

# The DAWN Report

November 22, 2011

## Emergency Department Visits Involving Energy Drinks

### In Brief

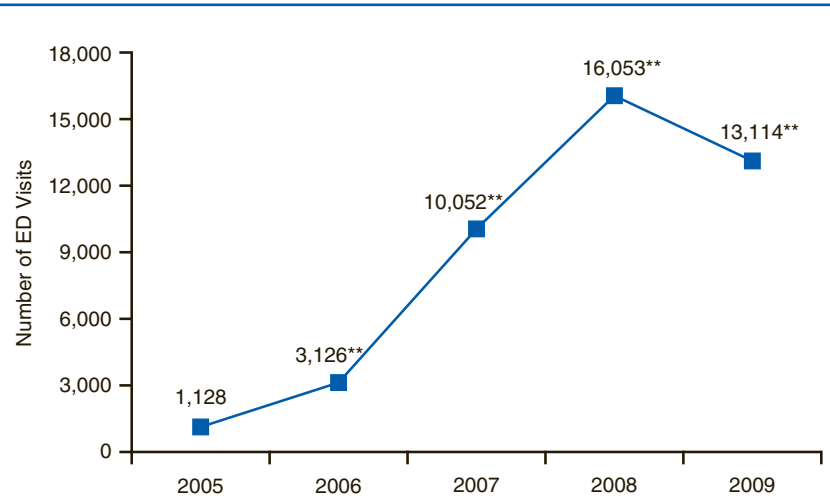
- Trend data show a sharp increase in the number of emergency department (ED) visits involving energy drinks between 2005 (1,128 visits) and 2008 and 2009 (16,053 and 13,114 visits, respectively), representing about a tenfold increase between 2005 and 2009
- Approximately half of the energy drink-related ED visits (52 percent) made by patients aged 18 to 25 involved combinations of energy drinks with alcohol or other drugs
- Overall, more ED visits involving energy drinks were made by males (64 percent) than by females (36 percent), and visits by males were more likely than visits by females to involve energy drinks in combination with alcohol (20 vs. 10 percent) or illicit drugs (12 vs. 5 percent); visits made by females were more likely to involve energy drinks in combination with pharmaceuticals than visits by males (35 vs. 23 percent)
- When examined by the reason for the ED visit, more than two thirds (67 percent) of visits involving energy drinks were classified as adverse reactions

Energy drinks are flavored beverages containing high amounts of caffeine and typically other additives, such as vitamins, taurine, herbal supplements, creatine, sugars, and guarana, a plant product containing concentrated caffeine. These drinks are sold in cans and bottles and are readily available in grocery stores, vending machines, convenience stores, and bars and other venues where alcohol is sold. These beverages provide high doses of caffeine that act as a stimulant upon the central nervous system and cardiovascular system. The total amount of caffeine in a can or bottle of an energy drink varies from about 80 to more than 500 milligrams (mg) of caffeine, compared with about 100 mg in a 5-ounce cup of coffee or 50 mg in a 12-ounce cola.<sup>1</sup> Research suggests that certain additives may compound the stimulant effects of caffeine. Some types of energy drinks may also contain alcohol, producing a hazardous combination; however, this report focuses only on the dangerous effects of energy drinks that do not have alcohol.

Although consumed by a range of age groups, energy drinks are marketed to appeal to youth and are consumed by 30 to 50 percent of children, adolescents, and young adults.<sup>2</sup> Of the several hundred brands of energy drinks on the market, the most popular brands of energy drinks that account for the majority of the market share are Red Bull, Monster, Rockstar, Full Throttle, and Amp. Marketing for energy drinks often targets young people, suggesting benefits such as increased energy and stamina, weight loss, and enhanced physical and/or mental performance.<sup>2</sup> Emphasizing thrill seeking with names such as “Cocaine” and “Venom,” energy drink companies use innovative media to reach their audiences, such as advertisements in video games and at sports events, and solicit market research feedback from consumers via social media to help identify new packaging designs.<sup>3</sup> The popularity of these drinks has increased markedly in recent years, with energy drink sales increasing 240 percent from 2004 to 2009.<sup>4</sup>

Consumption of energy drinks is a rising public health problem because medical and behavioral consequences can result from excessive caffeine intake. A growing body of scientific evidence documents harmful effects, particularly for children, adolescents, and young adults.<sup>2</sup> Among college students, associations have been established between energy drink consumption and problematic behaviors such as marijuana use, sexual risk taking, fighting, smoking, drinking, and prescription drug misuse.<sup>5,6</sup> In one study, bar patrons who consumed alcohol mixed with energy drinks were 3 times more likely to leave a bar highly intoxicated and were 4 times more likely to intend to drive while intoxicated than those who did not consume alcohol mixed with energy drinks.<sup>6</sup> This latter finding may be because the high levels of caffeine found in energy drinks can mask the symptoms associated with being intoxicated (e.g., feeling

**Figure 1. Energy Drink-Related Emergency Department (ED) Visits, by Year: 2005 to 2009\***



\* Although the remainder of the report includes combined data between 2004 and 2009, the number of visits in 2004 only was suppressed because of low statistical precision. Thus, only data between 2005 and 2009 are included in Figure 1.

\*\* The difference between the number of visits in 2005 and subsequent years was statistically significant at the .05 level.

Source: 2005 to 2009 SAMHSA Drug Abuse Warning Network (DAWN).

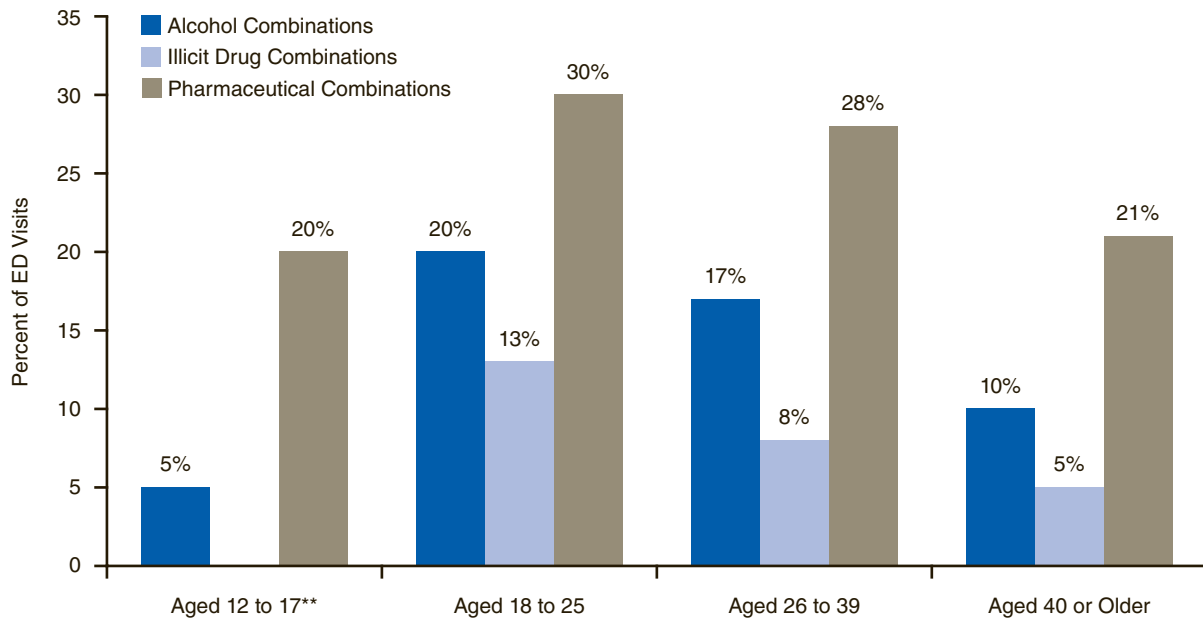
**Table 1. Selected Drug Combinations in Energy Drink-Related Emergency Department (ED) Visits: Annual Averages, 2004 to 2009**

Drug Combination	Number of ED Visits	Percentage of ED Visits*
<b>Total ED Visits</b>	<b>7,301</b>	<b>100</b>
Energy Drinks Only	4,059	56
Energy Drinks in Combination	3,242	44
Any Pharmaceutical Combination	1,985	27
Central Nervous System (CNS) Medications	1,158	16
CNS Stimulants	696	10
Pain Relievers	312	4
Narcotic Pain Relievers	107	1
Drugs That Treat Anxiety or Insomnia	143	2
Benzodiazepines	98	1
Any Alcohol Combination	1,174	16
Any Illicit Drug Combination	699	10
Marijuana	344	5
Cocaine	251	3

\* Because multiple drugs may be involved in each visit, estimates of visits by drug may add to more than the total number of visits, and percentages may add to more than 100 percent.

Source: 2004 to 2009 SAMHSA Drug Abuse Warning Network (DAWN).

**Figure 2. Percentage of Emergency Department (ED) Visits Involving Energy Drink Combinations,\* by Age Group: 2004 to 2009**



\* Visits involving energy drinks only are not shown. Because each visit may involve multiple drugs, the percentages may not add to the total.

\*\* The percentage for illicit drug combinations was suppressed for visits made by patients aged 12 to 17 because of low statistical precision.

Source: 2004 to 2009 SAMHSA Drug Abuse Warning Network (DAWN).

lethargic). Individuals, especially youthful drinkers, may incorrectly believe that consumption of caffeine can “undo” the effects of alcohol intake and make it safe to drive after drinking. The popularity of energy drinks—coupled with the burgeoning literature suggesting the risks involved with their use—underscore the importance of gaining additional information about these beverages.

The Drug Abuse Warning Network (DAWN) is a public health surveillance system that monitors drug-related emergency department (ED) visits in the United States and can be used as a source of information for assessing the more negative medical consequences associated with consuming energy drinks. To be a DAWN case, the ED visit must involve a drug, either as the direct cause of the visit or as a contributing factor. Such a visit is referred to as a “drug-related visit.” Drugs include alcohol; illegal drugs, such as cocaine, heroin, and marijuana; pharmaceuticals (e.g., over-the-counter medicines and prescription medications); and nutraceuticals, such as nutritional supplements, vitamins, and caffeine products. This issue of *The DAWN Report* highlights trend data for energy drinks from 2005 to 2009, as well as describes characteristics associated with energy drink-related visits using combined data from 2004 to 2009.

## Trends and Overview of ED Visits Involving Energy Drinks

Trend data show a sharp increase in the number of ED visits involving energy drinks between 2005 (1,128 visits) and 2008 and 2009 (16,053 and 13,114 visits, respectively) (Figure 1).<sup>7</sup> This represents about a tenfold increase between 2005 and 2009.

Combined 2004 to 2009 data indicate that the majority of ED visits involving energy drinks were made by patients aged 18 to 39, with 45 percent of visits made by young adults aged 18 to 25 and 32 percent made by persons aged 26 to 39. The two remaining age groups—adolescents aged 12 to 17 and adults aged 40 or older—each accounted for about 11 percent of visits. Males made up 64 percent of ED visits involving energy drinks.

## Alcohol and Drug Involvement

ED visits involving energy drinks can be divided into two groups: those that involve energy drinks only and those that involve energy drinks in combination with pharmaceuticals, alcohol, and/or illicit drugs (hereafter referred to as “energy drink combinations”). An estimated 56 percent of visits

involved energy drinks only (Table 1). About one quarter (27 percent) of visits involved energy drinks in combination with pharmaceuticals, 16 percent involved combinations with alcohol, and 10 percent involved combinations with illicit drugs. Central nervous system stimulants (e.g., Ritalin®) were involved in 10 percent of ED visits related to energy drinks in combination with pharmaceuticals.

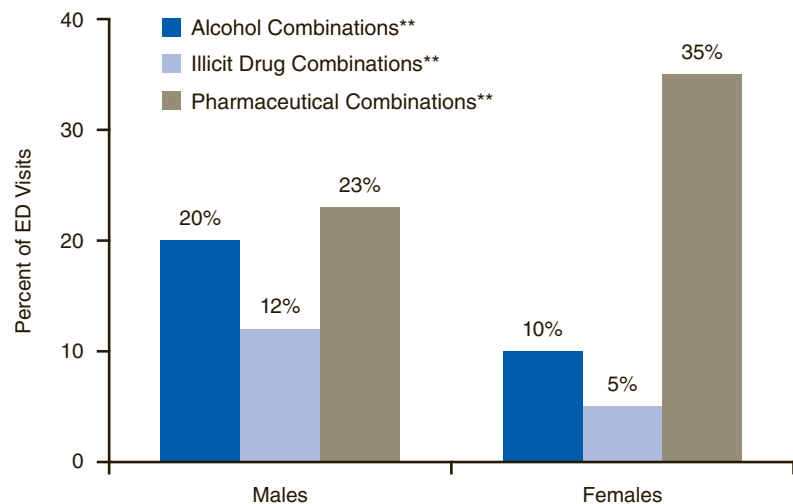
### Alcohol and Drug Combinations by Demographic Groups

Approximately half of the energy drink-related ED visits (52 percent) by patients aged 18 to 25 involved combinations of energy drinks with alcohol or other drugs, whereas 44 percent of visits made by patients aged 26 to 39 involved such combinations. Approximately 3 in 10 visits by patients aged 12 to 17 and those aged 40 or older involved energy drink combinations (28 and 30 percent, respectively).

When ED visits involving energy drink combinations were examined by drug type, pharmaceuticals were commonly combined with energy drinks across each age group (Figure 2). Specifically, combinations of energy drinks and pharmaceuticals were involved in 20 percent of energy drink-related ED visits among patients aged 12 to 17, 30 percent of such ED visits among those aged 18 to 25, 28 percent of such ED visits among those aged 26 to 39, and 21 percent of such ED visits among those 40 or older. Energy drinks in combination with alcohol were involved in 20 percent of energy drink-related ED visits made by patients aged 18 to 25, 17 percent of such ED visits among patients aged 26 to 39, and 10 percent of such ED visits among those 40 or older.

By gender, energy drink-related ED visits made by males were more likely than visits made by females to involve energy drinks in combination

**Figure 3. Percentage of Emergency Department (ED) Visits Involving Energy Drink Combinations,\* by Gender: 2004 to 2009**

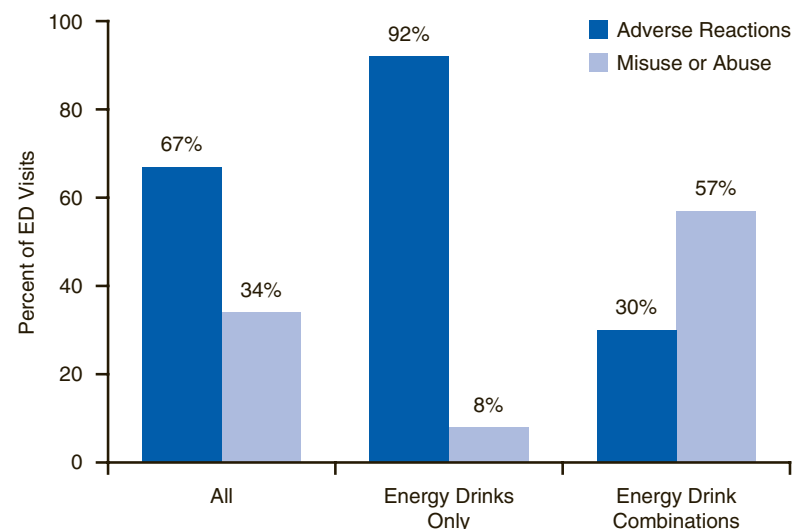


\* Visits involving energy drinks only are not shown. Because each visit may involve multiple drugs, the percentages may not add to the total.

\*\* The difference between males and females was statistically significant at the .05 level.

Source: 2004 to 2009 SAMHSA Drug Abuse Warning Network (DAWN)

**Figure 4. Reason for Emergency Department (ED) Visits Involving Energy Drinks Only or in Combination with Other Drugs\*: 2004 to 2009**



\* Visits for other reasons are not shown. Because each visit may involve multiple drugs, the percentages may not add to the total.

Source: 2004 to 2009 SAMHSA Drug Abuse Warning Network (DAWN).

with alcohol (20 vs. 10 percent) or illicit drugs (12 vs. 5 percent) (Figure 3). However, ED visits made by females were more likely to involve energy drinks in combination with pharmaceuticals than ED visits made by males (35 vs. 23 percent).

## Alcohol and Drug Combinations by Reason for Visit

When examined by the reason for the ED visit, more than two thirds (67 percent) of ED visits involving energy drinks were classified as adverse reactions, and approximately one third (34 percent) involved misuse or abuse of drugs (Figure 4).<sup>8,9</sup> Among visits involving energy drinks only, the majority (92 percent) were classified as adverse reactions, and 8 percent involved misuse or abuse. More than half (57 percent) of visits involving energy drink combinations were classified as misuse or abuse and less than one third (30 percent) involved adverse reactions.

## Discussion

Between 2005 and 2009, there was a marked increase in the number of ED visits involving energy drinks. It is notable that visits involving energy drinks alone often caused adverse reactions, suggesting that energy drink consumption by itself can result in negative health events serious enough to require emergency care.

Although there are no recommended or “safe” levels that have been experimentally established for caffeine, most researchers and clinicians consider 100 to 200 mg of caffeine per day to be moderate intake for an adult. Pediatricians recommend that children and adolescents abstain from all stimulant-containing energy drinks.<sup>2</sup>

Excessive caffeine intake from energy drinks can cause arrhythmias, hypertension, and dehydration, in addition to sleeplessness and nervousness. Additional risks and other medical complications can arise depending on the individual’s overall health status (e.g., cardiac conditions, eating disorders, diabetes, anxiety disorders) and other drugs or medications he/she may be taking (e.g., medications for attention deficit disorder). Use over time can cause dependence and withdrawal symptoms.<sup>10</sup> Risky behavior such as drinking and driving can also be facilitated by mixing energy drinks with other substances such as alcohol; a study of college students found that more than half of them mixed energy drinks with alcohol.<sup>2</sup>

Public awareness campaigns focusing on the health effects of consumption of energy drinks are needed to educate the public about the potential risks associated with consumption, alone and in combination with alcohol and/or pharmaceuticals. On an individual level, an ED visit involving energy drinks offers medical staff an opportunity

to educate the patient in the clinical setting. The fact that one in four ED visits related to energy drinks involved energy drinks in combination with pharmaceuticals, with more such visits made by males and adults aged 18 to 39 than by other demographic groups, suggests that these groups may benefit from targeted education on the dangers of energy drinks in combination with other substances. Finally, given the finding that one in six visits involved energy drinks in combination with alcohol, public health awareness campaigns could also help dispel the misguided belief that energy drinks can offset or eliminate the effects of alcohol intoxication.

## End Notes

- 1 Food and Drug Administration. (2007). *Medicines in my home: Caffeine and your body*. Retrieved from <http://www.fda.gov/downloads/Drugs/ResourcesForYou/Consumers/BuyingUsingMedicineSafely/UnderstandingOver-the-CounterMedicines/UCM205286.pdf>
- 2 Seifert, S. M., Schaechter, J. L., Hershorin, E. R., & Lipshultz, S. E. (2011). Health effects of energy drinks on children, adolescents, and young adults. *Pediatrics*, 127(3), 511-528.
- 3 Butschli, J. (2011, August 25). Social media input energizes Verve Energy Drink packaging redesign. *Packaging World*. [Available at <http://www.packworld.com/package-32243>]
- 4 Mintel Global New Products Database. (2009, August 28). *Energy drink ingredients continue down unhealthy path* (Press release). Retrieved from <http://www.mintel.com/press-centre/press-releases/386/energy-drink-ingredients-continue-down-unhealthy-path>
- 5 Miller, K. E. (2008). Energy drinks, race, and problem behaviors among college students. *Journal of Adolescent Health*, 43(5), 490-497.
- 6 Thombs, D. L., O'Mara, R. J., Tsukamoto, M., Rossheim, M. E., Weiler, R. M., Merves, M. L., & Goldberger, B. A. (2010). Event-level analyses of energy drink consumption and alcohol intoxication in bar patrons. *Addictive Behaviors*, 35(4), 325-330.
- 7 Although the remainder of the report includes combined data between 2004 and 2009, the number of visits in 2004 only was suppressed because of low statistical precision.
- 8 Within DAWN, an ED visit is categorized as an adverse reaction when the chart documents that a prescription or over-the-counter pharmaceutical, taken as prescribed or directed, produced an adverse drug reaction, side effect, drug-drug interaction, or drug-alcohol interaction. Although energy drinks are not treated as drugs by the Food and Drug Administration, ED visits involving energy drinks were classified as adverse reactions if the chart documented them as such. If other substances are reported on the chart as involved in the visit, an energy drink is not necessarily the sole reason for the adverse reaction.
- 9 Misuse or abuse cases within DAWN are broadly defined to include all visits associated with illicit drugs, alcohol use in combination with other drugs, alcohol use only among those younger than 21 years old, and nonmedical use of pharmaceuticals.
- 10 Bernstein, G. A., Carroll, M. E., Thuras, P. D., Cosgrove, K. P., & Roth, M. E. (2002). Caffeine dependence in teenagers. *Drug and Alcohol Dependency*, 66(1), 1-6.

## Suggested Citation

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Findings from SAMHSA's 2004 to 2009 Drug Abuse Warning Network (DAWN)

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The Drug Abuse Warning Network (DAWN) is a public health surveillance system that monitors drug-related morbidity and mortality. DAWN uses a probability sample of hospitals to produce estimates of drug-related emergency department (ED) visits for the United States and selected metropolitan areas annually. DAWN also produces annual profiles of drug-related deaths reviewed by medical examiners or coroners in selected metropolitan areas and States.

Any ED visit related to recent drug use is included in DAWN. All types of drugs—licit and illicit—are covered. Any substance taken for therapeutic purposes is also included. Alcohol involvement is documented for patients of all ages if it occurs with another drug. Alcohol is considered an illicit drug for minors and is documented even if no other drug is involved. The classification of drugs used in DAWN is derived from the Multum *Lexicon*, copyright 2010 Lexi-Comp, Inc., and/or Cerner Multum, Inc. The Multum Licensing Agreement governing use of the *Lexicon* can be found at [http://dawninfo.samhsa.gov/drug\\_vocab](http://dawninfo.samhsa.gov/drug_vocab).

DAWN is one of three major surveys conducted by the Substance Abuse and Mental Health Services Administration's Center for Behavioral Health Statistics and Quality (SAMHSA/CBHSQ). For more information on other CBHSQ surveys, go to <http://oas.samhsa.gov>. SAMHSA has contracts with Westat (Rockville, MD) and RTI International (Research Triangle Park, NC) to operate the DAWN system and produce publications.

For publications and additional information about DAWN, go to <http://DAWNinfo.samhsa.gov/>.



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