

# Energy drink use and high-risk behaviors: *Research evidence and knowledge gaps*

Amelia M. Arria, Ph.D.

Associate Professor, Department of Behavioral and Community Health  
Director, Center on Young Adult Health and Development  
University of Maryland School of Public Health

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The Use and Biology of Energy Drinks: Current Knowledge and Critical Gaps  
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# Overview



1. National Estimates of Energy Drink Use among U.S. Secondary School Students
2. Neurodevelopmental Context of Risk-taking Behavior during Adolescence
3. Energy Drink Use: Potential Exacerbation of Health-risk Behaviors
4. Relationship between Energy Drink Use and Alcohol Dependence in College Students
5. Prospective Relationship between Energy Drink Use and Subsequent Prescription Drug Abuse
6. Critical Knowledge Gaps

## *Understanding Risk-taking from a Neurodevelopmental Perspective*

*“Until quite recently, it was generally believed that the majority of brain development is finished by the age of 10. It has become clear that during the adolescent years, the organization and functioning of the brain go through complex changes.”*

*Aaron White, Ph.D.*

### **During the second decade of life:**

- The neurologic “pruning process” unfolds, which ultimately leads to more focused and efficient processing by the adult years.
- The parietal, temporal and occipital lobes all undergo unique changes.
- Emotional areas of the brain reach full operating power by mid-adolescence at a time when the frontal lobes are still in flux, giving rise to emotion-driven rather than methodical decision-making.
- Gray-matter volume increases during adolescence and into the early 20s.
- White matter volumes increase linearly into young adulthood.




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- Increases in risk-taking without regard for possible consequences
  - Increased susceptibility to rewarding properties of substances
  - Use during adolescence increases the risk of addiction in adulthood

### **References**

Casey & Jones, 2010  
Crews, He & Hodge, 2007  
Gladwin, Figner, Crone, et al., 2011  
Johnson, Blum & Giedd, 2009  
Kuhn, 2006

Pharo, Sim, & Graham, 2011  
Spear, 2013  
Steinberg, 2008  
Sturman & Mogghaddam, 2011  
White, 2009

## Energy Drink Use and Risk-taking Behavior

Authors	Sample	Study Design	Energy Drink Use (%)	Risk Behaviors Studied	Findings
Miller et al., 2008	(n=602)	Cross-sectional	10% weekly use	Marijuana, tobacco, alcohol, Rx drug use, sexual risk-taking, seat belt omission	Energy drink use associated with risk-taking; race/ethnicity difference existed
Arria et al., 2010	(n=1060)	Prospective	Typical use: 23% (Yr2), 36.5% (Yr3)	Incident use of eight drugs	Energy drink use assoc. with incident Rx drug use and frequency of tobacco smoking*
Velaquez et al., 2012	(n=585)	Cross-sectional	Past month use: 40% Past week use: 17.5%	Alcohol use, heavy drinking, mixing ED and alcohol	Energy drink use associated with greater risk of all behaviors studied.
Arria et al., 2011	(n=975)	Cross-sectional	Past year use: 51% less than weekly 10% weekly	Alcohol use and related problems, alcohol dependence	Energy drink use associated with alcohol dependence*
Stasio et al., 2011	(n=107)	Cross-sectional	Past week use: 57%	Anxiety, Sleep Quality	Energy drink use accounted for 29% and 20% of variance in anxiety and sleep quality, respectively*
Woolsey et al., in press	(n=267)	Cross-sectional	Past year use: 83%	Nonmedical Use of Rx Stimulants	Energy drink use was significantly associated with nonmedical Rx stimulant use
Peacock et al., 2013	(n=28)	Experimental, within subjects	n/a	Laboratory measure of risk-taking (BART)	Small significant relationship between energy drink condition and risk-taking task

\*controlled for other types of caffeine use

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# Study #1: Energy Drink Use and Alcohol Dependence

## Baseline Characteristics (*n*=975)

- Sex
- Race/Ethnicity
- Socioeconomic Status
- Fraternity/Sorority Involvement
- Sensation-Seeking
- Use of Other Caffeine Products
- Alcohol Consumption
- Age of First Intoxication
- Early Conduct Problems
- Depression Symptoms
- Family History

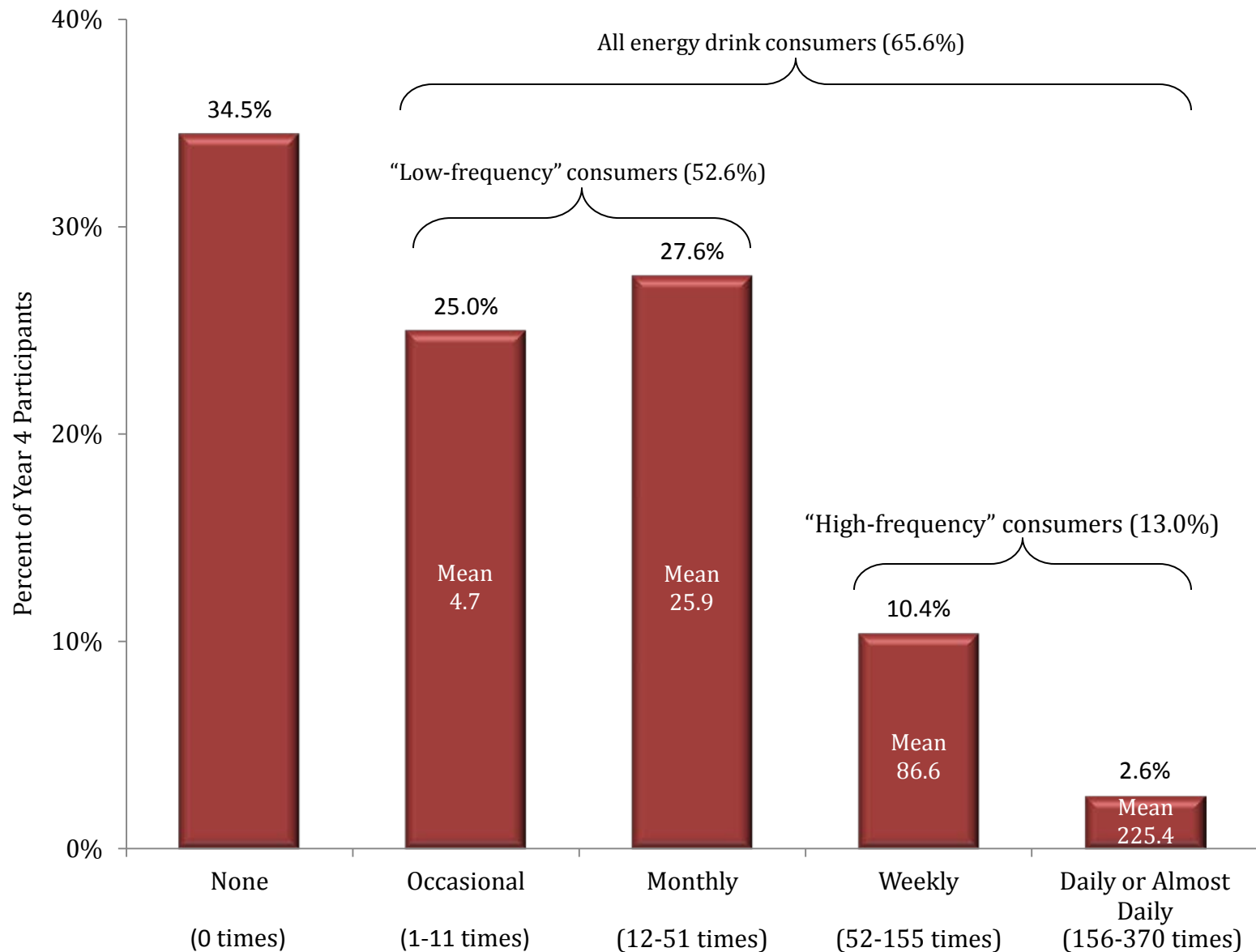
## Frequency of Energy Drink Use



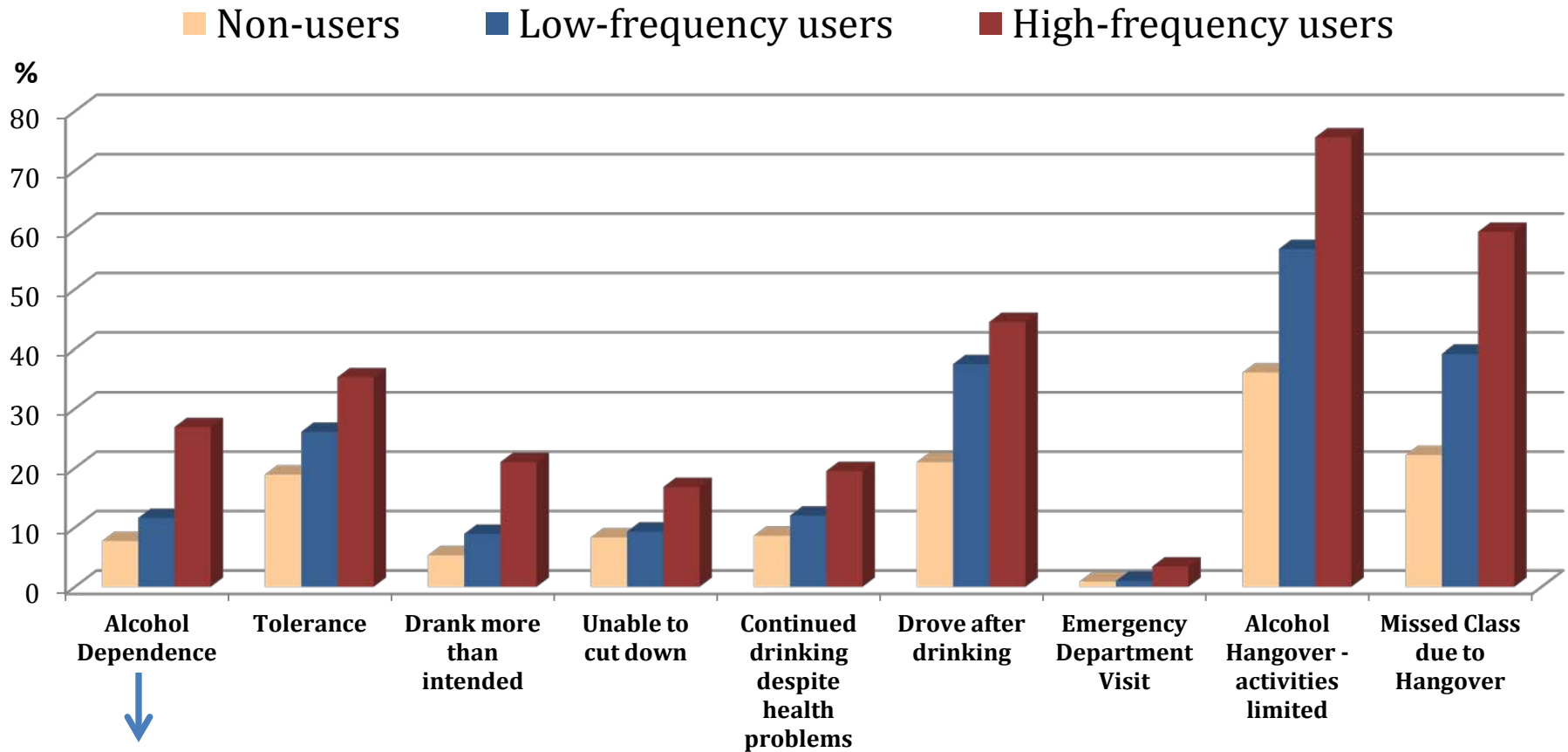
## Alcohol dependence and other alcohol-related problems



# Frequency of energy drink consumption among CLS sample ( $n=1,097$ )

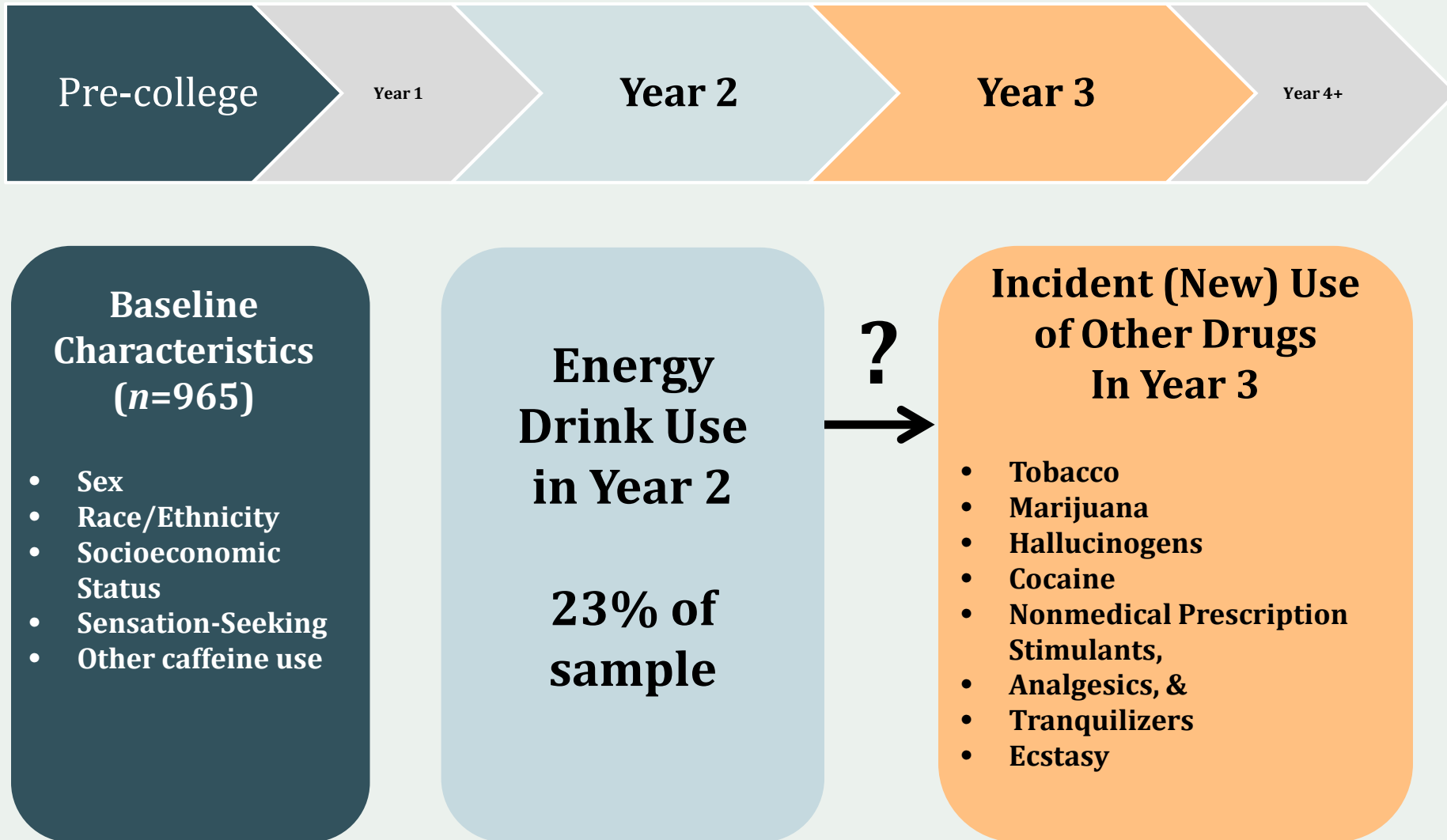


# Comparison of Energy Drink Users and Non-users on Alcohol Dependence Items and other Alcohol-related Problems

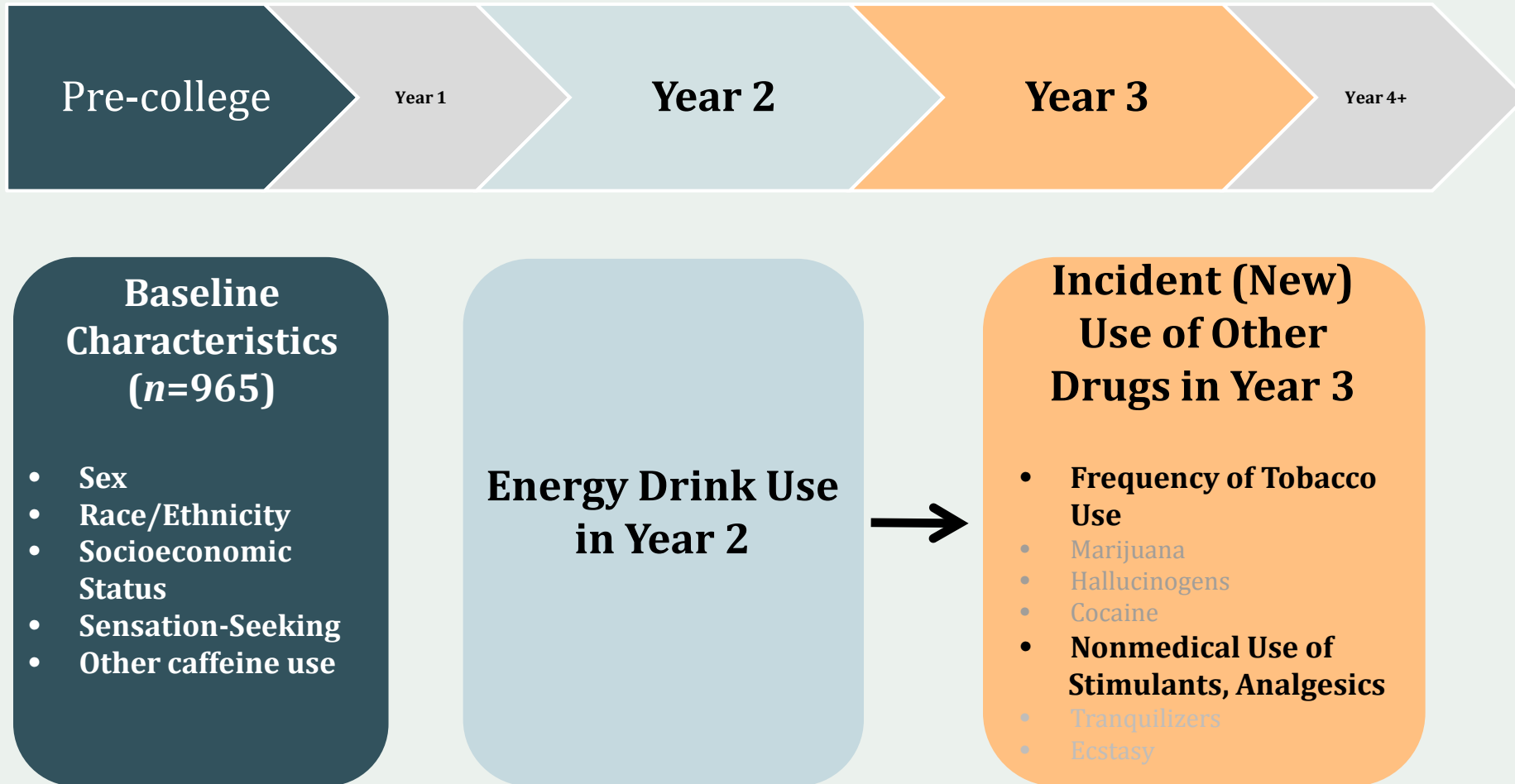


Energy Drink Consumption	AOR	p
High Frequency vs. None	2.40	.007
High Frequency vs. Low Frequency	1.86	.020
Low Frequency vs. None	1.29	.328

# Study #2: Energy Drink Use and Subsequent Use of Other Drugs

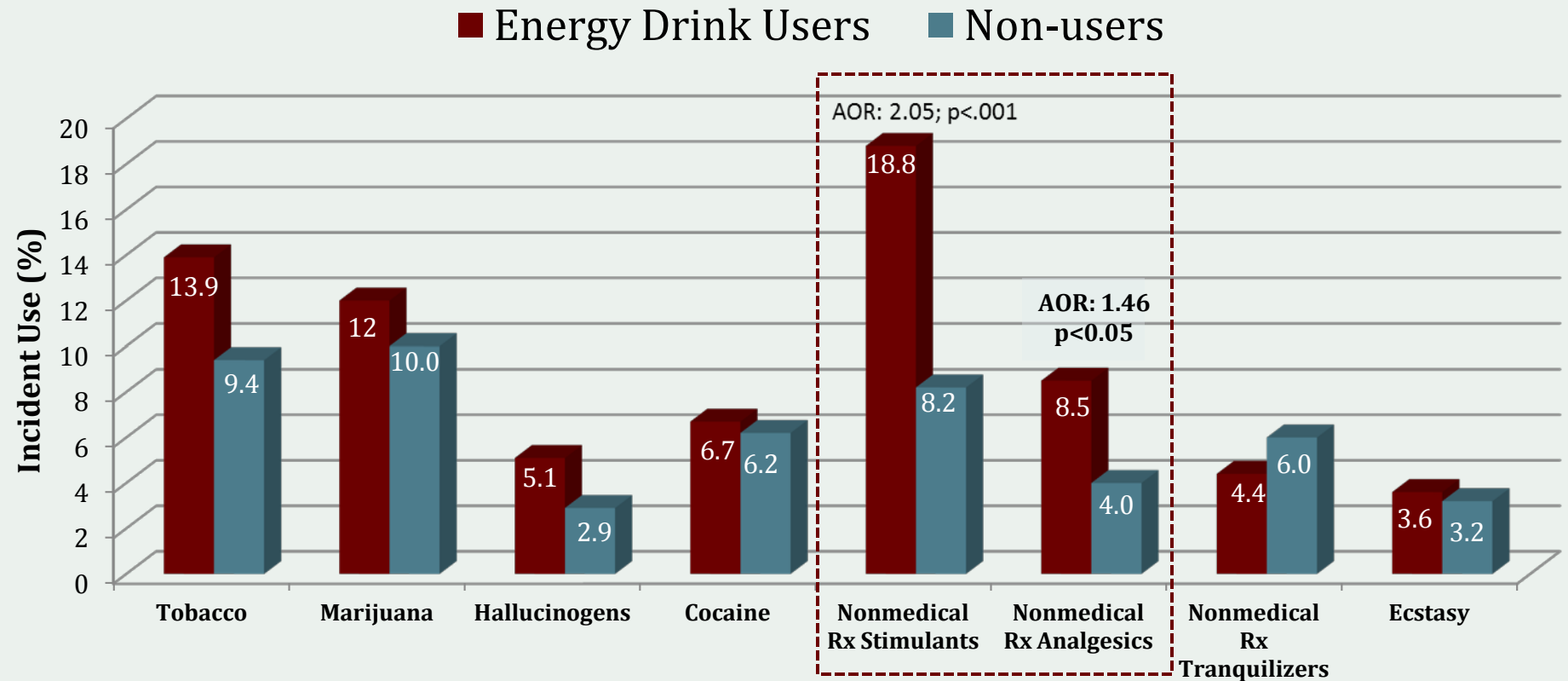


# Energy Drink Use and Subsequent Use of Other Drugs



***Energy drink users in Year 2 were significantly more likely than non-users to become new users of nonmedical prescription stimulants and analgesics, even after statistical adjustment for demographics, sensation-seeking and other types of caffeine use***

# Summary of Prospective Results



# Summary of Knowledge Gaps

- More research is needed to characterize energy drink use patterns (e.g., acute, chronic) and the contexts in which they are used (e.g., sports, driving, academics, social settings, etc.)
- Little is known about the safety of energy drink consumption on the developing human brain through the mid-20s.
- Evidence supports that energy drink consumption might compound the natural tendency to engage in health-risk taking, but more research is needed to explain possible mechanisms.
- More prospective studies are needed to investigate the relationship between energy drink use with alcohol, tobacco, illicit and nonmedical prescription drug use, particularly when energy drink use begins in adolescence.

# Summary of Knowledge Gaps

- More research is needed regarding the dose-dependency of these associations, and the acute and long-term impact of various patterns of consumption (e.g., heavy acute vs. chronic, etc.) on risk-taking behavior and health in general.
- Little research has been conducted to understand energy use patterns among high-risk populations, such as young individuals with cardiovascular abnormalities.
- Little is known of the safety of the concomitant consumption of energy drinks and other medications and illicit substances used by adolescents and young adults

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