced an investigation into three companies to see whether they violated federal laws by selling drinks as dietary supplements rather than as foods, which are more tightly regulated (Schwartz, 2012). Notably, an analyst for investment banking firm Stifel Nicolaus reported that, if this investigation resulted in tightened regulations with respect to label requirements and/or marketing, no significant change in energy drink sales should be expected (Ax & Geller, 2012). In March 2013, the attorney representing the city of San Francisco threatened Monster Beverage Corp. with litigation unless it reduced caffeine levels, provided warning labels, ceased promoting over-consumption and ended advertising to minors (Bouckley, 2013a). A countersuit was filed by the company the next month, and

dismissed the following December (Bouckley, 2013a; San Francisco City Attorney's Office, 2013). That year, a law was passed in Suffolk County, New York, to set up a public education campaign on the side effects of energy drinks, prohibiting their marketing to minors and their sales in county parks (News 4 New York, 2013). The bill was a modified version of a 2010 proposition to ban the sale of energy drinks to persons under 19 years old (ibid.). According to local lawmakers, the original bill was modified in order not to impede business (ibid.) and to work with companies rather than antagonize them with regulations (Morton, 2013). Also, a municipal government hearing was held in Chicago to discussing banning energy drinks, but it did not result in any regulation (Euromonitor International, 2013c).

Energy drink regulation in the United States is less strict than in Canada. Legal challenges have been filed throughout the country against energy drink manufacturers for not abiding by regulations. The FDA has been lobbied to increase regulation, and is conducting research on whether to do so. However, regulators such as the FDA prefer corporate self-regulation over increasing government regulation. For this reason, many state, county and municipal government efforts to tighten energy drink regulation have either failed or been modified to be significantly less strict. Self-regulation can be inconsistent and unpredictable. Recently, Consumer Reports tested the caffeine levels of 27 energy drinks in the United States (Castillo, 2012). Of the 16 products that voluntarily disclosed caffeine concentration in their labeling, five had 20% or more caffeine than listed (ibid.). A lack of compliance with food standards is especially worrisome when it concerns a youth safety issue.

3.3. European Union

In the European Union, there are regulations on energy drinks that apply to all member countries, and national regulations created within member countries. In 1999, the European Commission's Scientific Committee on Food (2003) stated that it was concerned about behavioural changes in youths, such as irritability and nervousness, which may result from an increase in caffeine dosage as a result of consuming energy drinks. A 2002 meeting of EU member states resulted in a change in labelling that was scheduled to become effective in 2004: beverages containing a caffeine concentration

higher than 150 mg/L were required to include both the statement “high caffeine content” and the amount of caffeine on the label (ibid.). However, the meeting resulted in a recommendation that the commission consider any new data on this issue (ibid.) but not take action such as setting upper limits for caffeine content (Simpson, 2004). In 2009, the European Food Safety Authority (2009) reported that taurine, a common energy drink ingredient whose safety was questioned by countries such as France, was not unsafe. In 2011, the European Parliament voted to change the required labeling for beverages with caffeine concentrations higher than 150 mg/L, other than tea or coffee, to “High caffeine content. Not recommended for children or pregnant or breast-feeding women”, which must be written in the same field of view as the product name, along with the caffeine concentration expressed in milligrams per 100 mL, by December of 2014 (European Parliament, 2011). That year, the European Food Safety Authority commissioned a literature review to assess the safety of caffeine in order to issue a scientific opinion (Zucconi, et al., 2013). In the fall of 2013, the agency published a study on consumption patterns discussed in the consumption prevalence section of this paper.

Energy Drinks Europe is a beverage association for energy drink manufacturers in Europe. Their voluntary code of practice is not to market to audiences with a majority of viewers under 12 years old, not to provide samples to this age group, and not to supply their products in vending machines to schools where this age group is a majority (Energy Drinks Europe, 2013).

In this section, France is analyzed separately because the French government has strongly opposed energy drink consumption for nearly two decades.

3.3.1. France

Red Bull is one of the most popular energy drinks in many countries. From 1996 until 2008, it was banned in France because the French Agency for Food Safety decided that studies on some of the ingredients, including caffeine, did not satisfactorily show that these substances did not pose a threat to public health (Anses, 2001). Consequently, a modified version of Red Bull was sold, with ingredients such as taurine either not present or reduced in concentration (Reuters, 2008). However, other energy

drinks were sold in France during this time (Euromonitor International, 2013d). French authorities may have feared that specifically Red Bull's aggressive marketing would result in excessive consumption of energy drinks in France (ibid.). In 2004, the European Court of Justice ruled that the French government could maintain the ban if France's own health experts advised this, despite evidence to the contrary from international studies (Frith, 2004). Four years later, the issue was revisited and the French government allowed Red Bull to be sold under its original formula since a European Union court determined that French health authorities could not provide satisfactory evidence to support claims about negative health effects (Reuters, 2008). The European Food Safety Authority's publications on energy drink ingredients thus far have not contained reason to justify a ban (EU Food Law, 2010a). France's health minister publicly stated that the government would continue monitoring Red Bull beverages and would again ban its sale if and when evidence supported this action (FLEXNEWS, 2008). When the original product returned to France, Red Bull was reported to have been planning aggressive marketing and associating its product with extreme sports (Pfanner, 2008).

In June of 2012, France's government food safety body began again issuing public warnings against energy drink consumption by pregnant women and children, and by anyone during physical exercise (Wilmore, 2012b). The agency stated that it had received reports of adverse effects, including deaths, as part of its ongoing investigation where consumers were requested to report any negative health outcomes to health professionals (ibid.). That December, the French parliament voted in support of a tax on energy drinks: 50 euros per 100 litres of energy drink containing 220 mg/L or more of caffeine (Lomas, 2012). The French constitutional court struck down the tax, stating that there was no "objective or rational criteria" for how the tax would address its objective of reducing energy drink consumption.

In September of 2013, the French government food safety body again issued warnings against energy drink consumption, and called for restrictions on advertising to vulnerable populations such as children (EU Food Law, 2013). The Union of European Beverages Associations responded by stating that its own guidelines already ensure that these concerns are addressed (ibid.). Their guidelines are very similar to those of the

aforementioned organization, Energy Drinks Europe. In October, the French parliament again voted in favour of a tax on energy drinks containing 220 mg/L of caffeine or more (Reuters, 2013). It was dubbed as the Red Bull amendment (ibid.). The outcome of this initiative is yet to be seen.

When energy drinks became popular in France, the French government banned Red Bull, the most widely consumed energy drink. In recent years, the government has actively discouraged French citizens from consuming all energy drinks, and has employed various strategies to reduce consumption of all energy drinks rather than singling out the more popular brands. However, such policy instruments have been repeatedly challenged in domestic and international courts, sometimes successfully. Although legal challenges should be anticipated any time the profits of large companies are affected by regulation, successful court challenges may indicate poor planning by decision-makers.

3.3.2. Other member countries

Like France, Italy also prohibited the marketing of energy drinks that had caffeine content exceeding a certain limit. Similar to the outcome for the French government, in 2003 the Italian regulation was overturned when a European Union court found that it had been implemented “without showing that that limit is necessary and proportionate for the protection of public health” (European Union, 2003).

Red Bull was also banned in Denmark until 2010 because of health experts’ recommendations (Kapner, 2004). In 2011, the maximum packaging size was increased to 500 mL (Euromonitor International, 2013e). Many Danish schools have banned energy drinks (IceNews, 2013). Some Dutch schools have also implemented bans (Dutch Daily News, 2010).

In 2012, Belgium’s public health authority reviewed the country’s 320 mg/L caffeine concentration limit (Superior Health Council, 2012). It recommended that the limit be lowered to 150 mg/L, and that the maximum amount of caffeine present in energy drinks be 80 mg per serving (ibid.). Regarding labeling, the agency agreed with Finnish health authorities that displaying only “High caffeine content” was insufficient,

and that energy drinks should also contain the warning “is not suitable for children, pregnant and lactating women and individuals sensitive to caffeine”, as is found on energy drinks in New Zealand and Australia (ibid. (p22)). The Belgian agency had previously recommended that children under 16 should not consume energy drinks (Superior Health Council, 2009) and that labels should also state “do not consume more than X units/day” where X is based on the 80 mg/day limit (ibid.). The organization also recommended that surveys to determine consumption patterns ought to be conducted on a regular basis, and warned that youth can consume excessive amounts of caffeine after only one energy drink (ibid.). Two years prior, a Belgian consumer research organization recommended an increase in labelling requirements (EU Food Law, 2010b). It also called for a restriction on energy drink advertisements that suggest social, sports or sexual success, and on advertisements to youth under 16 years old, especially at events attended by this age group where young people are employed to act as “ambassadors” for energy drink companies (ibid.), a strategy used frequently by Red Bull. A representative of the organization stated that “[t]he message of these energy drinks is to go beyond limits, to disobey the rules, which corresponds perfectly with what the young of today are looking for” (ibid.).

In the Republic of Ireland, the health minister convened a Stimulant Drinks Committee after an 18 year old died during a basketball game after drinking three Red Bull cans (Simpson, 2004). The committee recommended further research to determine consumption levels and establish a recommended maximum intake of caffeine, suggested that labelling caution against product consumption by vulnerable groups such as children under 16 years old, and cautioned against consumption associated with exercise (Finnegan, 2003). By 2007, in addition to EU regulations, Ireland required that energy drink labels state the caffeine concentration per 100 mL (Food Safety Authority of Ireland, 2007).

The United Kingdom has only EU energy drink regulations (Food Standards Agency, n.d.). However, in 2012 the health minister stated in parliament that although then-current scientific research regarding caffeine and energy drinks stated that health effects of caffeine were short-term, the government would continue researching the issue (Parliament of the UK, 2012). In November of 2013, a large chain of supermarkets

began a trial of banning sales of energy drinks to youths under 16 (Smithers, 2013). Other large supermarket companies stated that they would not be implementing such a policy (ibid.). The British Soft Drinks Association responded by stating that they believed that energy drink companies are only responsible for following the law and, as Canada's health minister has argued, for providing parents with information to decide their children's consumption habits (Bouckley, 2013b). Energy drinks are also banned in many schools in the United Kingdom (Sanghani, 2013).

In Germany, four ingredients have a maximum concentration in energy drinks (Federal Institute for Risk Assessment, 2008). The maximum concentration of caffeine is 320 mg/L (ibid.). In 2008, the Federal Institute for Risk Assessment advised that energy drinks must not be confused by youths as sports drinks, and that at-risk consumers such as children should be informed about risks. An EU-wide harmonised approach was recommended, and this occurred in 2011 with the aforementioned EU legislation. Finally, a draft law was proposed in 2010 that included a label warning against combining energy drinks with physical exertion or alcohol (EU Food Law, 2010c). It was opposed by an EU commission, which stated that the German government had not provided adequate evidence that would justify this health warning (ibid.). In 2012, a study on the regulatory control of energy drinks found that beverages sampled in Germany had caffeine concentrations below the legal limit (Down, 2012). Hence, research indicates that regulations are stricter and adhered to by manufacturers in Germany more so than in the United States, where energy drink regulation is less strict and there is evidence of less compliance (Castillo, 2012).

Before 2009, Red Bull was classified in Norway as a drug by health authorities (Dagbladet, 2009) and was available at pharmacies to teenagers 15 and older, where the product was dispensed by pharmacists (Oddy & O'Sullivan, 2009). Owners of convenience and grocery stores have advocated an age limit for purchasing energy drinks because they are popular among children (Dagbladet, 2009). As of May 2013, three large grocery retailers do not sell energy drinks to children under 14 years old (Euromonitor International, 2013f). The Norwegian Institute of Public Health warns against children consuming these products due to high amounts of sugar and caffeine (ibid.). Using Health Canada's recommended maximum daily caffeine intakes, the

agency assessed that lightweight youth can consume excessive amounts of caffeine by consuming only small amounts of energy drink (Norwegian Scientific Committee for Food Safety, 2005).

In Sweden, major grocery retail chains have age limits between 15 and 18 years old for selling energy drinks (Euromonitor International, 2013f). 7-Eleven is among them (just-drinks.com, 2009). These policies were in part a response to new flavors, product positioning and packaging sizes that may have been perceived as targeting youth (Euromonitor International, 2013g). As in Norway, Red Bull responded to these policies by stating that its product is not recommended for children, and that it does not market to children (ibid.). In Sweden, labelling must also include warnings against consumption during exercise or with alcohol (Oddy & O'Sullivan, 2009). The Swedish National Food Administration has recommended these two policies in response to three deaths in 2001 that were associated with energy drink consumption (BBC News, 2001). Some municipalities have banned the sale of an energy drink whose manufacturers claim that its product helps reduce weight (Euromonitor International, 2013g). The Swedish Consumer Agency is currently investigating whether this claim is against regulations (ibid.).

In Finland, the government food safety authority decided that current EU labelling requirements are insufficiently effective in protecting caffeine-sensitive consumers (Finnish Food Safety Authority, 2010). As a result, energy drink labels in Finland must state the maximum number of servings or cans that can be consumed in a day, and the statement "Not recommended for children, pregnant women or people sensitive to caffeine" (ibid.). Marketing of energy drinks must "take into account" children, persons sensitive to caffeine, and pregnant women (ibid.). It is uncertain what this phrase entails. Finally, energy drinks are subject to a national excise duty, although this may not be due to health concerns (European Union, 2012).

Across the EU, countries have implemented a variety of policy tools to curb energy drink consumption, and have pursued this goal with varying levels of concern voiced by regulators. However, there are very few reports on the effectiveness of these different policy tools. Some of these approaches were considered subsequently in this

report. Throughout the EU, government health agencies have stated a concern that young teens are the youth demographic most likely to consume excessive amounts of caffeine. The most common regulatory changes that have occurred to limit youth consumption of energy drinks in the jurisdictions examined have been increased labelling requirements. Lower caffeine concentration limits have also been recommended, although no EU state has successfully implemented them. Many government health authorities recommend age-specific bans, but only some private retailers have implemented these. Moreover, regulations have been successfully challenged on the basis of insufficient evidence or whether the means are appropriate for their purpose, as in the case of France, Italy and Germany. Finally, in comparison to the United States where corporate self-regulation has not been followed, government regulation in the EU has been shown to be more effective in obtaining compliance.

3.4. Australia and New Zealand

In August of 2013, a government committee representing both Australia and New Zealand published an invitation for public comments on policies governing caffeinated foods (Food Regulation Standing Committee, 2013). The committee stated that the impetus for this review was that the regulation of caffeine is currently being reviewed and modified in Canada, the United States and Europe, and so caffeine regulation in Australia and New Zealand may not reflect current best practices (ibid.). In these two countries, energy drinks must contain a caffeine concentration of no more than 320 mg/L, including caffeine from the common ingredient guarana (ibid.). Labels must state that the drink contains caffeine, that the product is not recommended for pregnant or lactating women, individuals sensitive to caffeine and children, and that no more than the recommended amount should be consumed in a day (ibid.). Energy drinks do not have to list the amount of caffeine they contain (ibid.). The main beverage associations in Australia and New Zealand have adopted a commitment not to make energy drinks available in secondary and primary schools, not to promote mixing them with other beverages, not to market or advertise them directly to children, and not to promote their excessive consumption (ibid.). In South Australia, energy drinks are banned from schools (Government of South Australia, 2013).

Similar to the Canadian and American Medical Associations, due to evidence that associates energy drink consumption with negative health outcomes in youth, the Australian Medical Association (2013) has called for regulation that either limits sales of energy drinks or reduces the amount of caffeine in them so that young people consume less caffeine. The association recommended that caffeine limits should be 130 mg/L (Morton, 2012). A cardiologist in the medical school at the University of Sydney has called for the same health warnings that exist on caffeine tablet packaging to be listed on energy drink labels, as well as the phone number for Australia's national poison control center (Reportage, 2013). The president of the Australian Medical Association has also called for clearer labelling on cans (McDonald, 2012). As in other countries, energy drink companies aggressively advertise in Australia at rock concerts, motor sport races and extreme sports events (Eurmonitor International, 2013h). Young adults are also the target consumers (ibid.). The Sydney cardiologist also called for an age restriction on purchasing energy drinks, community education, and the consideration of graphic labeling such as that on cigarette cartons (Reportage, 2013). In response to these suggestions by medical experts, the Australian Beverages Council argued that, if energy drinks are thusly regulated, so should coffee and chocolate due to their similar levels of caffeine (Morton, 2012). This mirrors arguments put forward by the American and Canadian Beverage Associations.

In 2009, a New South Wales Food Authority found that 77 percent of energy drinks contained more than the legal limit of caffeine (Reportage, 2013). Some drinks were removed from the market, and subsequent testing showed that all energy drink companies had become compliant (ibid.). This is further evidence that a strict regulatory environment, unlike that of the United States, results in regulatory adherence. The state government also announced that they were considering a ban on some energy drinks due to reports of adverse effects (just-drinks.com, 2009).

The positions of beverage associations, the opinions of medical experts, and the regulations pertaining to energy drinks in Australia and New Zealand are similar to those found in the other jurisdictions examined. As in the case of Canada, the two countries are actively reconsidering existing regulations and accepting input from organizations outside government. Unlike Canada, which is only accepting studies whose terms have

been agreed upon before they are carried out, regulators in Australia and New Zealand are seeking a much wider variety of public input in shaping new regulations.

3.5. Summary

Table 3. Summary of past and present policies found in cross-jurisdictional analysis

Jurisdiction	Regulations on energy drinks (past and present)
Canada:	<ul style="list-style-type: none"> - Adverse events must be reported - Caffeine content on label - Cannot market to children - Maximum caffeine concentration - Ongoing government research into health effects of energy drinks - Various school bans - Warning labels for vulnerable groups
United States	<ul style="list-style-type: none"> - Adverse events must be reported - Ongoing government research into health effects of energy drinks - Various school bans
European Union	<ul style="list-style-type: none"> - Caffeine content on label - Warning labels for vulnerable groups
France	<ul style="list-style-type: none"> - Ban on specific energy drinks (encountered legal challenges) - Publicized warnings by government against consuming energy drinks - Tax on energy drinks (encountered legal challenges)
Italy	<ul style="list-style-type: none"> - Ban on specific energy drinks (encountered legal challenges)
Denmark	<ul style="list-style-type: none"> - Ban on specific energy drinks - Various school bans
Netherlands	<ul style="list-style-type: none"> - Various school bans
Belgium	<ul style="list-style-type: none"> - Maximum caffeine concentration
Ireland	<ul style="list-style-type: none"> - Caffeine content on label
Germany	<ul style="list-style-type: none"> - Maximum caffeine concentration
Norway	<ul style="list-style-type: none"> - Ban on youth purchase of energy drinks
Sweden	<ul style="list-style-type: none"> - Municipal bans on specific energy drinks - Warning labels for vulnerable groups
Finland	<ul style="list-style-type: none"> - Tax on energy drinks (not known if related to health concerns) - Warning labels for vulnerable groups
Australia & New Zealand	<ul style="list-style-type: none"> - Caffeine warning on labels - Government has invited public comments - Maximum caffeine concentration - Ongoing government research into health effects of energy drinks - Various school bans - Warning labels for vulnerable groups

Nota bene, Table 3 should be considered incomplete due to the lack of published regulatory information and language differences between the researcher of this study and the jurisdictions analyzed.

Broadly speaking, the cross-jurisdictional analysis shows that six policy approaches have been implemented or at least considered in the jurisdictions examined. Taxation of energy drinks has been used to disincentivize the purchase of these products by raising the cost of consumption. Bans have been implemented in an attempt to prevent access to either specific energy drinks or to prevent youth consumption. Regulation to reduce caffeine concentration has been used for the same purposes. Product labels have been regulated in order to better convey health concerns to consumers and to prevent vulnerable groups from consuming energy drinks. Marketing restrictions regarding youth have been considered and implemented in some jurisdictions. Finally, educational campaigns are being used in most jurisdictions. These six policies were considered for reducing youth energy drink consumption in British Columbia.

The research also yielded information regarding regulatory environments, policy justifications, the effectiveness of some policies, causes of legal challenges, and stakeholder views. This information was used in evaluating policies.

4. Criteria & Measures

This section outlines the criteria and measures that were used to assess policy options to prevent youth consumption of energy drinks. Four criteria were used: effectiveness, cost, anticipated stakeholder acceptance and implementation complexity. Each policy option received a rating of high, medium or low for each of the criteria. Notably, a preferred policy had “high” ratings for the effectiveness and anticipated stakeholder acceptance criteria, and “low” ratings for the cost and implementation complexity criteria. Also, there exist very few evaluations of policy initiatives to prevent energy drink consumption specifically (Institut national de santé publique du Québec, 2013). Little to no data exists regarding the effectiveness of such policy instruments with respect to youth consumption. Hence, data from studies on reducing alcohol, tobacco and junk food consumption were extrapolated to assess potential similar policies for energy drinks. First, the criteria and measures were explained. They were then be applied to the policy options for evaluation. Table 4 summarizes the criteria and measures.

Table 4. Summary of the criteria and measures used to evaluate policy options

Criteria	Description	Measures	Methodology
Effectiveness	The primary objective of every policy is to reduce consumption of energy drinks by British Columbian youth below the legal drinking age as much as possible, and to do so as soon as possible.	1) Number of energy drinks consumed by youth. <i>High:</i> ≥50% decrease <i>Medium:</i> 20% - 49% decrease <i>Low:</i> <20% decrease 2) Amount of time for policy to reach maximum effectiveness. <i>High:</i> <1 year <i>Medium:</i> 1 - 2 years <i>Low:</i> >2 years	Research on impacts of policies meant to reduce prevalence of using tobacco products, drinking alcohol, and consuming junk food.
Cost	Cost of policy option based on the change in budget required for implementation.	Dollar amounts. <i>Low:</i> <\$20,000 <i>Medium:</i> \$20,000 - \$50,000 <i>High:</i> >\$50,000	Cost estimates for public education, label creation, and other labor required for the implementation of the policy.
Anticipated stakeholder acceptance	Acceptability of policies to stakeholder groups.	Anticipated stakeholder positions toward policy option. <i>High:</i> Mostly in approval of, <i>Medium:</i> Mostly indifferent to, <i>Low:</i> Potentially in opposition to, each of the policy options.	Positions of -Political parties -The general public -Industry groups -Provincial health authorities -Public health associations
Implementation complexity	The work required to implement a policy option, and the degree of difficulty of the work.	Qualitative measure of change required or complexity. <i>Low:</i> Low complexity <i>Medium:</i> Moderate complexity <i>High:</i> High complexity	Inferences from reviews of similar policies, consideration of coordination and administration requirements, and consideration of potentially successful legal and trade based challenges.

4.1. Effectiveness

The primary objective of every policy option is to reduce consumption of energy drinks by youth below the legal alcohol drinking age as much as possible. Reducing consumption will decrease the known and unknown deleterious effects of high caffeine consumption. Policies aimed at reducing youth smoking in the United States led to a 50% reduction in the number of high school students that smoked from 1997 to 2011 (Center for Disease Control and Prevention, 2013). Similar policies led to a 48% reduction in the number of 15 to 17 year old smokers in Canada from 2001 to 2011 (Janz, 2012). Considering that these results occurred after youth consumption bans were already in place, I estimate that the highest possible reduction of energy drink consumption prevalence by youth induced by a policy measure is over 50%.

Measure 1: The volume of energy drinks consumed by youth.

- *Highly effective:* Can decrease the volume of energy drinks consumed by youth by over 50%
- *Moderately effective:* Can decrease the volume of energy drinks consumed by youth by 20% - 49%
- *Limited effectiveness:* Can decrease the volume of energy drinks consumed by youth by less than 20%

Furthermore, given the known and unknown harms of energy drink consumption by youth as well as the indications of rapidly increasing consumption prevalence, consumption reduction ought to occur as soon as possible. Health Canada is conducting its own investigation into this issue but has stated that, unless new scientific data warrants it, new regulation regarding youth consumption of energy drinks should not be expected for a few years' time. Hence, the time required for a policy to become effective is also important. The amount of time after implementation for a policy to reach its maximum effectiveness was therefore be incorporated into the effectiveness rating. Of the options considered, education and media components of anti-smoking strategies were found to take the longest amount of time to impact behaviour, between 18 and 24 months after implementation (Mozaffarian et al., 2012). Hence, any option that takes

more than two years to reach maximum effectiveness was ranked as low in effectiveness with respect to this second measure.

Measure 2: The amount of time after implementation for a policy to reach its maximum effectiveness.

- *High*: Less than 1 year.
- *Medium*: Between 1 and 2 years.
- *Low*: More than 2 years.

Nota bene, the first measure is weighted more heavily than the second. Although timing is important, given the risks to youth, decreasing the amount of energy drink consumed by youth is paramount.

4.2. Cost

The cost of each policy option pertains to the total change in budget to government departments with respect to the creation and implementation of all required aspects of a policy option. The ranges of the measure were established after data was obtained on the approximate costs of each option. Notably, implementation costs are considered but not future costs, such as those experienced as a result of legal challenges. Such concerns are considered as part of the implementation complexity criterion.

Measure: Dollar amounts.

- *Low*: Requires less than \$20,000 in additional funding.
- *Medium*: Requires between \$20,000 and \$50,000 in additional funding.
- *High*: Requires more than \$50,000 in additional funding.

Nota bene, if a policy option is even moderately effective, it will likely reduce healthcare costs by more than \$50,000, such as by reducing emergency room visits related to energy drink consumption. The high/medium/low ratings should therefore be understood as relative measures that allow the decision-maker to choose a lower cost option. Given that no policy was determined to cost much more than \$50,000, the cost

criterion should be weighted less than other criteria and not considered prohibitive in policy selection.

4.3. Anticipated stakeholder acceptance

In this study, stakeholders are citizens, groups, organizations and businesses that may be affected by a proposed policy and have the ability to either complicate or advance the policy.

The following entities are the stakeholders whose positions were considered:

- Political parties
- The general public of British Columbia
- Industry groups
- Provincial health authorities
- Public health associations

Some policy options, such as a ban and tax, may be politically contentious. It is therefore important to consider opposition or support from the BC Liberal and NDP parties. The federal government's position is also considered.

Some of the policy options impact the public greatly as taxpayers, parents, youth and consumers whose liberty is affected. The public is therefore considered independently as a stakeholder.

“Industry groups” refers to energy drink manufacturers, beverage industry associations and retail stores and their associations that are involved in selling energy drinks in British Columbia.

“Provincial health authorities” refers to provincial government officials and organizations that are engaged in health care. They include the Ministry of Health, regional health authorities and the Provincial Health Officer.

“Public health associations” refers to groups that are concerned with public health and have authority on the matter. They include the Canadian and British Columbia Medical Associations, the Canadian Public Health Association and the Public Health Association of BC.

Measure: Stakeholders were be assessed as mostly in approval of, mostly indifferent to, or potentially in opposition to, each of the policy options.

- *High:* Most stakeholders are in approval of the policy option.
- *Medium:* Most stakeholders are indifferent to the policy option.
- *Low:* Most stakeholders are potentially in opposition to the policy option.

Organizational mandates, public statements on the issue of youth energy drink consumption or related health issues, and stated positions pertaining to similar policies were considered in determining this measure. Stakeholders were not interviewed because a preliminary scan of materials published by these stakeholders indicated that their positions could be inferred from this information, without interviews. Also, a high number of stakeholders was considered to ensure that unanticipated opposition would not be encountered in the implementation of a policy.

4.4. Implementation complexity

Implementation complexity refers to the amount of work required to implement a policy option, and the degree of difficulty of the work.

Measure: The measure for this criterion consists of an assessment of how different the proposed policy is from the status quo; if the policy requires cooperation or consultation with multiple groups; if new or amending legislation is required; and the likelihood of successful legal or trade based challenges

- *Low:* The option is similar to the status quo, requires little to no consultation or cooperation with multiple groups, requires no new or amending legislation, and/or is unlikely to encounter successful legal or trade based challenges.
- *Medium:* The option is somewhat different from the status quo, requires some consultation or cooperation with multiple groups, requires minor changes to legislation, and/or may encounter successful legal or trade based challenges.

- *High*: The option is significantly different from the status quo, requires substantial consultation or cooperation with multiple groups, requires new legislation, and/or is likely to encounter successful legal or trade based challenges.

5. Policy Options and Evaluation

This section outlines and evaluates policy options based on the above criteria and measures. A summary is found in subsection 5.5. All of the following policy options are intended to be implemented by the provincial government, which has the power to regulate the distribution of energy drinks (Intergovernmental Affairs, 2010; Quebec Coalition on Weight-Related Problems, 2012). Excluded policy options are found in the appendix.

5.1. Option #1: A tax on energy drinks

A tax of \$3.17³ per litre on energy drinks addresses the problem of youth consumption of energy drinks by increasing sales prices to disincentivize their purchases. This policy would ensure that youth encounter higher prices for energy drinks at all points of sale in British Columbia. To increase public acceptance, it is important that it is accepted as a tax measure to promote healthy lifestyles for youth. The implementation of this policy should therefore include a communications strategy involving a press release and official statements to shape public awareness about the purpose of the tax.

Effectiveness:

Measure 1: High.

Studies of taxes on alcohol, tobacco, and junk food have shown that taxes are effective in reducing purchases of these products. A meta-analysis of 132 studies found

³ See discussion of the first effectiveness measure for how this number was calculated.

that the median price elasticity⁴ for all types of alcoholic beverages (i.e. Beer, wine and spirits) was -0.82 in the long term and -.52 in the short term (Anderson, Chisholm, & Fuhr, 2009). A study on changes in Canadian cigarette prices between 1994 and 2006 found that participation elasticities⁵ for youth aged 15 to 19 years old ranged from -0.1 to -0.3, and -1.5 to -2.0 for children aged 10 to 14 years (Sen & Wirjanto, 2010). Regarding junk food, a Norwegian study determined that the price elasticity for soda was found to be -1.60 for those who had between 90% and 95% of the highest soda consumption, -1.48 for those who had between 75% and 90% of the highest soda consumption, -1.05 for those who had between 50% and 75% of the highest soda consumption, -0.77 for those who had between 25% and 50% of the highest soda consumption, and -0.62 for the lowest 25% of soda consumers (Gustavsen, 2005). The Rudd Center in the United States found that the price elasticity of soft drinks was -1.15 (The Rudd Center for Food Policy and Obesity, 2009). Another U.S. study found that low-income households reduce purchases of sugary beverages by 8% in response to a 10% increase in price (Lin & Guthrie, 2007). A study published in the health policy journal *Health Affairs* determined that a 1-cent per ounce tax on sugar-sweetened beverages would result in a 15% decrease in consumption among adults (Wang et al., 2012). Hence, a 12 oz (355mL) drink that costs one dollar would have the equivalent of a 12% tax. Finally, a study in a Boston Hospital cafeteria found that a soft drinks price increase of 35% led to a 26% drop in sales of soft drinks, but a 20% increase in diet soft drinks and coffee (Block et al., 2010). When Hungary⁶ introduced a tax equivalent to 1.18 USD per liter on beverages with a caffeine concentration higher than 10 mg per 100 mL, an unspecified number of customers were reported to have either stopped consuming energy drinks or begun purchasing cheaper brands (Euromonitor International, 2013i).

⁴ In other words, a 1% increase in price leads to a 0.52% reduction of alcohol purchased in the short term, and a 0.82% reduction in the long term

⁵ In other words, for every 1% increase in the price of cigarettes, there was a 1.5% to 2% decrease in the number of children aged 10 to 14 years who smoked any amount cigarettes, and a -0.1% to -.3% decrease in the number of teens aged 15 to 19 years who smoked any amount of cigarettes.

⁶ See Appendix A for more information about energy drink policies in Hungary.

Some of the above research indicates that a tax would reduce consumption more so as the age of the consumer decreases, and as the consumer's regular amount of consumption increases. In other words, a tax would be most effective on heavy and younger consumers who are the most likely to experience negative health outcomes. Furthermore, youth from poor families in the United States are twice as likely to consume energy drinks as youth from more well off families (Han & Powell, 2012). Hence, although this tax is regressive, this quality would result in further targeting of heavier consumers and therefore higher effectiveness. A rough approximation of the average price elasticity for alcohol, tobacco and junk food products with respect to youth is therefore a minimum of 1. Hence, to reduce the amount of energy drinks consumed by young persons by 50% or more, the proposed tax should increase the price of energy drinks by at least 50%.

Currently, British Columbian retailers have discretion in determining the prices at which they sell energy drinks. For example, while independent convenience stores often sell individual half-litre energy drinks for close to \$4, gas stations often sell two such drinks for \$4. Therefore, a tax based on volume rather than sale price would reduce retailers' ability to mitigate the effectiveness of this policy by lowering the sale price and thus the tax imposed on the consumer. Considering that 473 mL energy drinks usually cost between \$2 to nearly \$4, achieving a 50% increase in price for a product that costs \$3 per 473 mL requires a tax of \$3.17 per litre. Assuming that the price elasticity of energy drinks for youth is at least 1, a 50% increase in energy drink price would result in a decrease in energy drink consumption by at least 50%. Given that such taxes have an added effect for heavy and younger consumers, a tax of \$3.17 per litre of energy drink is expected to reduce youth consumption by over 50%.

This tax would be applied to beverages based the concentration of caffeine. Consequently, an added effect of this may be that some energy drink manufacturers change their product formulas and decrease caffeine amounts in order to avoid this tax.

As in the case of cigarettes, cross-provincial smuggling may be a concern when a tax significantly increases the price of a product. However, at an average cost of \$3, unlike cigarettes, energy drinks are not high value items and therefore do not offer a

similar profit incentive to potential smugglers. Moreover, they are larger and weigh much more than cigarettes, making transport relatively difficult. Finally, youth therefore cannot purchase and store large quantities of this contraband as easily.

Measure 2: High.

Many of the aforementioned price elasticity studies reported changes occurring in the same year that taxes took effect. Hence, a tax is expected to reach its maximum effectiveness within a year.

Cost: Low.

Given that a tax would increase government revenue, this option could pay for itself. The cost would still likely be low if revenue were reinvested to fund related initiatives.

Implementation complexity: Medium to High.

This option likely requires coordination with many groups to ensure retailers implement the tax. A tax would require legislation as well. Legal challenges should be anticipated such as those experienced by the French government, where manufacturers alleged that trade agreements were violated.

Anticipated stakeholder acceptance: Low.

Regarding political parties, the spokesperson for BC's Finance Minister stated in July of 2013 that the minister was not considering a tax on sugary drinks, but welcomed other ideas (Korstrom, 2013). However, the opposition could be in favour of a tax: in 2011 a NDP leadership candidate proposed a 25% tax on sugar-sweetened beverages, including energy drinks, the revenue from which would be reinvested into an educational campaign (Hui, 2011). Regarding public acceptability, 77% of the Quebec population was found to be favourable to a tax on energy drinks and soft drinks (Réseau du sport étudiant du Québec, 2012). However, British Columbians may be more opposed to new taxes at the moment than Quebecers due to the recent controversy about the

province's Harmonized Sales Tax. The money could be reinvested to increase palatability. A 2010 survey by the Public Health Association of Quebec found that close to 70% of Canadians supported a tax on sugar-sweetened beverages if tax revenues were reinvested in obesity prevention and promotion of healthy lifestyles (Quebec Coalition on Weight-Related Problems, 2012). BC's tobacco tax is approximately half the cost of a pack of cigarettes before HST is applied (Physicians for a Smoke-Free Canada, 2014). However, one should be very cautious before assuming that a tax that is effectively 50% of the sale price of energy drinks may therefore be perceived as appropriate by the public. Another study found that only one in three Canadians were found to be willing to pay a 50 cent tax on sugar-sweetened beverages if the money was invested in obesity prevention (Pellerin, 2011). Hence, it is unknown how much public support this policy would receive. Public support may even be low since the policy is meant to target young people, but affects all energy drink consumers. The public may perceive this policy as unnecessarily broad in reaching its goal.

Regarding industry groups, when a tax on sugary drinks in BC was proposed in 2013, representatives for the Canadian Beverage Association and retail outlets like 7-Eleven Inc. stated that they opposed new taxes and preferred public education (Korstrom, 2013). Regarding provincial health authorities, the Provincial Health Officer stated that taxes are necessary to curb consumption of sugary beverages (Kendall, 2010). However, he also stated that the tax would have to be substantial and would therefore not be very politically palatable (*ibid.*). Similarly, when alcoholic energy drinks were legal in the province in 2012, the Provincial Health Officer stated that increasing prices would reduce the amount consumed, but that doing so would be "extraordinarily unpopular" (Ackermann, 2012). BC Provincial Health Authorities have stated that energy drinks are not considered safe for children (Fraser Health, 2011). Considering their positions as discussed in the literature review, public health associations would likely be in favour of this policy. In sum, although many stakeholders would support this measure, the public may not support it since it targets all energy drink consumers and not just youth, and the BC Liberal Party may therefore view this as politically risky and be unlikely to adopt such a tax.

5.2. Option #2: Youth purchasing ban

Implementing a minimum legal drinking age would mean that youth under 19 years old are not legally permitted to purchase or consume energy drinks. Retailers that sell energy drinks to youth should receive significant fines, possibly up to a few thousand dollars. Tobacco enforcement officers throughout British Columbia would ensure compliance just as they incorporated enforcement of trans fat regulations into their work in 2009.

Effectiveness:

Measure 1: High.

A meta-analysis of 132 studies on changes to minimum age drinking laws between 1960 and 1999 found that lowering the legal drinking age reduces youth drinking. A meta-analysis of 241 analyses of the effects of minimum age drinking laws from 1960 to 2000 also found an inverse relationship between the minimum drinking age and alcohol consumption (Wagenaar & Toomey, 2002). However, there is insufficient data to determine the effects on specific groups, such as 19 year olds who could drink when New York State's minimum legal drinking age was 18, but not when it was 21 (ibid.). There is also insufficient data to determine exact decreases in alcohol consumption caused by drinking laws (ibid.). One econometric study predicted that enactment of a uniform minimum drinking age of 21 across the United States, where the minimum age varied and youth could often drive across state lines to obtain alcohol, would result in a 28% reduction in frequent young drinkers and an 11% reduction in the number of fairly frequent drinkers (Coate & Grossman, 1988). Studies on the effects of changing minimum legal drinking ages on alcohol-related accidents were also examined. When New Zealand lowered its minimum legal drinking age from 20 to 18 years old, in one central city emergency department, the number of persons aged 18 and 19 years old that were intoxicated when admitted to emergency rooms increased by 50% in the year after the law changed (Everitt & Jones, 2002). A reduction in the drinking age for beer from 21 to 18 years old was associated with an 11% increase in motor vehicle fatalities for that age group in the 48 continental states (Cook & Tauchen, 1984). In

Arizona, the lowering of the drinking age from 21 to 19 years old resulted in an increase of traffic fatalities by over 35% (Epperlin & Krieg, 1983).

From 2000 to 2006, Canadian smokers encountered an increasing number of restrictions on where they could smoke, such as workplace and public spaces smoking bans (Shields, 2007). Over the same period, the number of daily and occasional smokers in Canada declined by 27% (ibid.). The authors of this study stated that the bans may have reduced smoking prevalence (ibid.). Notably, within the same time period, the number of smokers aged 12 to 19 years old declined by 17.4% from 2003 to 2005 (Statistics Canada, 2013). Another study found that the number of students who first tried smoking was associated with a higher prevalence of smokers in a school (Poulin, 2007). On the other hand, studies on the effects of youth access laws in the United States before the year 2000 showed that youth still accessed tobacco products using social sources (e.g. Family members and older friends) and from retailers that did not abide by these laws (Ling, Landman, & Glantz, 2002). However, a 2007 study by the World Health Organization considered this research and nonetheless recommended prohibiting banning tobacco sales to youth as part of wider strategy to curb youth smoking. Significant penalties to retailers for illegal sales were also recommended (Barbour & Dobbe, 2002). Notably, American retailers are more likely to sell tobacco products to minors than Canadian retailers. 84% of retailers refused to sell to 15-17 year olds across Canada in 2009 (Ontario Tobacco Research Unit, 2013), whereas nearly half of high school students who tried to buy cigarettes in the United States were able to do so in 2006 (Eaton, et al., 2005). Also, penalties to retailers who would sell youth energy drinks must be sufficiently high to act as a deterrent (Vancouver Coastal Health, 2011). In British Columbia, retailers caught selling tobacco to minors receive fines up to \$5,000 and a 180-day ban on selling tobacco to anyone (ibid.).

In extrapolating this data to a potential ban on energy drinks, many qualitative differences between alcohol, tobacco and energy drinks should be considered. Youth desire for alcohol and tobacco may be significantly higher than for energy drinks. Youths often drink alcohol to socialize and to have fun, and smoke cigarettes as a result of social pressure or to seem mature or trendy. However, in researching this topic, no substantiated claims were found to support the idea that youth consume energy drinks

as a result of social pressure. Nor was evidence found that youth have expectations of becoming inebriated, of experiencing a “caffeine high”, when consuming energy drinks, although they are marketed as giving the consumer energy. Future research may determine this. Also, cigarettes are also consumed as a result of nicotine addiction. If drinking habits of EU youth as discussed in the prevalence section are similar to those of young British Columbians, high amounts of energy drinks are consumed by only a small proportion of youth. Conversely, a much higher proportion of cigarette smokers are regular smokers. This may indicate that youth do not consume energy drinks as a result of addiction. However, additional research is also needed to determine this.

Considering these assumptions, the factors associated with reductions in youth smoking, and the changes in alcohol-related injuries and youth alcohol consumption after adjustments of minimum legal drinking ages, a ban on sales of energy drinks to persons under 19 years old is expected to reduce youth consumption by 50% or more.

Measure 2: High.

In light of the high level of compliance by retailers with respect to tobacco sales laws, a ban on youth consumption would prevent the majority of young persons from purchasing energy drinks as soon as it was implemented. Also, it may be the case that the social pressures to consume alcohol and tobacco do not exist for energy drinks. Hence, most youth may not seek alternative ways to acquire energy drinks to soon after the ban is implemented. A ban is therefore expected to reach maximum effectiveness in less than a year.

Cost: Low to High.

Such a ban would likely be enforced with methods such as occasional checks. Given that most energy drinks are sold by retailers who also sell tobacco products (Pomeranz et al., 2013), tobacco enforcement officers (Vancouver Coastal Health, 2011) may be trained to check for retailers abiding by energy drink ban in addition to their current duties. A provincial restriction on trans fats in food service establishments was enacted in 2009 (BC Ministry of Health, n.d.) and tobacco enforcement officers were given the task of enforcing this ban (B. Johnston, personal

communication, March 6, 2014). They did so without additional training or funding (ibid.). Giving the task of enforcement energy drink bans to tobacco enforcement officers may therefore result in no additional costs. However, if additional labor was hired to perform this task instead, the cost of enforcing an energy drink ban across the province is estimated to cost between \$31,500 and \$126,000⁷. This number was calculated from the maximum and minimum annual costs derived from the following numbers: The task of enforcing an energy drink ban would add 5 to 10 minutes to each inspection, 5 to 10 inspections are performed daily by 3 officers paid approximately \$30 per hour, 210 days a year (ibid.) in a region containing 25% of the province's population (Vancouver Coastal Health, 2014). However, the lower estimate assumes only 25 minutes of additional labor per day, per officer. Such a small amount of time may be incorporated into officers' existing workload without additional costs, as occurred with the task of enforcing the trans fat restriction. Hence, the cost of this policy is highly variable and dependent upon whether or not the additional work would be incorporated into officers' work without additional pay. This option is therefore rated low to high. Potential implementation costs for retailers are considered in the anticipated stakeholder acceptance section.

Implementation complexity: High.

Most energy drinks are sold to youth in gas stations, convenience stores and large grocery stores. In the United States, 79% of these beverages are sold in convenience stores (Pomeranz et al., 2013). Such retailers usually already verify the age of customers for tobacco products, so adhering an age ban for another product should not be complicated for vendors. However, energy drinks may need to be sold behind counters as well. Such product segregation may be costly for larger, retail grocery stores. Moreover, expanding tobacco law enforcement by training tobacco enforcement officers to incorporate energy drink ban enforcement may be required. This policy would also require new legislation and regulations.

⁷ Lower estimate:

$$(5 \text{ minutes/inspection}) * (5*3 \text{ inspections/day}) * (\$0.50 /\text{minute}) * (210 \text{ days}) / (.25) = \$31,500$$

Upper estimate:

$$(10 \text{ minutes/inspection}) * (10*3 \text{ inspections/day}) * (\$0.50 /\text{minute}) * (210 \text{ days}) / (.25) = \$126,000$$

Anticipated stakeholder acceptance: Medium.

Regarding political parties, the British Columbia Liberal Party may consider a ban in light of the severity of potential health impacts on youth. A ban may be much more publicly palatable than a tax given that a ban would only affect youth. The provincial government has stated that children and teens should not drink energy drinks due to high caffeine content, and that caffeine has no place in a healthy diet for children (HealthLink BC, 2013). Energy drinks already cannot be sold in British Columbia schools (ibid.), and the provincial government has implemented a total ban on trans fats in public building vending machines (BC Ministry of Health, n.d.). Regarding public acceptability, 89% of Quebecers want such a ban (Réseau du sport étudiant du Québec, 2012). A 2013 Yale Rudd Center for Food Policy & Obesity study on parents found that 74% of respondents agreed that children and adolescents should not be able to purchase energy drinks. These statistics indicate that the British Columbia public may support this policy. Regarding industry groups, they would likely oppose a ban given their positions as discussed in the cross-jurisdictional analysis. As with a tax, potential legal challenges are a concern. Regarding BC provincial health authorities, some have stated that energy drinks are not considered safe for children (Fraser Health, 2011). They likely would not oppose this ban. The Provincial Health Officer has stated that youth should not consume sugar-sweetened beverages and his discussion of a tax on these drinks indicate that he may be in favor of comparably proscriptive policies (Kendall, 2010). Finally, public health associations would likely be in favour of this policy, considering their positions as discussed in the literature review.

5.3. Option #3: Improve warning labels on packaging

The Canadian Medical Association has stated that youth are drinking energy drinks despite current warning labels. Research shows that increasing the size to at least 50% of product packaging area and adding a pictorial may increase the deterrent effect of energy drinks' warning labels. However, a small number of studies show that this option may not be effective for younger consumers. Hence, implementation of this option should include monitoring (e.g. interviews, surveys) of youth perception of

warning labels, especially to ensure that these labels do not unintentionally promote energy drink consumption.

Effectiveness:

Measure 1: Low.

A study by the World Health Organization found that the effectiveness of cigarette labels depends on the size, position and design of the warnings (Hammond et al., 2007). Large, vivid warnings are more likely to be noticed. Graphic warnings are more likely to increase awareness of health risks and motivation to quit than text warnings. Text warnings that cover at least 30% of the package surface and are visible, clear, large, and legible are effective, but less so than pictorial warnings. Moreover, the effectiveness of labels diminishes over time since newly implemented warnings are the most likely to be noticed by consumers (ibid.). The European Commission states that graphic warnings are more effective for young people than text warnings only (European Commission, n.d.). The introduction of graphic warnings in Brazil and Canada was shown to contribute to a reduction in smoking rates. Also, warnings that cover 75% of packaging are more effective in conveying health information than warnings that cover only 50% of packaging. A 2008 study commissioned by Health Canada found that increasing warning size from 50% of packaging contributed to convincing 14 to 17 year olds not to smoke, until the warning covers 90% of the package (Health Canada, 2008). Another study commissioned by Health Canada found that youth smokers believe that decreasing branding on a package is more effective in encouraging reducing smoking (Environics, 2007).

A meta-analysis on alcohol policies from the University of Victoria found that there is little to no change in drinking behavior due to alcohol warning labels (Stockwell, 2006). The researchers stated that alcohol labels are unlikely to be effective as a standalone policy (ibid.). A meta-analysis sponsored by the World Health Organization also found little evidence in support of the effectiveness of alcohol warning labels (ibid.). A study of US adolescents found that no beneficial changes regarding beliefs about drinking behavior could be attributed to alcohol labels (ibid.). The UVIC study also reviewed tobacco labeling policies, and confirmed views similar to those above. The

researchers also suggested that alcohol is not believed to be dangerous relative to tobacco since only excessive alcohol consumption is seen as harmful, because of the widely held view that the benefits of moderate consumption outweigh the negative effects (ibid.). However, the researchers suggested that young and high-use consumers would likely notice new labels (ibid.).

Regarding soda, a German study of the effectiveness of warning labels for soft drinks on 10 to 22 year olds found that the younger the youth, the less likely they are to be affected by warnings (Effertz et al., 2013). Moreover, warnings that were next to pictorials on packages had their effectiveness diluted, especially for younger age groups (ibid.). The researchers also found that warnings are ineffective when producers respond to required warnings with an advertisement design that counterbalances the intended effect of warnings (ibid.). Even pictorials not intended to offset the effectiveness of warnings can do so, especially for the younger age group (ibid.).

In light of this data, a pictorial warning should be included in addition to the current text, and the size of the entire warning label should be increased to at least 50% of the size of the drink packaging in an attempt to have an effect similar to health warnings on cigarette packages. Given the nature of the health concerns regarding energy drinks, the picture may be something like a person clutching their chest, with the symbol of a ripped heart and/or a poison symbol. If and when local news agencies publicize this regulatory change, such a blunt message may result in parents striving to ensure that their children do not consume energy drinks. Furthermore, regulations for warnings should address possible co-opting of warnings by energy drink companies who may change the design of their cans to either de-emphasize the warning or make it seem as part of their own design. Differing typography and contrasting borders are among the factors that should be considered by designers of the warning. A focus group may be used to determine its effectiveness.

The studies pertaining to cigarette health labels only indicate what kind of labeling is more effective than other labeling, rather than how effective warning labels are. The studies on alcohol warning labels did not support their effectiveness. The German study on soda labels indicated that adolescents and younger children are less

likely to be affected by warnings. In other words, the more sensitive to caffeine a youth may be, due to their body weight and stage of development, the less likely this policy is to be effective in preventing that youth from consuming energy drinks. Furthermore, the former president of the Canadian Safety Council has also stated that food labeling policy is ineffective on its own (Therien, 2012). An analyst for investment banking firm Stifel Nicolaus stated that changes to labeling regulations are unlikely to impact energy drink sales (Reuters, 2012). The Canadian and Ontario Medical Associations have stated that labelling policy should be part of a broader strategy in changing food consumption behavior (Ontario Medical Association, 2014; Turnbull, 2011). This policy is therefore expected to reduce youth consumption of energy drinks by less than 20%.

Measure 2: High.

New warning labels would immediately be seen by consumers, and media stories on the new regulations would make parents and young consumers aware of them within days or weeks of implementation.

Cost: Low.

Contracting a private company to design such a pictorial would cost approximately \$500 (Nathan Singh, personal communication, March 8, 2014). Conducting a focus group would cost approximately \$5,000 (Jeff Anderson Consulting, n.d.).

Implementation complexity: Low.

This option is unlikely to be difficult to implement. Little action is required beyond creating the new labelling requirements and energy drink manufacturers subsequently modifying their product packaging.

Anticipated stakeholder acceptance: High.

Political parties are likely to support this policy since it would allow them to publicly demonstrate their concern for the health of British Columbian youth in a manner

that is much less controversial than a tax or ban. Regarding public acceptance, 86% of Ontario respondents in one study supported alcohol labeling policies (Stockwell, 2006). A 2013 Yale Rudd Center for Food Policy & Obesity study on parents found that 85% of parents believed reporting of caffeine content and warning labels were justified for energy drinks (Pomeranz et al., 2013). Hence, the British Columbia public would likely support this policy. Regarding industry groups, they would likely oppose this option given their positions discussed in the cross-jurisdictional analysis. Notably, any changes to the warnings should be based on well-documented evidence. In 2010, Health Canada's "extremely high priority" task of mandating addition of the statement "Irregular heart rate or rhythm have been known to occur, in which case discontinue use and consult a health care practitioner" to energy drink labels stalled when the Canadian Beverage Association questioned the scientific basis of the statement (Schmidt, 2011b). This retraction may have occurred due to fear of a successful legal challenge. Considering the provincial health authorities' stances on more severe policies, they would not oppose this ban. Public health associations would also be in favour of this policy, although they may suggest that more effective policies be implemented.

5.4. Option #4: Education campaign

The education campaign "Be smart, drink healthy!" was designed in BC to encourage youth to drink more healthy drinks and less unhealthy drinks (British Columbia Pediatric Society, n.d.). It is currently being used in Quebec schools, where teachers attend workshops and then educate their students on the subject matter (ibid.). The campaign is part of a school initiative that is generally designed to convince and encourage youth to have healthier beverage consumption habits. A similar program could be implemented in British Columbia by the Ministry of Health in partnership with educational institutions, where a greater focus could be placed on energy drinks in health education. The general public outside of schools could also be targeted. Advertisements for social media, radio and television would need to be created and purchased. The Ministry of Health may also partner with public health associations and municipalities to design and then conduct education campaigns.

Effectiveness:

Measure 1: Low.

Research shows that changing social norms is a promising way of reducing children's consumption of certain types of food (Réseau du sport étudiant du Québec, 2012). However, changing norms takes time (National Health Service, 2004) and it may not be as effective as other policy options. Although no data could be found regarding the effectiveness of the initiative in Quebec, much data exists on the effectiveness of education campaigns in general. A 2011 educational campaign on energy drinks in the USA was associated with a decrease in calls to poison centers due to energy drink consumption within two months of its implementation, but a cause and effect relationship was not established (Seifert, et al., 2013). However, the American Heart Association conducted a meta-analysis on various campaigns designed to change tobacco consumption habits (Mozaffarian, et al., 2012). The researchers concluded that education and media components of combined strategies account for at least 20% of the resulting declines in tobacco use (ibid.). Strong, negative messages about health were found to be associated with a higher decrease in tobacco use than were less severe messages (ibid.). The greater quantity and duration of exposure to a media campaign, the more effective it would be (ibid.). Increasing exposure may require use of mass media, such as television, radio and transit advertisements, as well as social media. Also, mass media would reach adults and parents, who should also be targeted as they influence children's behavior. Educating adults on the health risks may result in more inclination to pay attention to youth consumption habits, leading to reduction in youth consumption and higher reporting of adverse effects (Institut national de santé publique du Québec, 2013). Nonetheless, on their own, educational campaigns have been shown to cause only modest reductions in unhealthy drink consumption in children (James, Thomas, Cavan, & Kerr, 2004). Similarly, according to the American Heart Association, focused educational and media campaigns against smoking have meagre evidence supporting their efficacy when implemented alone (Mozaffarian, et al., 2012). This option therefore receives a "Low" rating for the first measure of effectiveness.

Measure 2: Low.

The Center for Disease control reported that an anti-tobacco media campaign needs to reach 75% to 85% of its target audience every quarter of a year for 6 months to cause an increase in awareness, 12 to 18 months in order to affect attitudes, and 18 to 24 months to have an impact on behavior (ibid.). Hence, this option is expected to take two years or more to reach its maximum effectiveness, and therefore also receives a “Low” rating for the second measure.

Cost: High

The cost of this policy varies with the amount of advertising chosen. For example, if the creation of a media campaign was contracted to non-government agencies, producing four videos, four transit and three radio advertisements would cost around \$60,000⁸. A social media campaign for a social media website like Facebook would cost approximately \$40,000 (Sam Wempe, personal communication, March 1, 2013). School curricula regarding beverage consumption can be changed using materials already developed in BC (British Columbia Pediatric Society, n.d.) and in other provinces (Alberta Health Services, 2011). Hence, the cost of the education and media campaigns is estimated to range from \$60,000 to \$100,000, depending on the amount and type of advertising chosen. This option is therefore considered a high cost policy.

Implementation complexity: Medium

Educators and possibly multiple advertising companies would be involved in implementing this option. Also, researchers of a study on the negative effects of drug and alcohol prevention programs recommended that educational policies be implemented incrementally, so that their effects can be monitored for unintended, negative consequences (Werch & Owen, 2001). Hence, this option includes both monitoring and possible future changes to educational and advertising materials.

⁸ Producing one video costs about \$10,000, producing a transit advertisement costs around \$500, and producing a radio advertisement costs approximately \$6,000 (Nathan Singh, personal communication, March 1, 2014).

Anticipated stakeholder acceptance: High.

Political parties are likely to support this policy since, as with the label policy, it would allow them to publicly demonstrate their protection of youth in a manner much less controversial than a tax or ban. The British Columbia public would also likely support this uncontroversial policy that aims to promote youth health. Regarding industry groups, they would likely support this option given their positions on education as discussed in the cross-jurisdictional analysis; manufacturers and beverage associations both suggested public education before considering more severe policies such as a tax or ban. They may, however, oppose educational material which states that children should not consume energy drinks. Considering the provincial health authorities' stances on more severe policies, they would likely support this policy. Similarly, public health associations would likely be in favour of this policy, although they may suggest that more effective policies be implemented.

5.5. Summary

Table 5. Summary of policy evaluations

Criteria	Measures	Tax	Ban	Label change	Education & media
Effectiveness	Measure 1: <i>High</i> : ≥50% decrease <i>Medium</i> : 20% - 49% decrease <i>Low</i> : <20% decrease	High	High	Low	Low
	Measure 2: <i>High</i> : <1 year <i>Medium</i> : 1 - 2 years <i>Low</i> : >2 years	High	High	High	Low
Cost	<i>Low</i> : <20,000\$ <i>Medium</i> : \$20,000 - \$50,000 <i>High</i> : >\$50,000	Low	Low to High	Low	High
Anticipated stakeholder acceptance	<i>High</i> : Mostly in approval of <i>Medium</i> : Mostly indifferent to <i>Low</i> : Potentially in opposition to	Low	Medium	High	High
Implementation complexity	<i>Low</i> : Low complexity <i>Medium</i> : Moderate complexity <i>High</i> : High complexity	Medium to High	High	Low	Medium

6. Recommendation

The analysis shows that implementing both the ban and an education campaign would reduce the overall cost of implementing both of these options and would increase their respective effectiveness. An energy drink tax is not recommended at this time due to anticipated opposition by the BC Liberal Party and the general public as a result of all consumers having to pay a levy intended to affect youth.

1. Ban

Although a ban may have a high cost, it is the only highly effective policy that is feasible since a tax is currently not likely to be politically acceptable. Furthermore, the cost may be low if tobacco enforcement officers are given the task of enforcing this ban without additional pay, as occurred with enforcement of the 2009 trans fat restriction. In consideration of the many assumptions made in the analysis with respect to the effectiveness of the ban option, this policy should be implemented with a sunset provision: if its effectiveness is substantiated by youth consumption prevalence studies before implementation, one year after implementation, and two years after implementation, then the ban should remain. If the ban is determined to be ineffective, the BC Liberal Party may reconsider its stance on a tax for which there is more evidence of effectiveness. Prevalence studies should be modeled on the EU studies that collect specific consumption data for different age groups, rather than on the majority of studies found in North America that are vague with respect to how often and how much energy drink youth consume. Energy drink prevalence surveying may be conducted regularly thereafter, as recommended by health authorities in EU member countries such as Belgium (Superior Health Council, 2009). To save costs, it can be incorporated into existing student drug use surveys such as the Cross-Canada Report on Student Alcohol and Drug Use and the BC Adolescent Health Survey. If money is available, prevalence research should be modeled on the large-scale EU study. Research should also be

conducted regarding the circumstances in which youth consume energy drinks, and why they do so. This will inform future evaluations of the implemented policies.

2. Education and media campaign

Health authorities and medical experts have stated that educational and media campaigns are considered useful, beneficial and effective when used as part of a larger, multi-component strategy, rather than on their own (James et al., 2004; Korstrom, 2013; Mozaffarian, et al., 2012). Studies have shown that, because behaviors and perceptions are influenced by many factors, laws and other stringent government policies should be combined with education initiatives to effectively change norms (Réseau du sport étudiant du Québec, 2012). Education should therefore be understood as a complementary rather than standalone policy. Moreover, if a ban were implemented, that would likely get much news coverage, thus increasing exposure and reducing costs of mass media campaigns.

One concern is that children will look for a substitute product such as coffee when energy drinks become unavailable or more costly to consume if they are obtained through social sources. At the moment, it is unknown whether such policies would lead to this result. While researching this paper, no studies were found that provided insight into why youth drink energy drinks, beyond the fact that they are marketed to them. Notably, many of the hospitalizations discussed in the literature review often involved energy drink consumption as well as other drugs such as ecstasy (Wolf, 2013). An important but unsubstantiated worry would be that, if youth were looking for the energetic feeling that caffeine in energy drinks once gave them, they may seek out amphetamines as a substitute. To address this potentially dangerous knowledge gap, gathering data on why youth consume energy drinks should be incorporated into the aforementioned prevalence studies. A focus group may also be used to investigate this issue, although their cost is significant at approximately \$5,000 per focus group (Jeff Anderson Consulting, n.d.).

Any educational campaigns or ban should be wary of a number of unintended outcomes. The product in question should not be understood as generally dangerous, but rather as specifically leading to negative health outcomes. Otherwise, young people

may become curious to try it and thus consumption would be promoted rather than deterred (Institut national de santé publique du Québec, 2013). Such education may support the advertising goals of some energy drink companies (Euromonitor International, 2008). Furthermore, stating the prevalence of consumption by young people may encourage a young audience to perceive that it is therefore an acceptable behaviour (ibid.). Also, if only energy drinks are presented as bad due to their caffeine content, then students may turn to other sources of caffeine (ibid.). Hence, educational programs should include general caffeine education as well as health warnings against energy drinks. As stated earlier, the researchers of a study on the negative effects of drug and alcohol prevention programs recommended that such policies be implemented incrementally, so that their effects can be monitored for unintended, negative consequences (Werch & Owen, 2001).

With a ban in place, the label change option outlined in Section 5 would work to dissuade youth that nonetheless seek out energy drinks from consuming them in the same way tobacco labelling laws seek to dissuade minors from smoking. However, the assumed qualitative differences between alcohol and tobacco products and energy drinks imply that energy drinks would likely not be sought out after a ban in the same way cigarettes and alcohol are. Hence, increasing the size to at least 50% of product packaging area and adding a pictorial is a precautionary measure against this possible action. Hence, its use may be reconsidered if the ban is found to be insufficiently effective. Meanwhile, a label change for energy drinks may not be required, since alcoholic beverages do not require labeling stating that they cannot be sold to minors.

Finally, this strategy needs to be implemented with consideration of Health Canada's ongoing policies with respect to energy drinks. The federal department is conducting its own research and soliciting external studies on the safety of energy drinks. If, as a result of new research, British Columbia's Minister of Health becomes satisfied that energy drink consumption is safe for youth, or that federal regulations sufficiently protect children's health, then the age ban should be either modified or eliminated, and the education and media campaigns would likely need to be changed if not terminated. Also, data on adverse reactions to energy drink consumption would improve if reporting of relevant emergency room visits by doctors and nurses were made

mandatory in British Columbia. Preferably, Health Canada could mandate such reporting across the country as part of its own research.

7. Conclusion

This paper provides an analysis of policy approaches to reduce youth consumption of energy drinks in British Columbia. It presents a comprehensive review of medical literature on the health effects of energy drinks and caffeine on children, adolescents and teenagers, a cross-jurisdictional analysis of policies that have been and are being implemented in response to this concern, and analyzes approaches for reducing youth consumption of energy drinks in British Columbia. A multipronged approach is recommended, including a ban on youth purchasing and an educational and media campaign that are intended to supplement each other.

Limitations to this study include lack of independent confirmation of conclusions made based the medical and policy literature. Due to lack of precedent policies, evaluation of many of the options involved extrapolation. Although the studies examined in this paper were not overly complex, further research should include interviews with both policy and medical experts to ensure that the medical literature and policy options were evaluated appropriately. Such interviews may also yield medical and policy knowledge that was not considered in the literature review and the cross-jurisdictional analysis.

Next steps should involve independent confirmation of the policy evaluation in this paper. An evaluation of the feasibility of implementing these policy options in other Canadian provinces should then be considered, followed by an assessment of whether a nation-wide strategy would be more effective and more feasible to reduce youth consumption of energy drinks until there is certainty about safety issues.

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Appendix A.

Additional findings from the cross-jurisdictional analysis

Countries in the European Union

Hungary introduced a tax on certain unhealthy foods in 2011 (Chriqui et al., 2013). Beverages with a caffeine concentration higher than 10 mg per 100 mL now have a tax equivalent to 1.18 USD per liter (ibid.). An unspecified number of customers were reported to have either stopped consuming energy drinks or begun purchasing cheaper brands (Euromonitor International, 2013i). Some energy drink manufacturers decreased caffeine amounts in their products to avoid the tax (ibid.). Others, such as Red Bull, did not reformulate their product and experienced significant sales decreases (ibid.)

In recent years, there has been much discussion in the Estonia media about the health effects of energy drinks on children (Euromonitor International, 2013j). In 2012, the second largest political party proposed a limit on energy drink advertisements and places of sale, and to improve young persons' knowledge about the products (Roman, 2013). A party member stated that children and adolescents had become the primary consumers of energy drinks (ibid.). Later that year, a large supermarket chain stated that they would no longer sell energy drinks to youth under 16 years old (Ilves, 2012). As in the United Kingdom, other major retailers said that they would not follow suit (ibid.). In 2013, another bill that would establish advertising restrictions for energy drinks was introduced by the same party (ERR News, 2013). It was rejected (ibid.). The elected party did not back the bill because it stated that further studies are needed on the effects of energy drinks, and that advertising restrictions alone would not suffice to protect public health (ibid.). Estonia's National Institute for Health Development supported this stance, despite the existence of data indicating a high prevalence of daily consumption by young children in the country (Ilves, 2012).

In 2012 or 2013, a bill was introduced in the Latvian national legislature that would forbid energy drinks to be sold to persons under 18 years old (Baltic News Network, 2013). The bill also includes a ban on energy drink sales at educational institutions, and the offering of free energy drinks to persons under 18 years old as gifts

or compensation (ibid.). Moreover, stores that sell energy drinks must have signs that warn of their products high caffeine levels, and that pregnant women should not consume them (ibid.). Finally, advertisements would have to contain warnings about the negative health effects associated with consuming energy drinks excessively (ibid.). Although the bill was meant to come into force in January, 2014, it has thus far only gone through a second reading (Saeima, n.d.). During debate, members of parliament likened current warnings on energy drinks to labeling a movie as suitable only for adults, but still letting underage persons attend (Saeima, 2012). Such arguments are similar to those of the Canadian and American Medical Associations, which state that despite current recommendations and other policies designed to deter youth consumption, children and adolescents are still consuming energy drinks. Other Latvian members of parliament raised questions about the effectiveness of these policies, and about a lack of scientific data which states that energy drinks are harmful (ibid.).

Countries outside the European Union

In 2012, the Mexican Senate voted to ban energy drink sales to persons under 18 years old (Euromonitor International, 2012), prohibit vitamins and minerals as additives so that energy drinks are not perceived to be healthy, and require labeling with respect to health risks such as heart problems and neurological complications (Euromonitor International, 2013k). The labeling plan included a recommendation of consuming no more than half a litre per day, and that the product may be dangerous for pregnant women (ibid.). However, these regulations have not been introduced as of the end of 2012 (ibid.). Furthermore, a lack of enforcement may prevent the effectiveness of these laws. In the case of youth smoking, 10% of Mexican smokers are underage despite a prohibition on tobacco sales to youth (Euromonitor International, 2012). Since 2011, a higher tax was levied on energy drinks (Euromonitor International, 2013k). It is the same tax levied on other vice products such as alcohol and tobacco (ibid.).

In Uruguay, Red Bull is currently banned. Another energy drink was banned until 2009, when it was reformulated to contain a lower concentration of caffeine (Euromonitor International, 2013l). In Argentina, a 200 mg/L limit on caffeine concentration was proposed in 2005. The province of Buenos Aires introduced a limit of 120 mg/L

(Universidad de Palermo, 2011). Currently, energy drinks cannot be sold in Buenos Aires in bars and night clubs after 10:00 pm (ibid.).

In 2002, the Turkish Agricultural Ministry introduced legislation stating that energy drinks could not be sold in Turkey with a caffeine concentration higher than 150 mg/L (Pravda, 2006). The ban was introduced due to health concerns about high levels of caffeine (ibid.). It came into effect in 2007 to give companies time to adapt to the new requirements (ibid.). Current legislation also states that labels must contain the following warnings: "It should not be consumed by mixing with alcohol or together with alcohol. Not recommended for children, underage persons, aged persons, diabetics, the persons who have high blood pressure, pregnant and breastfeeding mothers, the persons who have metabolic diseases, renal failures and caffeine sensitivity. Not suitable for sportsmen. It should not be consumed during or after intensive physical activity. More than 500 ml daily consumption is not recommended" (Kuş, 2013). Further warnings may be added if the Ministry of Food, Agriculture and Livestock decides that new scientific evidence warrants this (ibid.).

Appendix B.

Excluded alternatives

The following policy options were deemed to be either not feasible or inappropriate in lieu of the options included in the analysis.

1. Energy drink reformulation

Lowering the maximum caffeine concentration in energy drinks was excluded from the analysis because, as with the tax option, it would target all British Columbians rather than just youth. However, the effects of this option would be more severe than those of the tax. The findings in this paper aim to justify a ban on youth consumption, not adult consumption. Content reformulation would effectively ban energy drinks as they are now for all British Columbians, not just youth. Notably, the recommended youth purchasing ban may influence manufacturers to lower the caffeine levels of their products anyway, as in the case of Hungary's energy drink tax.

2. A more restrictive ban on youth advertising

A policy that decreases the number of energy drink advertisements viewed by youth was found to be not feasible since it would be very difficult for the provincial government to enforce this with respect to online social media. Many studies show that youth are currently viewing advertisements online, such as through Red Bull's youth-oriented YouTube videos and Facebook pages.

According to the Temporary Marketing Authorizations issued by Health Canada, energy drinks cannot be marketed to children under 12 years old, nor can they be given samples of these products (Health Canada, 2012b). However, such bans may have limited effectiveness since youth nonetheless see advertisements that may not be aimed at them directly, such as online, in social media, in video games, and in extreme sporting events. Many studies in the United States indicate that children are exposed to energy drink advertisements despite voluntary bans because they watch programming intended for older persons (Holt et al., 2007; Speers et al., 2011). In 2010, children in the United

States saw about the same amount of energy drink and energy shot advertisements as they saw for the children's drinks Kool-Aid and Capri Sun (Harris, 2013). A Yale study found that American teens' exposure to energy drink advertisements on television increased by 33% from 2010 to 2012 (ibid.). The researchers also found that 1.31 times as many teens as adults viewed television advertisements for Red Bull (ibid.). In response to similar findings for alcohol advertising, the Institute of Medicine and National Research Council recommended that advertisements for alcohol products not be shown to audiences whose share of underage viewers is 15% or more (ibid.).

Energy drink advertising influences the children that view it. Canada's professional association for dietitians has stated that children choose foods for which they have seen advertisements at significantly higher rates than children who have not viewed advertisements (Dietitians of Canada, 2010). A Quebec student sports association conducted a survey on youth aged 13 to 17 years old (Réseau du sport étudiant du Québec, 2012). 54% of respondents believed that energy drinks give energy for sports for which they were not designed, indicating that youth associate energy drinks with increased physical performance in sport (ibid.). This is in accordance with messages advertised by energy drink companies. Notably, the researchers found that boys are more likely than girls to believe such messages (ibid.).

Similar findings exist with respect to alcohol and tobacco products. Children are more influenced by cigarette marketing than adults. A United States congressional report found that while 54% of adults smoked three heavily marketed brands, over 80% of youth smoked those same brands (Hoflander, 2011). In the United States, tobacco is now strongly associated with sports due to advertising and sponsorship, and is also portrayed as a part of sports and a healthy lifestyle (ibid.). Literature reviews and meta-analyses on the effects of alcohol advertising on reducing youth alcohol consumption are inconclusive (Anderson et al., 2009; Center on Alcohol Marketing and Youth, 2010; Fortin & Rempel, 2005; Nelson, 2001). Current research indicates that partial advertising reductions have little if any effect on youth alcohol consumption, but that total bans are promising and would likely be effective in reducing youth consumption of alcohol (Center on Alcohol Marketing and Youth, 2010; Fortin & Rempel, 2005). However, such bans are a long term strategy (Fortin & Rempel, 2005).

According to the Public Health Association of BC, industry self-regulation and voluntary approaches have not prevented successful promotion of sugary-sweetened beverages to children in British Columbia (Quebec Coalition on Weight-Related Problems, 2012). Similarly, self-regulation of the European alcohol industry with respect to not advertising to youth is not considered effective by the European Commission (European Commission, n.d.). However, further government regulation of energy drink advertising may not be successful in British Columbia because of what youth view online.

Youth view energy drink advertisements online. The social networking company Facebook states that children aged 12 and under may not sign up for their extremely popular service, Facebook (Facebook, 2014). Nonetheless, many do. Oxford researchers found that 48% of girls and 39% of boys aged 14 to 16 accessed Facebook between December 2010 and May 2011 (Winpenny, 2013). In 2013, the United Kingdom Advertising Standards Authority published a study where 42% of their child test subjects registered on Facebook as being 18 years old or older, and 11% of the ads they viewed were for products that, according to government regulation, “must not be directed at people under 18 through the selection of media or the context in which they appear” (Advertising Standards Authority, 2013). Moreover, no age limits exist for using similarly popular websites YouTube and Twitter. All three of these high-traffic websites contain advertisements for energy drinks. In 2013, Monster Energy’s Facebook page had over 20 million “likes”, and Red Bull’s page had approximately 40 million “likes” (Harris, 2013). By 2013, Red Bull had approximately 600 million views of videos the company uploaded to YouTube (ibid.). Many if not most of these videos are of exciting, extreme sports that are seen by youth. As with adult programming watched by children, youth are not necessarily the target audience but nonetheless view the content and thus the advertisements.

Hence, a policy that aims to further restrict energy drink advertising to youth may be successfully enforced in traditional media such as television. However, it may not be very effective in reducing youth exposure to energy drink advertisements overall because on the online presence of manufacturers in websites that are very popular with

youth, such as YouTube and Facebook. For this reason, a more restrictive ban on youth advertising was excluded from the analysis.