

Energy drinks: An emerging public health hazard for youth

Jennifer L. Pomeranz*, Christina R. Munsell and Jennifer L. Harris

Rudd Center for Food Policy & Obesity, Yale University, 309 Edwards Street,
PO Box 208369, New Haven, CT 06520-8369, USA.

*Corresponding author.

Abstract Energy drinks are emerging as a public health threat and are increasingly consumed by youth internationally. Energy drinks contain high levels of caffeine, sugar, and novel ingredients, and are often marketed through youth-oriented media and venues. We review these practices and the current inconsistent state of labeling. We also examine international support for regulation of these products, including a survey showing that 85 per cent of United States parents agreed that regulations requiring caffeine content disclosure and warning labels on energy drinks are warranted. We then examine the regulatory structure for energy drinks in the United States, analyzing legal and self-regulatory strategies to protect consumers, especially youth, from these potentially dangerous products. Recommended government interventions include revised labeling requirements, addressing problematic ingredients, and enacting retail restrictions. We conclude by identifying areas for future research.

Journal of Public Health Policy advance online publication, 14 March 2013;
doi:10.1057/jphp.2013.6

Keywords: child and adolescent health; energy drinks; marketing; regulation; law

Introduction

The consumption of sugary beverages is an established public health concern,¹ with *energy drinks* emerging as a unique and independent risk for youth. Sales of energy drinks are rising at a steady pace.² In 2011, they increased by 12.5 per cent overall, and by 15–30 per cent for the category leaders, Red Bull and Rockstar.³ In a study of 600 nationally advertised beverage products in the United States, the sale of energy drinks surpassed that of either sports or fruit drinks.⁴

The products in this category typically have the word 'energy' in the product name and contain high levels of caffeine plus additional ingredients not found in sodas and juice drinks. (Energy drinks differ from sports drinks which are marketed to accompany physical activity and contain electrolytes.) The energy drink category includes two types of products: drinks and shots. Drinks are sold in 8–32 oz. containers. Many are available in large, non-resealable cans that produce one serving, despite the number of servings listed on the container.^{4,5} Shots come in 2–2.5 oz. single serving containers.⁴ Because there are few data on youth consumption of energy shots, this article focuses primarily on energy drinks.

A recent study of US high school students revealed that energy drinks represented 8.8 per cent of sugar-sweetened beverages they consumed, and more than 10 per cent of drinks consumed by males and Hispanic students.⁶ Another US study indicated that 31 per cent of 12–17 year olds regularly consume energy drinks.⁷ Similarly, a study of German adolescents found that 53 per cent tried energy drinks and 26 per cent of adolescents consumed them regularly.⁸ Internationally, Thailand was reported to be the highest per capita consumers of energy drinks in 2007, with the United States, Austria, Ireland, New Zealand, Slovenia, and Kuwait rounding out the top seven countries.⁹

Energy drink consumption is a potential health hazard for the general population and especially alarming for youth due to high levels of caffeine and novel ingredients not normally found in the food supply.^{10,11} The American Academy of Pediatrics (AAP) stated that 'energy drinks have no place in the diet of children and adolescents' due to their 'stimulant content',¹² but energy drink manufacturers continue to advertise directly to adolescents in media also viewed by children.¹² A study by the US Department of Health and Human Services revealed that emergency room (ER) visits involving energy drinks (alone or mixed with other substances) increased tenfold from 2005 to 2009.¹³

The mixing of energy drinks with alcohol is an obvious public health concern,¹⁴ but adolescent consumption of energy drinks alone also poses considerable health risks. Eleven per cent of total ER visits related to energy drink consumption involved youth aged 12–17 years and 75 per cent of those visits were due to energy drink intake alone.¹³ Similarly, calls to the Australian poison information center revealed increasing reports of caffeine toxicity from energy drink consumption among adolescents. The median age of callers was 17 years and more than half of all calls were due solely to energy drink consumption.¹⁵



The first part of this article builds on previous research about negative health effects of energy drink consumption among youth,^{7,9} by discussing the potential health effects of problematic ingredients, inconsistent labeling practices, and the marketing of energy drinks to adolescents. Then it describes international support for increased regulation of energy drinks; we also report on a survey of US parents that indicates such support to protect youth. We review current regulatory structure for energy drinks and analyze legal strategies to protect consumers, especially youth, from these potentially dangerous products. We conclude by identifying areas for future research, in particular the need for more information about energy shot consumption and its effects.

Inconsistent Labeling

US Food and Drug Administration (FDA) regulations contain certain requirements for beverage labels but not all manufacturers of energy drinks designate their products as ‘beverages’, thus labels are inconsistent across companies. Manufacturers that label energy drinks as beverages comply with the Nutrition Labeling and Education Act of 1990 (NLEA). Others mislabel their products as dietary supplements and comply with labeling required by the Dietary Supplement Health and Education Act of 1994 (DSHEA). However, DSHEA has significantly more lax requirements and manufacturers can list ingredients on *supplement facts panels* that would not be permitted under the NLEA.¹⁶ If there are no macronutrients in a product, manufacturers of dietary supplements can eliminate disclosure of the macronutrient list on the supplements fact panel, unlike beverage manufacturers who must list the amount as zero.¹⁷

The Food, Drug, and Cosmetic Act (FDCA) does not require caffeine disclosure for beverages or supplements. American Beverage Association (ABA) member companies and some independent ones disclose caffeine voluntarily,¹⁸ but as many manufacturers do not, consumers would have to call these companies directly to obtain information about the caffeine content.

Ingredients and Health Risks

Energy drinks are generally composed of sugar and/or artificial sweeteners, caffeine, and additional ingredients, many of them in high

quantities or novel for beverages, such as guarana and taurine. Under the FDCA, ingredients added to beverages are considered food additives, and must be pre-approved by the FDA if they have not already gained status as GRAS (Generally Regarded as Safe).¹⁹ If a food additive is not proven safe by the entity seeking to introduce it into the food supply, beverages containing such additives are considered ‘adulterated’ and may be condemned by the FDA.²⁰ Conversely, manufacturers of dietary supplements are responsible for determining their products’ safety without any DSHEA requirement to obtain pre-approval for an ingredient unless it is new. Thus, ingredients not designated GRAS are found in some energy drinks labeled as dietary supplements.

Owing to these labeling issues, it is difficult to determine amounts of many ingredients contained in energy drinks. Table 1 summarizes calorie, sugar, caffeine, and sodium content of prominent, nationally advertised sugar-sweetened energy drinks identified in a 2010 study.⁴ On the basis of the labels of these products, the most common additional ingredients are sodium compounds, guarana, panax ginseng, and taurine.

Sugar and sugar substitutes

A comprehensive study of energy beverages reported that the median sugar content of sugar-sweetened energy drinks was 27 g per 8 oz. serving, comparable to sodas and fruit drinks, and higher than sports drinks and flavored water.⁴ With one exception, all energy drinks in this analysis were available in large, non-resealable containers, providing excessive sugar and calories in a single serving. Sixty-nine per cent of energy products also contained artificial sweeteners in lieu of or *in addition* to sugar.⁴ More than half of these were not labeled as diet products; diet labels would normally alert consumers to the presence of artificial sweeteners.

Consumption of sugary beverages is associated with increased risk for dental caries, weight gain, overweight, obesity, diabetes, and heart disease.²¹ In 2008, sugary beverages made up 31 per cent of added sugar in the diet of 6–11 year olds and 44 per cent of the added sugar consumed by 12–17 year olds in the United States.²² Although added sugar intake derived from sugary beverages in total, such as soda, has decreased since 1999, added sugar intake from energy drinks has increased.²² Consistent with sales data, youth may be substituting energy drinks for other sugary beverages.^{2,3}

Table 1: Caffeine, calorie, sugar, and sodium content of common sugar-sweetened energy drinks^a

<i>Product^b</i>	<i>Additional varieties^c</i>	<i>Manufacturer</i>	<i>ABA member company</i>	<i>Can size (oz.)</i>	<i>Caffeine per can (mg)</i>	<i>Calories per can (kcal)</i>	<i>Sugar per can (g)</i>	<i>Sodium per can (mg)</i>
Amp Energy	4	PepsiCo	X	16	142	220	58	140
AZ Energy	3	Arizona	—	15	188	188	49	20
Full Throttle (Red Berry)	2	Coca-Cola	X	16	200	230	58	160
Monster Energy	24	Hansen Beverage Company	—	16	160	200	54	180
Monster Energy	24	Hansen Beverage Company	—	24	240	300	81	270
Monster Energy	24	Hansen Beverage Company	—	32	320	400	108	360
NOS	4	Coca-Cola	X	16	260	210	54	410
Red Bull	0	Red Bull	X	8.4	80	110	27	99
Red Bull	0	Red Bull	X	12	114	160	39	142
Red Bull	0	Red Bull	X	16	154	220	54	189
Red Bull	0	Red Bull	X	20	192	275	68	237
Rockstar	11	Rockstar	—	8	80	140	31	40
Rockstar	11	Rockstar	—	16	160	280	62	80
Rockstar	11	Rockstar	—	24	240	420	93	120
Venom Energy (Black Mamba)	3	Dr. Pepper Snapple	X	16.9	170	250	57	320

^aNutrition information as of September 2012 for each available can size for nationally advertised energy drink brands identified in the 2011 Sugary Drink FACTS report from the Rudd Center for Food Policy & Obesity.

^bInformation given for original variety of drink brand. For those brands that do not have an original variety, the flavor is specified.

^cNumber includes additional sugar-sweetened unique flavor varieties within each listed brand, not including multiple can sizes.

Caffeine

Energy drinks are touted for high caffeine content, but manufacturers do not always report the amount in each container. In the 2010 study of sugary drinks, 54 per cent of 83 total energy drink products reported their caffeine content with a median of 80 mg per 8 oz. serving or shot, more than double the median caffeine in 8 oz. of soda.⁴ Two products contained extreme levels and were available in 20 oz. containers, providing 245 mg and 325 mg of caffeine.⁴ Another study found that energy drinks may contain up to 505 mg of caffeine per container.⁹

Caffeine toxicity is a concern for youth. In 2007, there were 5448 caffeine overdoses reported in the United States and a striking 46 per cent of them occurred in persons younger than 19 years.⁸ The AAP raised additional concerns for children because of caffeine's effect on developing neurological and cardiovascular systems, plus a risk of physical dependence and addiction.¹² Caffeine binds to cell membranes in place of adenosine, an inhibitory neurotransmitter, causing changes in normal physiological processes. Specific effects of caffeine consumption include disturbed sleep, increased body temperature and gastric secretions, increased blood pressure and heart rate, as well as a risk of physical dependence and addiction. This is especially problematic for youth because they are still growing. The AAP specifically cautioned that dietary intake of caffeine can produce harmful adverse effects in youth and should be 'discouraged for all children'.¹²

Sodium and other ingredients

Energy drinks contain surprisingly high levels of sodium. In the 2010 study, the median sodium level was 123 mg per 8 oz. serving or shot, more than three times the amount in soda.⁴ Several energy drinks had even more extreme levels, with one containing 340 mg per 8 oz. serving.⁴ Diets high in sodium can result in high blood pressure and increased risk for heart disease and stroke.²³

Energy drinks often contain *specialty* ingredients with purported health benefits, but that can have negative effects on young people. Table 2 provides information on three of the most common ingredients: guarana, taurine, and panax ginseng. Many of the same novelty ingredients found in energy drinks are also ingredients in over-the-counter diet drugs.²⁷ As consumption of energy drinks increases, these ingredients raise

**Table 2:** Common energy drink ingredients

<i>Ingredient</i>	<i>Intended effects</i> ⁸	<i>Generally recognized as safe (GRAS)</i>	<i>Comments from the American Academy of Pediatrics clinical report</i> ²⁴	<i>Other notes</i>
Guarana	Stimulant (caffeine-containing)	Yes	Guarana is concerning for youth because it increases the total amount of caffeine in the product	Contains 40 milligrams of caffeine per gram
Taurine	Amino acid believed to assist with cell metabolism, thought to improve athletic performance	No	Amino acids in energy drinks should be discouraged in children	Mayo Clinic study found no evidence that it produces advertised benefit ²⁵
Panax ginseng	Thought to improve athletic performance	No	Not Available	Potential negative side effects include insomnia, menstrual problems, increased heart rate, and blood pressure disturbances ²⁶

significant concerns because it is unclear what combined health impact they may have on consumers, especially youth.

Marketing

A comprehensive analysis of marketing practices and youth exposure to this marketing in the United States confirmed that several energy drink manufacturers market their products using media and techniques aimed at adolescents.⁴ In 2010, US adolescents saw on average 124 television ads for energy drinks and shots, which is the equivalent of one ad every 3 days.⁴ This is similar to adolescents' viewing of regular soda ads (122), and more ads for energy drinks and shots than seen by adults.⁴ Adolescents viewed 9–16 per cent more ads than adults for three energy drink brands.²⁸ The majority of energy drink ads viewed by adolescents appeared on youth-targeted cable networks including Adult Swim (80–90 per cent more adolescent than adult viewers), MTV and MTV2 (88–199 per cent more adolescent viewers), and Comedy Central (20–30 per cent more adolescent viewers).²⁸

Energy drink brands also sponsor extreme sports competitions and are prominent in digital media that disproportionately appeals to adolescents. Adolescents were approximately twice as likely to visit the Monster and Rockstar energy drink websites compared to adults,⁴ and youth under age 18 often visited Facebook pages of popular energy drinks, comprising 11 per cent of unique visitors for Red Bull and 38 per cent to Monster's page.²⁹ Although it does not appear that energy drink companies directly market to children less than 12 years of age, many children view the same media as adolescents. As a result, children in the United States saw on average 62 energy drink and shot ads in 2010, which is on par with the number of ads they saw for the children's drinks Capri Sun and Kool-Aid.⁴

Support for Regulation

In 2008, scientists and physicians wrote to the FDA requesting increased regulation of energy drinks because their high caffeine content puts youth at risk for caffeine intoxication and alcohol-related injuries.³⁰ France, Denmark, and Norway attempted to ban Red Bull because of concerns about excessive caffeine and other novel ingredients in the product,³¹ but the European Court of Justice found it to be an improper trade restriction.³²

In 2011, Canada officially designated energy drinks as subject to regulation as food; they established specific criteria, including composition restrictions and labeling requirements.³³ Canada determined the maximum amount of caffeine permitted per single-serve container to be 180 mg and designated all non-resealable containers *one serving*.³³ Canada also requires labels to disclose the amount of caffeine per serving and to include warnings for use by children and certain sensitive adults.³³

The Rudd Center for Food Policy & Obesity conducted a nationally representative online survey of 985 US parents of 2–17 year olds in 2011, seeking to understand attitudes about energy drinks, beliefs about appropriateness of these drinks for their children, feelings regarding caffeine and other common ingredients, and attitudes toward energy drink labeling and regulation.³⁴ They found that 67 per cent of parents were concerned about the caffeine content of beverages for their children, 78 per cent agreed that energy drinks should not be marketed to children and adolescents, and 74 per cent agreed these drinks should not be sold to children or adolescents. In addition, 85 per cent of parents



agreed that regulations requiring reporting of caffeine and warning labels were warranted for energy drinks.

In 2012, US Senators Durbin and Blumenthal asked the FDA for increased regulation of energy drinks, including clarifying labeling requirements, directly regulating the amount of caffeine permitted in products, and an FDA determination of the safety of other additives and ingredients.³⁵

Regulatory Recommendations

The FDA has primary authority over the safety, labeling, and ingredients of energy drinks.³⁶ Federal law preempts state and local governments from addressing issues in the FDA's domain. State and local governments (collectively states), via their legislatures and agencies, can, however, exercise authority over public health and safety to regulate the sale of these products and protect consumers.³⁷ If a government entity determines that increased regulation of energy drinks is warranted, several options are available, summarized in Table 3 and discussed below.

Designation as beverages

The FDA issued a non-binding draft guidance document in 2009 distinguishing beverages from liquid dietary supplements,¹⁶ and the agency is currently finalizing the guidance document.³⁵ The FDA has explained that even if a manufacturer characterizes a product as a dietary supplement, it may be a beverage for regulatory purposes. Beverages can be distinguished by packaging, volume, advertising, name, and similarity to other beverages (for example, soda),¹⁶ whereas a dietary supplement is defined as 'a product taken by mouth that contains a "dietary ingredient" intended to supplement the diet'.¹⁶ According to the FDA, energy drinks labeled as supplements are mislabeled.

Ingredients

The FDA expressed concern that energy drinks contain some GRAS ingredients 'at levels in excess of their traditional use levels', which 'raises questions regarding whether these higher levels and other new conditions of use are *safe*'.¹⁶ The FDA granted GRAS status to added sugar³⁸ and caffeine (at levels of 0.02 per cent of the product) in the

Table 3: Potential interventions to reduce underage consumption of liquid energy products

<i>Topic</i>	<i>Intervention</i>	<i>Actor</i>
Ingredients	● Reconsider GRAS status for problematic ingredients (including caffeine, sugar, and guarana), especially in large quantities	FDA
	● Add limitations to permissible amounts of GRAS ingredients	FDA
	● Take enforcement action against manufacturers that add unapproved ingredients	FDA, AGs
Labeling	● Require caffeine disclosures on all products regulated by FDA	FDA
	● Establish Daily Reference Value (DRVs) for caffeine and added sugar	FDA
	● Require warning labels for liquid energy products	FDA
	● Require liquid energy products comply with the NLEA	FDA
	● Take enforcement actions against products mislabeled as dietary supplements	FDA, AGs
Retail	● Take enforcement action against the marketing of mislabeled products or products with false or deceptive claims	FTC, AGs
	● Require age limits for purchase	Congress, State, Local
	● Establish location restrictions in retail establishments	State, Local
	● Prohibit the sale of the most problematic products	State, Local, AGs
Marketing	● Establish excise taxes on highly sugared products	Congress, State, Local (to extent authorized)
	● Stop marketing to adolescents, including on programming and in events that appeal to them	ABA, Manufacturers
Research	● Measure population caffeine consumption and youth consumption of energy drinks and shots	Public Health Community
	● Identify best practices to reduce sales to underage consumers	Policy Advocates

1970s.³⁹ During the approval process, the Select Committee on GRAS substances recognized potential health hazards associated with consuming added sugar at levels higher than at that time and caffeine in doses larger than used in cola-type beverages.^{38,40} Energy drinks contribute to high *added sugar* consumption, which exceeds the levels at the time of GRAS approval, and they contain far more caffeine than cola-type beverages.²² Further, although the stimulant guarana is GRAS up to a specified amount, it is unclear exactly how much guarana is in energy drinks and how much would be considered safe when it is added to an already highly caffeinated product.



The FDA has the authority to revise GRAS status for sugar, caffeine, and guarana and to regulate the amount of each ingredient permitted to be added to beverages. The agency can mandate maximum levels of these ingredients in single-serving containers.

The FDA also expressed concern that other ingredients in energy drinks are not GRAS and are not being used in accord with existing food additive regulations.¹⁶ Taurine and panax ginseng, among other potential ingredients, are not approved for use in beverages. The FDA has the authority to designate these products as *adulterated* and unsafe for the food supply.¹⁶ The agency can reprimand manufacturers or condemn the products outright.

Labeling

The US government has several labeling options that should be considered to protect and inform consumers about the ingredients and risks associated with energy drinks. Congress can amend the FDCA and the FDA can issue binding regulations that energy drinks must be labeled as beverages and that caffeine content must be disclosed on all products under the FDA's purview.⁴¹

Some or all energy drinks should contain warnings about caffeine toxicity and the introduction of ingredients not normally found in the food supply. Today, when caffeine is added to stimulant drug products, the package must bear a specific warning label stating that the product is for 'occasional use only' and not intended for children under 12 years of age.⁴² US law requires a warning when 'foreseeable risks of harm posed by the product could have been reduced or avoided by the provision of reasonable instructions or warnings' and the omission of such a warning 'renders the product not reasonably safe'.⁴³ ER data from visits involving energy drinks, show these products may be regarded as not reasonably safe without warnings.

Consumer protection actions

The Federal Trade Commission (FTC) and state attorneys general (AGs) have authority to institute consumer protection actions to address labeling and ingredient violations identified above. The FTC can bring an action against manufacturers for unfair and deceptive marketing practices. The state AGs have similar authority over questionable marketing and

labeling and can additionally bring actions to protect citizens from particularly problematic products.⁴⁴ In 2012, for example, New York's Attorney General started an investigation into whether energy drink manufacturers were misleading consumers about caffeine content and potential health risks.⁴⁵

Retail restrictions

State governments in the United States may enact retail regulations. Seventy-nine per cent of energy drinks are sold from convenience stores, and thus subject to a variety of potential regulations.⁴ States can, for example, restrict the sale of energy drinks to youth under a certain age; an option supported by parents. In 2010, a New York county legislator proposed a ban on the sale of energy drinks to minors younger than 19 years.⁴⁶ Lawmakers can determine which age is appropriate. Implementation would be straightforward, because retail outlets are already legally required to verify the age of customers purchasing alcohol and tobacco.

Another option would be to regulate the location of problematic products in the retail environment, akin to state requirements that tobacco be sold from behind the counter. Energy drinks are generally offered in a refrigerator case near alcoholic or other sugary beverages. This placement may imply that they are similar to sugary beverages and/or encourage consumers to mix them with alcohol. Research might help determine how revised placement of drinks could have a positive impact on public health by discouraging purchases and the mixing with alcohol. Research can answer the question whether the top shelf of coolers or aisles, the back of the store, or behind the counter would help protect consumers.²¹

Another retail restriction would ban the sale of certain energy drinks, such as those in large non-resealable containers or with the highest caffeine content. A bill proposed in Oregon sought to ban sale of 'high-calorie' beverages in single-serving containers larger than 12 oz.⁴⁷ The same type of restriction could be placed on the sale of highly caffeinated products in large containers.

Finally, it is noteworthy that an excise tax placed on sugary beverages would surely apply to sugary energy drinks. The underlying rationale and potential benefits of such a tax have been discussed elsewhere; the goal is to decrease consumption.¹ Both federal and state governments can institute excise taxes. Local jurisdictions can sometimes also enact

taxes or fees – to the extent permitted by the state’s laws governing localities.²¹

Marketing restrictions

Tighter regulations on the marketing of energy drinks to adolescents are warranted, but in the United States a substantial barrier exists to government enacting such regulations. The Supreme Court has interpreted the First Amendment of the Constitution to protect marketing, or *commercial speech*, from government interference. Thus, the United States has focused on self-regulation, hoping to maintain some control over marketing directed at youth.

The ABA established guidelines for the sale and marketing of energy drinks, under which member companies agree to refrain from marketing products to children (ages 2–11) and selling them in schools (grade levels K–12).¹⁸ The guidelines also state that energy drinks should not be promoted as sports drinks or in connection with alcohol consumption. In response to criticism of marketing that promotes energy drinks to youth, both Red Bull⁴⁸ and the ABA,⁴⁹ as a spokes-organization for its member companies, reiterated that they do not market energy drinks to children under age 12. But these self-regulatory pledges do not prohibit marketing targeted directly to adolescents and, as noted, despite these restrictions, children and adolescents continue to be exposed to large numbers of advertisements for energy drinks.

Self-regulation of alcohol marketing to minors (20 years and younger) provides a potential blueprint for reducing energy drink marketing to youth. The FTC has recommended a self-regulatory approach to reduce underage exposure to alcohol marketing. Major alcohol suppliers agreed that they would not advertise in media with an audience comprising more than 30 per cent minors and have largely complied.⁵⁰ The National Research Council (NRC), Institute of Medicine (IOM),⁵¹ and 19 state AGs⁵² recommended tighter self-regulatory standards, including no alcohol advertising in media with an underage audience share of 15 per cent (approximately their share of the US population) and restrictions on marketing practices with substantial underage appeal. The NRC and IOM also recommended establishment of an independent review board to monitor alcohol marketing practices. A similar protocol would work well for energy drinks.

Companies that belong to the ABA currently comply with their self-regulatory commitments, but this program has limitations. Several of the highest selling energy drink brands do not belong to the ABA. At a minimum, these companies should agree to abide by ABA guidelines. However, to address the majority of youth-targeted marketing of energy drinks, all energy drink manufacturers should also agree to discontinue their marketing practices that disproportionately appeal to adolescents, including advertising on television programming with a higher-than-average proportion of youth in the audience and the use of social media and sponsored events.

Discussion and Conclusion

Existing evidence points to significant public health issues arising from youth consumption of energy drinks, but further research and analysis are needed:

- More comprehensive measurement of youth consumption of caffeine and energy drinks, separate from other sugary beverages. Because energy drinks are relatively new products in the American marketplace, ongoing dietary measurement panels do not adequately monitor and report on these products.
- Research to determine consumer understanding of ingredients and claims on energy drink labels would help us understand the extent to which current practices mislead or deceive.
- Studies of *energy shots* are also warranted. We know little about energy shot consumption by youth; but 82 per cent of the energy product ads viewed by children and adolescents promoted one shot: 5-Hour Energy.⁴ Of all products examined in the 2010 study, a 2.5 oz. shot had the highest per-serving caffeine content overall, 200 mg.⁴ Manufacturers designate energy shots as dietary supplements so they are located with other dietary supplements in pharmacies, which may send an unwarranted health message to consumers. In other retail outlets, shots are often located in free-standing displays at the check-out⁴ further encouraging purchase. The FDA should pay particular attention to categorization and labeling of shots because companies market them in media viewed by youth and they contain extreme levels of caffeine that could be dangerous for children and adolescents.



- To identify best policies, research might help local jurisdictions determine the best location in retail establishments to require problematic products to be placed to discourage purchase by youth. Alternatively, locales can experiment with product placement restrictions to determine which locations work best.

* * *

Consumption of energy drinks is a public health concern especially for young people. Increased regulation is warranted to inform and protect consumers by addressing problematic ingredients, clarifying labeling requirements, and restricting youth access. At a minimum, increased self-regulatory efforts should be instituted to protect youth from marketing. Energy drinks are a unique beverage and should be regulated accordingly.

About the Authors

Jennifer L. Pomeranz (JD, MPH) is the Director of Legal Initiatives at the Yale Rudd Center for Food Policy & Obesity at Yale University. Ms. Pomeranz speaks and publishes on subjects including: sugar labeling, weight discrimination, food marketing to children, the First Amendment, preemption, regulating sugary beverages, and innovative legal solutions to obesity. She earned her Juris Doctorate from Cornell Law School, and her Master of Public Health from the Harvard School of Public Health.

Christina R. Munsell (MS) is a Research Associate and Registered Dietitian at the Rudd Center for Food Policy & Obesity at Yale University. She completed a dietetic internship and Master's degree in Health Care Policy and Management at Stony Brook University after earning a Bachelor's degree in Nutrition from Texas Christian University. Munsell works with the marketing team at the Rudd Center, developing and executing projects that analyze food marketing to youth as well as providing nutrition expertise for other Rudd Center projects and research.

Jennifer L. Harris (MBA, PhD) is Director of Marketing Initiatives at the Rudd Center for Food Policy & Obesity at Yale University. She is responsible for identifying and coordinating research initiatives to understand and communicate the extent and impact of children's exposure to food advertising. Dr Harris received her BA in Political Science from

Northwestern University, her MBA in Marketing from The Wharton School at the University of Pennsylvania, and her PhD in Social Psychology from Yale University. Before returning to graduate school, she worked for 18 years as a Vice President in marketing at American Express and ran a marketing consulting firm specializing in marketing strategy and new product and market development. Dr Harris has written on the psychological and behavioral effects of advertising to children and adolescents and conducted research to quantify the amount and types of food marketing seen by young people and its impact on their health and diet.

References and Notes

1. Brownell, K.D. *et al* (2009) The public health economic benefits of taxing sugar-sweetened beverages. *New England Journal of Medicine* 361(16): 1599–1605.
2. PR Newswire. (2011) Energy drink industry report shows strong growth. 20 December, <http://www.prnewswire.com/news-releases/energy-drink-industry-report-shows-strong-growth-135915263.html>, accessed 26 September 2012.
3. BEVNET. (2011) Morgan Stanley report: Energy drinks and RTD teas perform well in year-over-year comparison. 8 December, <http://www.bevnet.com/news/2011/morgan-stanley-report-energy-drinks-and-rtd-teas-perform-well-in-year-over-year-comparison>, accessed 26 September 2012.
4. Yale Rudd Center for Food Policy & Obesity. (2011) Sugary drink FACTS: Evaluating sugary drink nutrition and marketing to youth, http://www.sugarydrinkfacts.org/resources/Sugary-DrinkFACTS_Report.pdf, accessed 26 September 2012.
5. *Hansen Bev. Co. v. Innovation Ventures, LLC*, 2009 U.S. Dist. LEXIS 127605 (S.D. Cal. 22 December, 2009).
6. Park, S., Blanck, H.M., Sherry, B., Brener, N. and O’Toole, T. (2012) Factors associated with sugar-sweetened beverage intake among united states high school students. *Journal of Nutrition* 142(2): 306–312.
7. Simon, M. and Mosher, J. (2007) *Alcohol, Energy Drinks, and Youth: A Dangerous Mix*. California: Marin Institute.
8. Seifert, S.M., Schaechter, J.L., Hershorin, E.R. and Lipshultz, S.E. (2011) Health effects of energy drinks on children, adolescents, and young adults. *Pediatrics* 127(3): 511–528.
9. Zenith International. (2007) US overtakes Thailand as world leader in energy drinks, http://www.zenithinternational.com/news/press_release_detail.asp?id=206, accessed 26 September 2012.
10. Reissig, C.J., Strain, E.C. and Griffiths, R.R. (2009) Caffeinated energy drinks – A growing problem. *Drug and Alcohol Dependence* 99(1–3): 1–10.
11. *Hansen Bev. Co. v. Innovation Ventures, LLC*, 2008 U.S. Dist. LEXIS 76243 (S.D. Cal. 28 September, 2008).
12. (2011) Sports drinks and energy drinks for children and adolescents: Are they appropriate? *Pediatrics* 127(6): 1182–1189.
13. Substance Abuse and Mental Health Services Administration, Center for Behavioral Health Statistics and Quality. (2011) The DAWN Report: Emergency Department Visits Involving Energy Drinks. 22 November, Rockville, MD.



14. WA State Liquor Control Board. (2010) The mix with dangerous risks: Energy drinks and alcohol, <http://liq.wa.gov/education/alcohol-energy-drinks>, accessed 26 September 2012.
15. Gunja, N. and Brown, J.A. (2012) Energy drinks: Health risks and toxicity. *Medical Journal of Australia* 196(1): 46–49.
16. FDA. (2009) Draft guidance for industry: Factors that distinguish liquid dietary supplements from beverages, considerations regarding novel ingredients, and labeling for beverages and other conventional foods, <http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/DietarySupplements/ucm196903.htm>, accessed 2 February 2013.
17. 21 U.S.C. 343(q)(5)(F).
18. ABA. Guidance for the responsible labeling and marketing of energy drinks. American Beverage Association, http://www.ameribev.org/files/339_Energy%20Drink%20Guidelines%20%28final%29.pdf, accessed 2 February 2013.
19. 21 U.S.C. 321(s).
20. United States v. An Article of Food, *Coco Rico*, 752 F.2d 11 (1st Cir. 1985).
21. Pomeranz, J.L. (2011) Advanced policy options to regulate sugar-sweetened beverages to support public health. *Journal of Public Health Policy* 33(1): 75–88.
22. Welsh, J.A., Sharma, A.L.G. and Vos, M.B. (2011) Consumption of added sugars is decreasing in the United States. *American Journal of Clinical Nutrition* 94(3): 726–734.
23. CDC. (2011) Usual sodium intakes compared with current dietary guidelines – United States, 2005–2008. *Morbidity and Mortality Weekly*, 21 October, 60(41): 1413–1417.
24. Committee on Nutrition and the Council on Sports Medicine and Fitness of the American Academy of Pediatrics. (2011) Sports drinks and energy drinks for children and adolescents: Are they appropriate? *Pediatrics* 127(6): 1182–1189.
25. Higgins, J.P., Tuttle, T.D. and Higgins, C.L. (2010) Energy beverages: Content and safety. *Mayo Clinic Proceedings* 85(11): 1033–1041.
26. MedlinePlus. (2011) Panax Ginseng. US National Library of Medicine, 11 August, <http://www.nlm.nih.gov/medlineplus/druginfo/natural/1000.html>.
27. *Zoller Labs., LLC v. NBTY, Inc.*, 111 Fed. Appx. 978 (10th Cir. 2004).
28. Yale Rudd Center for Food Policy & Obesity. (2012) Adolescent-targeted television advertising for energy drinks. February, www.yaleruddcenter.org/resources/upload/docs/what/advertising/TVadvertising_EnergyDrinks_2010.pdf, accessed 26 September 2012.
29. comScore. Site Detail Report. Average of monthly unique visitors from October to December, 2011.
30. Weise, E. (2012) Petition calls for FDA to regulate energy drinks. *USA Today*, 22 October, http://www.usatoday.com/news/health/2008-10-21-energy-drinks_N.htm, accessed 26 September 2012.
31. Medical News Today. (2004) French ban on Red Bull (drink) upheld by European court. 8 February, <http://www.medicalnewstoday.com/releases/5753.php>, accessed 26 September 2012.
32. Palmer, D. (2008) France reluctantly lifts ban on Red Bull. *Australian Food News*. 17 July, <http://www.ausfoodnews.com.au/2008/07/17/france-reluctantly-lifts-ban-on-red-bull.html>, accessed 26 September 2012.
33. Health Canada. (2011) Health Canada's proposed approach to managing caffeinated energy drinks, <http://www.hc-sc.gc.ca/fn-an/legislation/pol/energy-drinks-boissons-energisantes-eng.ph>, accessed 26 September 2012.
34. Yale Rudd Center for Food Policy & Obesity. (2012) Parents' attitudes about energy drinks. June, http://www.yaleruddcenter.org/resources/upload/docs/what/policy/SSBtaxes/SSB_Parent_Attitudes_Energy_Drinks.pdf, accessed 26 September 2012.
35. Letter to the FDA from Senators Durbin and Blumenthal. 11 September 2012, http://durbin.senate.gov/public/index.cfm/files/serve?File_id=fe44b78e-32ae-41a0-8a61-2ddf14ab95d1, accessed 26 September 2012.

36. 21 U.S.C. §301 et seq.
37. *Hutchinson Ice Cream Co. v. Iowa*, 242 U.S. 153, (1916).
38. 21 C.F.R. §184.1854 et seq.
39. 21 C.F.R. §182.1180.
40. FDA. (1978) Database of Select Committee on GRAS Substances Reviews: Caffeine. Report No. 89. I.D. code 58-08-2, <http://www.accessdata.fda.gov/scripts/fcn/fcnDetailNavigation.cfm?rpt=scogsListing&id=42>, accessed 26 September 2012
41. 62 Federal Register 49826 (23 September 1997).
42. 21 C.F.R. §340.50.
43. American Law Institute. (1998) Restatement 3d of Torts: Products Liability §2 Categories of Product Defect.
44. Connecticut Attorney General's Office. (2007) Attorney general, DCP Commissioner announce agreement banishing 'cocaine' drink from CT stores. 7 May, <http://www.ct.gov/AG/cwp/view.asp?A=2788&Q=379504>.
45. Schwartz, N.D. (2012) New inquiry into energy drink firms. *The New York Times*, 29 August.
46. Epstein, R.J. (2010) Under 19? Suffolk bill could ban Red Bull. *Newsday*. 8 December, <http://www.newsday.com/long-island/suffolk/under-19-suffolk-bill-could-ban-red-bull-1.2527343>.
47. OR HB 3222 (2010).
48. Montague-Jones, G. (2011) Red Bull denies child marketing claims in new study. *Beverage-Daily.com*. 3 June, <http://www.beveragedaily.com/content/view/print/378916>, accessed 26 September 2012.
49. ABA. (2011) Beverage industry responds to latest Rudd Report, http://www.ameribev.org/files/news/253_ABA%20responds%20to%20Rudd%20Report.pdf, accessed 26 September 2012.
50. FTC. (2008) Self-regulation in the alcohol industry: Report of the Federal Trade Commission, <http://www.ftc.gov/os/2008/06/080626alcoholreport.pdf>, accessed 26 September 2012.
51. National Research Council and Institute of Medicine. (2003) *Reducing Underage Drinking: A Collective Responsibility*. Washington DC: National Academies Press.
52. Rowe, G.S. et al (2006) A communication from the Chief Legal Officers of the following states: AZ, CT, DE, HI, ID, IL, IA, ME, MD, NJ, NM, NY, OH, OR, RI, UT, VT, WA, WY. RE: Alcohol Reports: Paperwork comment FTC File No. P064505, 8 May, <http://www.ftc.gov/os/comments/alcoholmanufacadstudy/522852-01287.pdf>, accessed 26 September 2012.