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Research Review: What Have We Learned About Adolescent Substance Use?

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Abstract

Background—Adolescence is a critical biological, psychological, and social developmental stage involving heightened risk for substance use and associated adverse consequences. This review, synthesizing emerging findings on this complex topic, is intended to inform research and clinical care focused on adolescents.

Methods—Literature searches were conducted using PubMed, yielding a cross-section of observational and interventional studies focused on adolescent substance use. Findings were organized and categorized to cover key areas of epidemiology, neurobiology, prevention, and treatment.

Findings—Adolescent substance-related attitudes and use patterns have evolved over time, informed by adult and peer behaviors, public policy, media messaging, substance availability, and other variables. A number of risk and resiliency factors contribute to individual differences in substance use and related consequences. Advances in observational techniques have provided enhanced understanding of adolescent brain development, and its implications for substance use. Prevention efforts have yielded mixed results, and while a number of adolescent-targeted evidence-based treatments for substance use disorders have been developed, effect sizes are generally modest, indicating the need for further research to enhance prevention and treatment outcomes.

Conclusions—Substance use in adolescence is heterogeneous, ranging from normative to pathological, and can lead to significant acute and long-term morbidity and mortality. Understanding risk and resiliency factors, underlying neurobiology, and optimal developmentally-sensitive interventions is critical in addressing substance-associated problems in adolescence.

Keywords

adolescence; development; substance use; addiction; neurobiology; prevention; treatment

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Introduction

Adolescence is a critical developmental phase involving significant physical, cognitive, emotional, social, and behavioral changes. The neurobiological alterations underlying these complex developmental processes may predispose adolescents to initiate substance use, to develop substance use disorders, and to experience potentially serious and long-lasting substance-related adverse consequences. Given the high prevalence of problematic substance use in this age range, and given the unique biopsychosocial context, research has increasingly focused on characterizing adolescent substance use disorders, with particular focus on optimizing and disseminating evidence-based prevention, assessment, and treatment interventions. The present review was conducted to provide an overview of recent clinically relevant advances in the field.

Methods

Literature searches were conducted via PubMed, and information was compiled to yield an overview of clinically relevant advances in knowledge regarding adolescent substance use, spanning epidemiology, neurobiology, assessment, and interventions.

Results

Epidemiology

Prevalence of Use—Substance use is typically initiated during adolescence. Alcohol is the most commonly used substance among adolescents, with 64% of 18 year olds endorsing lifetime alcohol use, followed by marijuana (45%) and cigarette use (31%) (Johnston et al., 2017). Overall, rates of adolescent substance use have remained relatively stable over the past several years, with a few notable exceptions. Cigarette use has declined dramatically over the past several decades, while e-cigarette use has become more prevalent in recent years. Thirteen percent of teens report using e-cigarettes in the past month, compared to 3% reporting cigarette use, with a concerning increase in the number of never-smoking youth reporting e-cigarette use (Bunnell et al., 2015). Another recent trend includes increased frequency of marijuana use, with 6% of 18 year olds reporting using marijuana daily (Johnston et al., 2017). Attitudes about marijuana use continue to move toward greater acceptance; the perception of risk about using marijuana is at the lowest point ever recorded, with a third of 18 year olds reporting that regular marijuana use is harmful. While overall rates of marijuana use have remained relatively stable over the past several years, decreased perception of harm typically corresponds with increased use. Other drug use is relatively uncommon, with less than 6% of adolescents reporting past month use of other illicit drugs (Johnston et al., 2017). A brief summary of rates of current substance use, by substance and by grade level, among adolescents in the United States is presented in Table 1 (Johnston et al., 2017).

Prevalence of Substance Use Disorders—Adolescent substance use is heterogeneous, ranging from normative early experimentation with substance use to heavier and higher-risk patterns of use. Most youth who use substances do not become addicted; however, the prevalence of substance use disorders is still quite high, with 15% of youth

meeting diagnostic criteria for alcohol abuse and 16% for drug abuse by age 18 (Swendsen et al. 2012). Tobacco, alcohol, and marijuana are typically the first addictive substances that youth try. The likelihood of developing a substance use disorder increases significantly when individuals initiate alcohol and drug use during adolescence. Youth who begin drinking before age 15 have four to six times the rate of lifetime alcohol dependence than those who remain abstinent from alcohol use until age 21 (Grant & Dawson, 1997; SAMHSA, 2014). The majority of adults who have a substance use disorder started using before age 18 and develop their disorder by age 20, highlighting the need to delay initiation of substance use for as long as possible (Dennis et al., 2002).

Neurobiology

The brain undergoes significant neurodevelopment between childhood and young adulthood, with maturation continuing until around age 25 (Pfefferbaum et al., 1994; Giedd 2004). Brain gray matter, which includes mostly nerve cell bodies and dendrites, tends to decrease during adolescence via synaptic pruning and changes in the extracellular matrix (Gogtay et al., 2004; Paus, 2005; Petjanek et al., 2011; Raznahan et al., 2014; Sowell et al., 1999; Stiles & Jernigan, 2010). Concurrently, white-matter volume and white matter integrity increases over this time, which allows for more efficient and rapid communication between brain regions (Giedd, 2004; Lebel et al., 2011; 2012). Brain regions have time-varying developmental trajectories, with lower-order sensorimotor regions maturing first, and regions associated with higher-order cognitive functioning (e.g., frontal and subcortical brain regions) developing later in adolescence and young adulthood (Sowell et al., 1999, 2004; Shaw et al., 2008; Giedd and Rapoport, 2010; Stiles & Jernigan, 2010). Healthy brain development throughout adolescence is imperative, with even minor changes in neurodevelopmental trajectories affecting a range of cognitive, emotional, and social functioning (Nagy et al., 2004; Casey et al., 2008). Altered brain development due to exposure of neurotoxins during adolescence, particularly alcohol and other drug use, could set the stage for cognitive problems into adulthood, conferring functional consequences throughout life.

Adolescents are known to be particularly vulnerable, compared to children and adults, to initiation of substance use and progression to problematic use. Dopaminergic systems are significantly reorganized in the adolescent brain, with decreases in dopamine in striatal structures such as the nucleus accumbens, in the context of limited inhibitory control, potentially precipitating high-risk behaviors to compensate for dopaminergic void (Chambers et al., 2003; Spear, 2002). Theories have suggested an “imbalance” in brain development underlying a propensity for risk behavior, including substance use, during adolescence, with emotion and reward systems (e.g., amygdala, nucleus accumbens) developing before cognitive control systems (e.g., prefrontal cortex) (Casey et al., 2008; Somerville et al., 2010). Within the window of this imbalance, adolescents’ decisions may be based on brain processes favoring immediate reward over consideration of longer-term consequences (Casey & Jones, 2010). This theoretical model has been supported by a number of recent experimental studies (Baker et al., 2015; Mills et al., 2014; van Duijvenvoorde et al., 2016).

In the past 10 years, there has been a proliferation of neuroimaging and neurocognitive studies that have attempted to understand neural risk factors that predate adolescent substance use, as well as determine the effect of substance use on the developing brain. Because alcohol and marijuana are the two most commonly used substances, most existing research has focused on these substances. Several large-scale, multisite longitudinal studies are currently underway to help further understand the consequences of alcohol and marijuana use on cognitive functioning, as well as determine the effects of tobacco and other less frequently used drugs on adolescent brain development. These studies include the National Consortium on Alcohol and Neurodevelopment in Adolescence (NCANDA) which is following >800 youth across 5 different sites in the US for at least 10 years (Brown et al., 2015); the IMAGEN study which has followed 2,000 youth from England, Ireland, Germany, and France for the past 8 years (https://imagen-europe.com/); and the recently launched Adolescent Brain Cognitive Development (ABCD; http://abcdstudy.org/), which will follow 11,500 youth across 21 US sites for at least 10 years. Existing studies have relatively small, homogeneous samples; therefore, these large scale studies will allow for a more complex understanding how demographic, social, genetic, and environmental factors play a role in the impact of substance use on brain development.

Several neurocognitive features have been identified as risk factors for initiation of alcohol and other drug use during adolescence (Squeglia & Gray, 2016; Squeglia & Cservenka, 2017). Findings suggest poorer performance on tasks of inhibition and working memory (Heitzeg et al., 2015; Khurana et al., 2013; López-Caneda et al., 2014; Squeglia et al., 2014a, 2017), smaller brain volumes in reward and cognitive control regions (Cheetham et al., 2012, 2014; Squeglia et al., 2014a; Urošević et al., 2015; Weiland et al., 2014; Whelan et al., 2014), less brain activation during executive functioning tasks, and heightened reward responsivity are important predictors of adolescent substance use (Dager et al., 2014; Heitzeg et al., 2014; Mahmood et al., 2013; Norman et al., 2011; Ramage et al., 2015; Squeglia et al., 2012, 2017; Wetherill et al., 2013a; Whelan et al., 2014).

Alcohol and marijuana use during adolescence has been associated with poorer performance on a range of cognitive domains. In a sample of 234 healthy adolescents, greater alcohol and marijuana use between approximately ages 13 to 17 was associated with poorer verbal memory, visuospatial functioning, and psychomotor speed (Nguyen-Louie et al., 2015). Gender specific effects have also been found, with heavy-drinking girls showing worsening performance on tests of visuospatial functioning compared to non-using girls, and alcohol-using boys showing poorer attention compared to alcohol-naïve boys (Squeglia et al., 2009). In a 10-year longitudinal study, treatment-seeking youth who continued to use alcohol and other substances showed poorer verbal learning and memory, visuospatial functioning, and working memory and attention by age 25 (Hanson et al., 2011a, 2011b). A dose-dependent relationship was found, with heavier use patterns and greater hangover and withdrawal symptoms relating to poorer cognitive functioning. Youth who were in remission from alcohol and drug use performed similarly to those who continued to meet criteria for a substance use disorder, suggesting substance use during adolescence could have persisting effects into adulthood (Hanson et al., 2011b).

There is some suggestion that cognitive domains are differentially impacted by marijuana use in adolescence, with attention, declarative memory, and cognitive control particularly affected (Randolph et al., 2013). In a longitudinal study of marijuana and alcohol-using youth, substance use was related to worsening performance on several cognitive domains when compared to non-using youth, including worse performance on tests of complex attention, memory, processing speed, and visuospatial functioning, with early use (before age 16) relating to worse performance (Jacobus et al., 2015). A large longitudinal birth cohort study from New Zealand (N=1,037) found that persistent adolescent-onset marijuana use was associated with an IQ decline of more than 5 points in the most persistent marijuana-use group, with deficits persisting into adulthood (Meier et al., 2012). However, a recent longitudinal twin study found that IQ deficits observed in marijuana users may be attributable to confounding factors like familial and environmental influences rather than the direct neurotoxic effect of marijuana (Jackson et al., 2016). The follow-up assessment periods for these studies differed, with the Meier study ending at age 38 and the Jackson study following youth until age ~20; regular use over a prolonged period may result in more deleterious effects.

Adolescent alcohol and marijuana use has also been associated with a range of structural and functional brain changes. In the largest prospective study to date on this topic (N=134), alcohol-using adolescents showed abnormal neurodevelopmental trajectories when compared to continuously non-using controls, including accelerated decreases in gray matter volume (particularly in frontal and temporal regions) and attenuated increases in white matter volume over the ~5 year follow-up (Squeglia et al., 2015), replicating earlier studies with smaller sample sizes (Luciana et al., 2013; Squeglia et al., 2014b). These findings suggest potentially non-beneficial pruning or, alternatively, premature cortical gray matter decline in alcohol-using youth. In a study examining white matter development, adolescents with extensive marijuana- and alcohol-use histories showed worsening white matter integrity over an 18 month (Baba et al., 2013) and 3-year follow-up (Jacobus et al., 2013a, 2013b) in a number of important white matter tracts when compared to non-using youth, as well as poorer performance on tests of neurocognitive functioning. In conjunction with structural changes, adolescent alcohol and marijuana use appears to also affect brain functioning. On several functional MRI studies, youth who initiated heavy alcohol use during adolescence have shown increasing brain activation over time on tests of visual working memory (Squeglia et al., 2012) and inhibition (Wetherill et al., 2013a, 2013b), when compared to non-using peers.

Risk Factors—Several factors increase the likelihood of an individual developing a substance use problem, including familial, social, and individual risk factors (Whitesell et al., 2013). Vulnerability for developing substance-related problems is especially heightened among individuals with a family history of substance use disorder (Cservenka, 2016). A recent meta-analysis of twin and adoption studies found that alcohol use disorder is approximately 50% heritable (Verhulst, Neale, & Kendler, 2015); however, identifying specific genes has been challenging, highlighting the complexity and heterogeneity of the disorder (Hart & Kranzler, 2015; Tawa, Hall, & Lohoff, 2016). Findings suggest there are a number of genes, each with relatively small effects, that interact with each other and with the

environment (Enoch, 2012) to make an individual more or less susceptible to having a substance use disorder (Meyers & Dick, 2010). While specific genes have not been consistently identified, youth with a family history of alcohol use disorder are 3–5 times more likely to develop an alcohol use disorder than youth without a family history of alcoholism (Cotton, 1979).

Males tend to have higher rates of substance use than females (SAMSHA, 2014). Other important risk factors for adolescent substance use include environmental factors such as early exposure to traumatic life events (Dube et al., 2006), prenatal exposure to alcohol and other drugs (Enoch et al., 2011), lack of parental supervision and monitoring (Nash et al., 2005), sleep problems (Shibely et al., 2008), being involved in romantic relationships (Squeglia et al., 2017; Whelan et al., 2014), and peer substance use (Leung et al., 2014). Co-occurring psychopathology, including ADHD and depression have been shown to significantly increase the risk of adolescent alcohol use (Charach et al, 2011; Lee et al., 2011; Libby et al., 2005; Rao et al., 1999; Taylor, 2011; Wu et al., 2008). Additionally, childhood depression and conduct disorder symptoms predict persistence of substance dependence in adulthood (Meier et al., 2016). Other research suggests that externalizing, but not internalizing, mental health problems in childhood predict later substance use in males and females, while among females adolescent substance use predicts internalizing disorders in adulthood (Miettunen et al., 2014).

Prevention

Prevention science is grounded in the premise that modulation of risk and protective factors may affect the probability of later problems (Coie et al., 1993). Applied to adolescent substance use, this has been implemented across a number of modalities and settings, with the goal of reducing modifiable risk factors and enhancing/reinforcing modifiable protective factors (Harrop & Catalano, 2016). Most commonly, programs have been developed and evaluated in school, family, and community settings. Evidence is mixed amid heterogeneity of methodology and outcomes between studies, but there is some support for parenting-focused (Allen et al., 2016), school-based teacher-led (Lize et al., 2017), and peer-led prevention programs (MacArthur et al., 2016).

Screening and Assessment

Despite the serious implications of adolescent substance use, many clinical providers do not conduct routine screening, and most that do fail to utilize a validated screening method (Harris et al., 2012). In light of this, considerable recent effort has focused on developing and disseminating efficient and reliable screening methods for adolescent substance use (Levy et al., 2016). Screening tools can potentially be used across a number of settings where adolescents are present, though to date most research in this area has focused on primary care practice. The ideal tool would be both sensitive and specific to substance use and related problems, and would guide subsequent in-depth assessment and intervention when appropriate. This must be balanced with the need for time efficiency amid busy clinical practice in which a wide variety of health screening assessments are indicated.

Two brief screeners have strong evidence of achieving the balance of the aforementioned goals, and can be delivered via interview or electronic administration. The Screening to Brief Intervention (S2BI), which queries the adolescent regarding frequency of using 8 types of drugs in the past year, yields high sensitivity and specificity for identifying use and substance use disorders (Levy et al., 2014). Similarly, the Brief Screener for Tobacco, Alcohol, and Other Drugs (BSTAD) queries frequency of use in the past year, with optimal cutoff points for identifying substance use disorders as ≥6 days of tobacco use, ≥2 days of alcohol use, and ≥2 days of marijuana use (Kelly et al., 2014). Both screeners can be delivered electronically, which is a preferred method for adolescents. In practice, adolescent patients can complete the screener via mobile electronic device in the waiting area, and the results can be delivered to the provider in anticipation of the visit and interview.

Initial screeners such as the S2BI and BSTAD can be complemented with subsequent brief assessments to evaluate level of substance involvement and severity of substance-related problems. These assessments can help determine the level and modality of treatment that may be needed, spanning from psychoeducation and/or brief intervention in the primary care office to more intensive service referrals. The CRAFFT (Car, Relax, Alone, Friends/Family, Forget, Trouble), ASSIST (Alcohol, Smoking and Substance Involvement Screening Test) and GAIN (Global Appraisal of Individual Needs) are all validated for this purpose. The CRAFFT and ASSIST serve as adolescent-validated analogues to the adult screener CAGE, the latter of which is not developmentally appropriate for adolescents (Gryczynski et al., 2015; Knight et al., 1999). The GAIN assesses for both substance use disorders and potentially associated mental health disorders, including four subscales assessing substance use, internalizing disorders, externalizing disorders, and crime/violence (Dennis et al., 2006).

When more thorough and formal evaluation is indicated (i.e., when brief screening is highly suggestive of substance-related problems requiring intervention), diagnostic evaluation via the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5), may be undertaken (American Psychiatric Association, 2013). Within this framework, problematic substance use may be diagnostically categorized as a substance use disorder (e.g., Cannabis Use Disorder), with severity of mild, moderate, or severe, depending on the number of substance use disorder symptoms endorsed for a given substance. Diagnostic evaluation should be complemented by functional behavioral analysis, in which substance use is evaluated as a problem behavior with antecedents and consequences which may be unique to a given adolescent's substance use. The functional analysis framework is used to determine what antecedents and consequences are potentially modifiable to reduce the likelihood of ongoing problem behavior (Randall et al., 2001).

Laboratory testing, most commonly urine drug testing, is often used to complement self-report when evaluating adolescent substance use; it is, however, not generally supported as a standalone screening or assessment for substance use (Hadland & Levy, 2016). Particularly in situations when trust has been eroded within a family and the veracity of an adolescent's self-report is in doubt, urine testing may serve as a useful, though imperfect, method for objective assessment. With some exceptions, most studies have shown reasonable agreement between adolescent self-report and urine drug test results (Gignac et al., 2005). Parental

report is comparatively less consistent with urine testing, reflecting that parents may not often be aware of the adolescent's day-to-day substance use patterns. Variations in detection times due to substance, dose, chronicity of use, cutoff used, and metabolism of user, should be noted as potential limits of urine testing. Additionally, some "designer" and synthetic substances may not be included among commonly available urine drug testing panels. Home drug testing kits are widely available, but often lack informational guidance to inform parents/guardians of empirically supported strategies to incorporate them as a part of treatment and monitoring, indicating that clear guidance by the provider is critical when considering drug testing at home rather than in clinic (Washio et al., 2014).

Treatment

Treatment development for adolescent substance use disorders has focused primarily on psychosocial interventions, spanning individual, group, and family modalities. The intensity and duration of investigated treatments has varied from brief (even single-session) interventions to extended multimodal strategies. The majority of studies have evaluated office-based outpatient interventions, many of which were developmentally adapted from established adult-targeted treatments.

Despite the considerable appeal of brief interventions as part of the Screening, Brief Intervention, and Referral to Treatment (SBIRT) model, standalone brief interventions have demonstrated very limited effects when provided to adolescents with substance use disorders (Young et al., 2014). This is similarly the case with brief school-based interventions (Carney et al., 2016) and brief standalone motivational interviewing approaches (Li et al., 2016). These strategies appear more useful when provided as a component of multimodal intervention with increased overall intensity and duration.

A recent comprehensive review indicated that the most well established efficacious treatments include ecological family-based treatment, group cognitive-behavioral therapy (CBT), and individual CBT, while fair evidence supports behavioral family therapy and motivational enhancement therapy (MET) (Hogue et al., 2014). Substantial evidence supports combined treatment approaches, incorporating elements from the aforementioned modalities and others to enhance outcomes. Given that adolescent substance use disorders are heterogeneous and multidetermined, treatment approaches that address multiple biopsychosocial targets are often indicated. Among combined treatments, strong evidence supports combined MET and CBT, as well as combined MET, CBT, and behavioral family-based treatment (Hogue et al., 2014). Outcomes are further enhanced by complementing the aforementioned treatments with contingency management (CM), a behavioral treatment based on operant conditioning principles, in which tangible rewards are provided for objectively confirmed desired behaviors (e.g., token provided for negative urine drug test) (Stanger et al., 2015, 2016). In general, evaluated treatments in large-scale trials have demonstrated short-term substance reduction and/or cessation, but adolescents with substance use disorders, even with the best evidence-based care, rarely achieve long-term abstinence (Dennis et al., 2004; Hogue et al., 2014; Waldron & Turner, 2008).

Pharmacotherapy is an established complement to psychosocial treatment for adults with substance use disorders, with several medications receiving United States Food and Drug

Administration (FDA) approval for treatment of alcohol, tobacco, and opioid use disorders. While the neuropathology of adolescent substance use disorders is increasingly recognized, relatively little work has focused on developing pharmacotherapies for this age group. To date, only buprenorphine-naloxone possesses FDA approval for opioid use disorder in youth ages 16 and older. Other medications have been studied at least preliminarily for youth alcohol, tobacco, cannabis, and opioid use disorders, yielding mixed results (Hammond & Gray, 2016). Findings from randomized controlled trials, though not yet exhaustive, indicate that select pharmacotherapies may be considered as adjunctive treatments to psychosocial interventions: buprenorphine-naloxone maintenance to improve treatment retention and outcomes for opioid use disorder (Marsch et al., 2005; Woody et al., 2008), *N*-acetylycysteine as an adjunct to cessation counseling and contingency management for cannabis use disorder (Gray et al., 2012), and nicotine patch or bupropion SR to improve tobacco cessation rates (Gray et al., 2011, Moolchan et al., 2005; Muramoto et al., 2007).

Given the ubiquity of mobile technology among adolescents, and the considerable logistical barriers to office-based care (e.g., transportation, accessibility), recent research has focused on translating evidence-based care for delivery via electronic platforms. A meta-analysis revealed a small positive effect size for text messaging interventions for youth with substance use problems (Mason et al., 2015), and a pilot study demonstrated the feasibility of using smartphones to provide recovery support for adolescents after discharge from residential treatment (Dennis et al., 2015). Ongoing work is focused on combining ecological momentary assessment and smartphone application intervention in adolescents with substance use and co-occurring psychiatric disorders (Benarous et al., 2016).

Limitations

This review provides a general overview of a broad, complex topic area, with multiple lines of ongoing research. The methodology of the review was by design not structured or meta-analytic, but rather a general cross-section of recent advances and findings. Additionally, the review focused largely, but not exclusively, on data derived from United States samples. As such, caution should be taken in interpreting findings, acknowledging the potential for limitations in generalizability across populations, policies, and cultural and environmental factors.

Conclusions

Recent research has significantly advanced the understanding of substance use in adolescence. Survey-based epidemiological studies have identified trends in substance-related attitudes and rates of use of various substances, while emerging longitudinal neuroimaging studies have elucidated the neurobiology underlying adolescents' propensity for substance initiation and progression to substance use disorders, with potentially lasting substance-related adverse consequences. A variety of prevention programs have been implemented across settings with varying degrees of success. Novel screening and assessment instruments have been developed to efficiently identify youth with particular risk for serious substance-related problems, and a number of evidence-based treatment approaches have been shown to be effective in reducing substance use and substance-related

problems. Unfortunately, adolescents with substance use disorders rarely achieve long-term abstinence even with the most robust evidence-based treatments, indicating that further work is needed to optimize methods to understand and address this important public health issue.

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Key Points

- Adolescents, amid rapid biopsychosocial development, are more prone than children or adults to initiating substance use and suffering lasting substance-related adverse consequences
- Recent research has elucidated the neurobiological processes underlying substance use risk in adolescents, as well as substance-related neuropathology among adolescents with substance use disorders
- Advances in prevention, screening, assessment, and treatment research have yielded evidence-based interventions to address adolescent substance use disorders
- Further research is needed to enhance outcomes and reduce the considerable public health burden of adolescent substance use disorders

Table 1

Rates (%) of current (30-day) substance use among adolescents in the United States, by substance and grade level (Johnston et al., 2017).

	8th Grade	10th Grade	12th Grade
Alcohol (any)	7.3	19.9	33.2
Alcohol (been drunk)	1.8	9.0	20.4
Marijuana	5.4	14.0	22.5
E-cigarettes	6.2	11.0	12.5
Cigarettes	2.6	4.9	10.5
Smokeless Tobacco	2.5	3.5	6.6
Inhalants	1.8	1.0	0.8
Hallucinogens	0.6	0.9	1.4
Ecstasy (MDMA)	0.3	0.5	0.9
Cocaine	0.3	0.4	0.9
Heroin	0.2	0.2	0.2
Narcotics other than Heroin	NR	NR	1.7
Amphetamines	1.7	2.7	3.0
Methamphetamine	0.3	0.2	0.3
Tranquilizers	0.8	1.5	1.9
Any Prescription Drug	NR	NR	5.4

NR=Not Reported