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Predicting Adolescents' Persistence, Non-persistence, and Recent Onset of Nonmedical Use of Opioids and Stimulants

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Abstract

This study sought to distinguish among adolescents who were persistent, non-persistent, or recent onset nonmedical users of prescription opioids and stimulants (respondents' ages ranged from 12–17 years, $N = 126{,}764$). Multinomial logistic regression analyses of combined data from the 2003 through 2009 National Survey of Drug Use and Health were used to investigate the association of respondents' sex, age, family income, race, parental status, population density, and user status (persistent, non-persistent, recent onset) on common illicit substances (cigarettes, alcohol, marijuana, and inhalants) with opioid and stimulant use. Odds of nonmedical opioid and stimulant use were significantly greater for females than males, and increased with age. Results were mixed for income, race, and parental status. Population density was largely unrelated to nonmedical use. Persistent nonmedical users of common illicit substances, especially marijuana and inhalants, were at greatest risk for nonmedical opioid and stimulant use. Non-persistent use of common illicit substances was a strong predictor of both non-persistent opioid and stimulant use. Recent onset of common substance use predicted recent onset of prescription opioid and stimulant use. Results indicate that persistence may be related to polysubstance use involving prescription opioids and stimulants, supporting efforts to investigate the underlying causes of polysubstance use.

Keywords

opioids; stimulants; prescription drugs; nonmedical use; adolescents

1. Introduction

Over the past several years, adolescents' increasing nonmedical use of opioids and stimulants has become a major concern in the US (Johnston, 2009), with millions of 12–18 year olds using them annually (Substance Abuse and Mental Health Services Administration, 2009). Reflecting the danger of improper use of prescription medications,

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Contributors
Brandon Nakawaki designed the study, recoded data, conducted analyses, and wrote the first draft of the manuscript. Dr. William Crano revised the manuscript and contributed to the literature review and discussion.

Conflict of Interest
All authors declare no conflicts of interest.

emergency room visits involving opioid use rose an estimated 111% between 2004 and 2008 (Substance Abuse and Mental Health Services Administration, 2010). Further societal costs have been noted in both a dramatic increase of opioid-motivated robberies of pharmacies between 2006 and 2010 (Hawley, 2011) and an estimated $150 million of duplicate prescriptions billed to Medicare Part D in 2008 (US Government Accountability Office, 2011). Despite mounting concern, nonmedical use of prescription drugs such as opioids and stimulants remains very much understudied.

Numerous studies have established relationships between nonmedical use or misuse of prescription opioids, stimulants, and other substances (Back, Payne, Simpson, & Brady, 2010; Boyd, Young, Grey, & McCabe, 2009; Ford, 2009; Goldsworthy & Mayhorn, 2009; Levine & Coupey, 2009; McCabe, Boyd, Cranford, & Teter, 2009; McCauley et al., 2010; Schepis & Krishnan-Sarin, 2009; Wu, Pilowsky, & Patkar, 2008), though many do not classify users into meaningful subtypes (McCabe, Boyd, & Teter, 2009). As research has suggested, there is substantial heterogeneity among nonmedical users of prescription drugs across various dimensions, including motive (Boyd, McCabe, Cranford, & Young, 2006; McCabe, Boyd, & Teter, 2009; McCabe, Cranford, Boyd, & Teter, 2007; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005; Teter, McCabe, LaGrange, Cranford, & Boyd, 2006), route of drug administration, (Compton & Volkow, 2006; McCabe, Boyd, & Teter, 2009; McCabe, Cranford, et al., 2007; Teter, et al., 2005), co-ingestion, (Compton & Volkow, 2006; McCabe, Boyd, & Teter, 2009; McCabe, Cranford, & Boyd, 2006) and time of onset (Dowling, Storr, & Chilcoat, 2006). Better identification of user subtypes may help identify those at greatest risk, the correlates of those risks, and the consequences the risks carry, better shaping our understanding and the efficacy of prevention efforts.

Research by Dowling and associates (2006) subtyped users by time of onset, categorizing them into recent onset (< 24 months prior to interview) and persistent users (onset beginning 24+ months prior, with some use indicated within the past year). More recently, other researchers have identified experimentation as a major reason for use of opioids and stimulants by adolescents (McCabe, Boyd, Cranford, et al., 2009; Teter et al., 2006) and college students (McCabe, Boyd, & Teter, 2009; McCabe, Cranford, et al., 2007; Teter et al., 2006).

Numerous studies also have examined demographics related to nonmedical use of prescription drugs. Studies commonly find females more prone to nonmedical use than males (Dowling, et al., 2006; Schepis & Krishnan-Sarin, 2008; Teter, McCabe, Boyd, & Guthrie, 2003; Wu, et al., 2008). Not surprisingly, odds of lifetime nonmedical use increase with age as well (Dowling et al., 2006; Havens, Young, & Havens, 2011; Wu et al., 2008). Results have been less consistent for other demographic variables. Some studies have found nonmedical use less common among lower income categories than higher ones (Wu, et al., 2008; Wu, Woody, Yang, & Blazer, 2010), but other researchers have come to the opposite conclusion or found no differences (McCabe, Teter, & Boyd, 2006; Simoni-Wastila, Yang, & Lawler, 2008). Similarly mixed results have been observed with race (Daniulaityte, Falck, Wang, & Carlson, 2009; McCabe, Cranford, & West, 2008; McCabe, West, Morales, Cranford, & Boyd, 2007; Simoni-Wastila et al., 2008; Wu et al., 2008, 2010), and county type (Havens et al., 2011; McCabe, Boyd, & Teter, 2005; McCabe, Teter, Boyd, Knight, & Wechsler, 2005; Simoni-Wastila et al., 2008; Wu, et al., 2008). Few studies have considered parental status (Havens et al., 2011; Hemovich & Crano, 2009; Hemovich, Lac, & Crano, 2011; Schepis & Krishnan-Sarin, 2008), but those that have suggest adolescents from dual parent households are at less risk for substance use than those from other types of family structures.

Because many adolescents discontinue substance use after a short period of experimentation (Botvin & Griffin, 2007), the present study sought to investigate whether adolescents who discontinued use of a common illicit substance (marijuana, inhalants, etc.) are differentially at risk for use of other drugs relative to those who persist with use, who have recently begun using, or who never have used.

Hypotheses

Persistent use of common illicit substances was expected to be associated with nonmedical opioid or stimulant use. Given the consistency of results found in other studies, it was anticipated that females would be more likely to use than males, that odds of use would increase with age, and that adolescents from dual parent households would be at less risk than those from single parent or absent parent households across all categories. No predictions were made with respect to other demographic variables due to the mixed results noted in earlier studies. Differences between persistent, non-persistent, and recent onset users were expected, and though no specific predictions about strength of relationships were made, it is reasonable to expect that polysubstance use would be more likely when nonmedical use of either stimulants or opioids was persistent, rather than transitory.

2. Method

2.1 Study information

Data were pooled from the 2003 through 2009 National Survey of Drug Use and Health (NSDUH), each a representative cross-sectional sample of noninstitutionalized civilians collected annually. The NSDUH is one of the primary sources of information on prevalence of illicit drug use in the United States (Substance Abuse and Mental Health Services Administration, 2009). As other studies have noted, data collected by the NSDUH are amenable to pooling, thereby increasing the sample size and providing more precise estimates of population values (Han, Gfroerer, Colliver, & Penne, 2009; Wu, Blazer, Li, & Woody, 2011). Response rates for these years ranged from approximately 74–79%. The survey uses a multistage area probability design with additional stratification along demographic factors. Post-stratification population weights are computed to adjust for nonresponse and coverage. To be eligible for inclusion, participants must be at least 12 years old and live in community dwellings. Data are collected through computer-assisted personal interviewing (CAPI) and audio self-interviewing (ACASI) methods. More specific information about the design and procedures is available elsewhere (Grucza, Abbacchi, Przybeck, & Gfroerer, 2007; Substance Abuse and Mental Health Services Administration, 2009).

2.2 Sample

The combined data from the 2003–2009 samples total 388,962 cases. This aggregated sample made use of the maximum number of NSDUH datasets appropriate for pooling, given notable differences in the datasets, weights, and design prior to 2003. Pooling datasets afforded substantially more sensitivity to detect small differences that otherwise might go unnoticed in smaller samples. Narrowing the sample to include only adolescents aged 12–17 reduced the sample size to 126,764. Of this group, about 40% had drunk alcohol and 26% smoked cigarettes, despite both being illegal substances for those less than 18 years of age. Marijuana had been used by about 18% of respondents; inhalants by nearly 9%. About 12% were involved in the nonmedical use of opioids, and 3% in the nonmedical use of stimulants at some points in their lifetimes.

2.3 Demographic variables

Sex, age, income, race, parental status, and population density measures were included as demographic variables. Respondents' family income was coded into four categories: less than $20,000, $20,000–49,999, $50,000–74,999, and $75,000 or more. Parental status was ascertained from adolescents' responses to questions asking about their household compositions. Status was coded into dual parent households, mother-only, father-only, and households in which neither parent lived. Population density was based on Core-Based Statistical Area (CBSA) classifications provided by the federal Office of Management and Budget. CBSAs are regional classifications centered on urban areas that were intended to replace metropolitan-micropolitan distinctions. The NSDUH classified individuals into more heavily populated CBSAs with at least one million people, fewer than one million people, or as being from an area not in a CBSA.

2.4 Substance user status

Questions probing nonmedical use of opioids and stimulants asked participants if they had taken a prescription medication that was not prescribed for them, or if they took the medication only for the experience or feeling it caused. For some types of drugs, including inhalants, opioids, and stimulants, respondents identified use of specific examples or brands. Composite inhalant, opioid, and stimulant variables were computed, based on participants' responses to any specific examples or brands that fell under those categories. The survey also asked participants several questions regarding use of those broad categories of substances, including their lifetime use, past year's use, and age at first use. Participants responded to similar questions concerning cigarette, alcohol, and marijuana use.

The present analysis was designed to assess associations of opioid and stimulant use with subtypes of common substance (cigarette, marijuana, alcohol, and inhalant) users. Subtypes of interest included *recent onset users,* who initiated use less than 24 months prior to assessment, *non-persistent users,* who first initiated use at least 24 months prior, *persistent users,* who initiated use at least 24 months prior to assessment, and *nonusers*. Both prescription and common substance users were partitioned into subtypes. Similar to earlier studies, recent onset users were defined as those whose age at first use was one year or less than their current age (Chen, O'Brien, & Anthony, 2005; Dowling et al., 2006; O'Brien & Anthony, 2005). This timeframe was described as less than 24 months, as it could span from one day to just short of two years, depending on date of initiation, birthdate, and date of interview. As such, recent onset users began at any point up to two years prior to assessment. Owing to limitations in the dataset, no distinction could be made between recent onset users who used regularly and those who used only once or twice before discontinuing.

Non-persistent users were defined as those whose age at initiation of use of the substance was at least two years younger than current age, and who had indicated no use of the substance in the past year. This was a heterogeneous group that could include those who tried the drug once or twice and chose not to continue using, and those who used consistently for a time but discontinued and had not used in the past year. Finer distinctions of subtypes of non-persistent users could not be made with available data.

Like non-persistent users, persistent users' age at initiation was at least two years prior to current age, but these respondents also indicated some use of the substance in the past year. Distinctions could not be made between heavy and occasional users. The nonuser category was comprised of those who expressed no use of the substance at any point.

2.5 Data analysis

Multinomial logistic regressions were computed using sex, age, family income, race, parental status, population density, and user status for cigarette, marijuana, alcohol, and inhalant usage to predict odds ratios pertaining to nonmedical opioid and stimulant use, separately. Owing to the complex multistage cluster design of the survey, analyses were conducted using SUDAAN 10 (Research Triangle Institute, 2008). Adjusted person-level weights were applied to the analyses to accommodate pooling. Data were sorted by the variance estimation (pseudo) stratum and variance estimation (pseudo) replicate within stratum variables as needed to estimate the variances and standard errors appropriately (Research Triangle Institute, 2010).

Of the total sample, 8–9% of the cases had missing data and were omitted from analyses. Substance use data were considered missing if the participant did not know or refused to answer whether he or she had taken a substance and if so, at what age the substance was first used. Parental status was considered missing if the adolescent did not answer one or more questions concerning household composition. Alcohol use had the most missing data (n = 3,132), followed by inhalants (n = 2,899), opioids (n = 2,771), cigarettes (n = 2,325), stimulants (n = 1,129), marijuana (n = 1,032) and parental status (n = 134).

3. Results

3.1 Opioid use

As expected, females were more likely than males to be lifetime nonmedical users of prescription drugs in all categories, holding constant all other variables in the model (Table 1). Odds of use also increased with age across all subcategories, as predicted. Income results were mixed, with adolescents from households making less than $20,000 a year and those between $20,000 and $49,999 more likely than adolescents from the wealthiest group to be non-persistent or persistent opioid users; however, income was not associated with recent onset usage. Race results also were mixed, with most racial minorities at lower odds of recent onset than White adolescents, and in the singular instances where differences were detected, also at lower odds of use in the persistent and non-persistent subcategories. Parental status associations were similarly mixed. Adolescents from mother-only households were at higher odds of recent onset, and those from absent-parent households at higher risk of non-persistent use than adolescents from dual parent households. No other differences were detected for parental status. The only differences detected in population density was in recent onset of use, with adolescents in CBSAs with fewer than one million people at higher odds of persistent use than those in the most heavily populated CBSAs.

With few exceptions (see Table 1), persistent use of common illicit substances, especially marijuana and inhalants, were most strongly associated with the nonmedical use of opioids in each persistence category. Notably, non-persistent use of alcohol and inhalants predicted the greatest odds of non-persistent use of opioids, and recent onset of inhalant use were associated with the greatest odds of recent onset of opioid use.

3.2 Stimulant use

Results from the logistic regression predicting stimulant use were substantially similar to the opioid findings. Females were more likely to use than males across all subcategories of stimulant use (Table 2). Odds of non-persistent and persistent use increased with age, but recent onset did not. Findings related to income were again mixed, but this time, adolescents in all three lower income categories were less likely to be recent onset stimulant users than those in the highest income category. Race also yielded mixed results, though where differences were significant, racial minorities were less likely to use stimulants than White

adolescents. Neither parental status nor population density saw significant differences from dual parent households or the most heavily populated areas, respectively.

As with opioids, persistent use of any common illicit substance was generally predictive of the greatest odds ratios of use of stimulants across all subcategories. The exceptions were identical for stimulants as for opioids, such that non-persistent use of alcohol and inhalants predicted the greatest odds of non-persistent use of stimulants, and recent onset of inhalant use predicted greatest odds of recent onset of stimulant use.

4. Discussion

The results of these analyses underscore the importance of determining which adolescents are at greatest risk for nonmedical use of opioids and stimulants. Considerable differences were observed between persistent and non-persistent users, and those who had initiated in the past two years. Consistent with expectations derived from prior research (Dowling et al., 2006; Schepis & Krishnan-Sarin, 2008; Teter et al., 2003; Wu et al., 2008), females were at greater risk than males for opioid and stimulant use. Age also predicted increased odds of nonmedical use, except for recent onset of stimulants. It is unclear why that sole exception occurred. Possibly, the exception occurred as a function of the pooling process, since rates of ADHD diagnosis have been changing over the years for different age groups (CDC, 2010).

The scarcity of income-related differences was surprising. To the best of the authors' knowledge, no studies have seriously attempted to explain why income-related differences such as these might exist. Results concerning income and stimulant use were particularly unexpected since lower income categories were associated with lower odds of recent onset of use. Given the relative stability of the sample, underlying differences likely exist, though pinpointing exactly what is driving those differences is beyond the scope of the data available in this study.

Reliable race-related differences also were rarely found. For opioids, there were no differences detected other than for recent onset of use. Where differences existed, racial minorities used less than White adolescents. This may be at least partially a result of differential access to health care or prescription coverage. Other studies have noted that White Americans tend to have more stable healthcare and prescription drug coverage and use more prescriptions (Winters et al., 2010) than racial minorities. Systematic differences in coverage, as well as in diagnosis of ADD and ADHD, may also explain why racial minorities were less likely than White adolescents to use stimulants (Bloom, Cohen, & Freeman, 2009; Pastor & Reuben, 2005).

Parental status results revealed few differences between adolescents from dual parent families and those from single-parent or absent-parent families. Those from absent-parent families had greater odds of non-persistent use of opioids, and those from mother-only families had greater odds of recent onset of use. This may be attributable partially to a deficit in monitoring (e.g., Lac & Crano, 2009); however, without further information on custodial parent/caregiver in single-parent or absent-parent families, definitive conclusions about monitoring of the adolescents in these households cannot be drawn. Some studies have found that adolescents who do not live with their parents may be adequately monitored by other relatives with whom they do live (Hamilton, 2005; Strom, Collinsworth, Strom, & Griswold, 1993). The present results indicate a systematic difference between adolescents who were not living with either parent and those from dual parent families, though it cannot be determined whether this is because of the amount or quality of their monitoring or some other factor (see Hemovich et al., 2011). Overall, the relative dearth of differences suggests

that parental status may not be a major risk factor for nonmedical prescription drug use, especially for stimulants, but lack of information on custodial caregivers in the dataset render this conclusion tentative. The same conclusion can be extended for population density, for which only a single difference was noted among opioid users.

The overall findings concerning substance use can be reduced to two major points: persistent use of an illicit substance was generally associated with the greatest odds of use of other illicit substances, and better distinctions need to be made to differentiate subtypes of users. Substantial overlap in confidence intervals made it clear that non-persistent use of a common illicit substance predicted notably elevated odds of non-persistent use of opioids and stimulants, and recent onset of a common illicit substance also predicted elevated odds of recent onset of opioid or stimulant use. These results were particularly true for inhalant users, for whom use in any subcategory yielded unusually high odds ratios for use of both opioids and stimulants. The structural similarity of accessing both inhalants and prescription drugs may be responsible, as both substances often can be easily accessed at home. Because adolescents who use inhalants are often at substantial risk for other substance use (Crano, Ting, & Hemovich, 2009; Mackesy-Amiti & Fendrich, 1999; Ramirez et al., 2004), it is not surprising that many of these adolescents proved willing to use prescription drugs nonmedically as well.

While it cannot be determined whether the relatively strong non-persistent-non-persistent, persistent-persistent, and recent onset-recent onset odds ratios were attributable to substances being taken simultaneously or concurrently (i.e., independently but within a several month time period), the results suggest a need to differentiate among users. An ideal study would have differentiated between current addicts, past addicts, experimenters, and non-users. Such differentiation is important to understand how and why some become addicted, some shed their addictions, and some never become addicted or never use in the first place, all of which may be foundational to future interventions. Unfortunately, the NSDUH does not include the diagnostic information necessary to assess substance use disorders, let alone information on current versus past substance use disorders. For the moment, generic identification of persistent, non-persistent, and recent onset nonmedical use of opioids and stimulants is used to move closer to these ideals.

Other limitations to the present analysis should be noted. First, the NSDUH does not distinguish users motivated by recreation from those who self-medicate. Nonmedical use of prescription drugs was defined to include both motives. Prior research has found notable differences among subtypes of users distinguished by motivation that may differentially correlate with drug use (McCabe, Boyd, & Teter, 2009). Second, participation in the NSDUH is limited to noninstitutionalized civilians living in community dwellings, so the results may not generalize to military personnel, institutionalized civilians, or the homeless. Third, because the NSDUH uses cross-sectional data, causal relationships cannot be ascertained between any of the variables studied. Finally, because data consist of self-report measures, it is possible that issues of social desirability or faulty memory affected responses, though prior research suggests the general validity of these self-reports, given the nature of their collection (Richter & Johnson, 2001; Smith, McCartney & Goldman, 1995; Patrick et al., 1994).

Despite these limitations, this study had several strengths. First, use of the NSDUH was appropriate, as the sample is representative of the U.S. population in general. The NSDUH also used ACASI and pill cards to minimize the likelihood that social desirability or faulty memory would affect responses (Harrison & Hughes, 1997). Pooling datasets across years produced a sample that enabled stable estimates of inhalant users to be identified. Most importantly, use of these subcategories classified users into more meaningful categories than

would have been the case with lifetime use or past year use categorizations, thereby enabling more sensitive estimates despite their imperfections.

As other research has suggested, it is important to further our understanding of the heterogeneity in nonmedical use of prescription drugs (McCabe, Boyd, & Teter, 2009). Examining subtypes of users yields useful information to help unravel the factors associated with nonmedical prescription drug use. Ideal measures of user status would accurately classify adolescents to help determine who becomes addicted, why, and how to overcome addiction or avoid becoming addicted in the first place. Future research addressing opioids and stimulants would benefit both from consideration of clinical addiction and persistence of use to better move towards these ideals. And though the subcategories used do not quite reach the level of ideal, they demonstrate unique results that help sharpen our focus of who might be at greatest risk.

Highlights

- We examined adolescent nonmedical use of prescription opioids and stimulants (NMUOS).
- Results were based on NSDUH data pooled over 7 years, producing a stable analysis.
- Tobacco, alcohol, marijuana, and inhalant use predicted adolescent NMUOS.
- Persistent use of these substances predicted greatest odds of adolescent NMUOS.

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Table 1

Multinomial logistic regression predicting the odds ratios [95% CI] of opioid persistence subgroup using sex, age, income, race, parental status, population density, cigarette, alcohol, marijuana, and inhalant persistence subgroups (unweighted n = 116,160).

Substance		Non-persistent	*p*-value	Persistent	*p*-value	Recent onset	*p*-value
Female		1.17 [1.04–1.30]	.007	1.17 [1.05–1.30]	.006	1.27 [1.17–1.38]	<.001
Age		1.15 [1.10–1.20]	<.001	1.11 [1.07–1.16]	<.001	1.03 [1.01–1.06]	.013
Income	Less than $20,000	1.50 [1.22–1.84]	<.001	1.40 [1.16–1.68]	<.001	1.08 [.95–1.22]	*.ns*
	$20,000–49,999	1.41 [1.21–1.64]	<.001	1.23 [1.06–1.43]	.007	1.01 [.89–1.13]	*.ns*
	$50,000–74,999	1.21 [.98–1.50]	*.ns*	1.07 [.91–1.27]	*.ns*	1.10 [.99–1.23]	*.ns*
Race	Hispanic/Latino	.98 [.83–1.15]	*.ns*	.83 [.70–.99]	.042	.81 [.70–.95]	.008
	Black	.92 [.77–1.11]	*.ns*	1.14 [.96–1.35]	*.ns*	.69 [.60–.80]	<.001
	Native American	.64 [.42–1.00]	.048	.83 [.49–1.43]	*.ns*	.89 [.60–1.31]	*.ns*
	Pacific Islander	1.03 [.38–2.74]	*.ns*	1.58 [.90–2.77]	*.ns*	.61 [.28–1.34]	*.ns*
	Asian	.78 [.49–1.24]	*.ns*	.96 [.65–1.42]	*.ns*	.61 [.40–.93]	.023
	Multiracial	1.22 [.84–1.77]	*.ns*	1.07 [.82–1.39]	*.ns*	.76 [.61–.93]	.009
Parental status	Mother-only	1.12 [.98–1.29]	*.ns*	1.14 [.97–1.34]	*.ns*	1.16 [1.04–1.28]	.007
	Father-only	1.05 [.80–1.38]	*.ns*	1.02 [.79–1.31]	*.ns*	1.15 [.96–1.37]	*.ns*
	Neither parent	1.44 [1.13–1.83]	.004	1.16 [.93–1.45]	*.ns*	1.20 [.99–1.44]	*.ns*
Population	Not in CBSA	.99 [.83–1.18]	*.ns*	.92 [.78–1.09]	*.ns*	1.10 [.98–1.23]	*.ns*
density	CBSA < 1M	1.07 [.93–1.22]	*.ns*	1.12 [.99–1.27]	*.ns*	1.10 [1.01–1.20]	.038
Cigarette	Non-persistent	1.85 [1.53–2.23]	<.001	1.05 [.85–1.30]	*.ns*	1.33 [1.15–1.55]	<.001
	Persistent	2.37 [1.91–2.93]	<.001	2.49 [2.09–2.97]	<.001	2.30 [2.06–2.57]	<.001
	Recent	1.22 [.92–1.61]	*.ns*	1.10 [.88–1.38]	*.ns*	1.97 [1.74–2.22]	<.001
Alcohol	Non-persistent	2.78 [2.23–3.46]	<.001	1.95 [1.54–2.48]	<.001	2.10 [1.70–2.58]	<.001
	Persistent	2.59 [2.13–3.16]	<.001	3.05 [2.55–3.65]	<.001	3.86 [3.30–4.52]	<.001
	Recent	1.48 [1.17–1.86]	<.001	1.19 [.96–1.47]	*.ns*	3.24 [2.80–3.74]	<.001
Marijuana	Non-persistent	2.35 [1.89–2.92]	<.001	1.61 [1.29–2.00]	<.001	1.84 [1.53–2.20]	<.001
	Persistent	2.53 [2.07–3.08]	<.001	3.88 [3.36–4.48]	<.001	4.71 [4.11–5.41]	<.001
	Recent	1.00 [.78–1.29]	*.ns*	1.00 [.80–1.25]	*.ns*	2.82 [2.53–3.14]	<.001
Inhalants	Non-persistent	4.34 [3.69–5.10]	<.001	3.97 [2.86–5.50]	<.001	2.61 [2.06–3.32]	<.001
	Persistent	4.09 [3.42–4.89]	<.001	9.60 [7.69–11.97]	<.001	3.97 [3.26–4.83]	<.001
	Recent	2.15 [1.85–2.50]	<.001	3.69 [2.96–4.60]	<.001	3.96 [3.49–4.49]	<.001

Note: The reference group for sex = male, income = $75k+, race = White, parental status = dual parent household, population density = CBSA > 1M, and for each type of substance = nonuser. All odds ratios and *p*-values are the weighted estimate.

Table 2

Multinomial logistic regression predicting the odds ratios [95% CI] of stimulant persistence subgroup using sex, age, income, race, parental status, population density, cigarette, alcohol, marijuana, and inhalant persistence subgroups (unweighted n = 117,442).

Substance		Non-persistent	*p*-value	Persistent	*p*-value	Recent onset	*p*-value
Female		1.58 [1.32–1.89]	<.001	1.49 [1.19–1.86]	<.001	1.66 [1.44–1.91]	<.001
Age		1.25 [1.16–1.34]	<.001	1.15 [1.04–1.27]	.005	.97 [.92–1.03]	*.ns*
Income	Less than $20,000	1.12 [.88–1.42]	*.ns*	1.07 [.73–1.56]	*.ns*	.74 [.56–.98]	.035
	$20,000–49,999	1.12 [.91–1.37]	*.ns*	.94 [.72–1.22]	*.ns*	.82 [.70–.97]	.021
	$50,000–74,999	.82 [.63–1.07]	*.ns*	.96 [.70–1.32]	*.ns*	.80 [.67–.97]	.022
Race	Hispanic/Latino	.69 [.52–.91]	.010	.62 [.42–.90]	.013	.57 [.45–.72]	<.001
	Black	.55 [.38–.80]	.002	.85 [.55–1.33]	*.ns*	.46 [.33–.64]	<.001
	Native American	.39 [.19–.77]	.007	.43 [.21–.88]	.022	1.09 [.64–1.88]	*.ns*
	Pacific Islander	.11 [.03–.45]	.002	.12 [.03–.53]	.006	.96 [.33–2.84]	*.ns*
	Asian	1.19 [.64–2.20]	*.ns*	.87 [.28–2.64]	*.ns*	.84 [.42–1.67]	*.ns*
	Multiracial	1.17 [.81–1.70]	*.ns*	.86 [.47–1.56]	*.ns*	.64 [.43–.94]	.025
Parental status	Mother-only	1.06 [.85–1.32]	*.ns*	.83 [.60–1.16]	*.ns*	1.05 [.85–1.30]	*.ns*
	Father-only	.99 [.73–1.36]	*.ns*	.73 [.47–1.14]	*.ns*	.95 [.69–1.31]	*.ns*
	Neither parent	1.00 [.65–1.52]	*.ns*	1.10 [.71–1.70]	*.ns*	1.29 [.90–1.84]	*.ns*
Population	Not in CBSA	.92 [.70–1.19]	.ns	.93 [.65–1.32]	.ns	.87 [.67–1.13]	*.ns*
density	CBSA < 1M	1.04 [.85–1.27]	.ns	.97 [.75–1.24]	.ns	.93 [.79–1.09]	*.ns*
Cigarette	Non-persistent	2.04 [1.44–2.90]	<.001	1.49 [.84–2.64]	.ns	1.46 [1.03–2.07]	*.ns*
	Persistent	2.44 [1.76–3.36]	<.001	3.80 [2.21–6.55]	<.001	2.71 [2.11–3.47]	.033
	Recent	.95 [.60–1.49]	.ns	1.07 [.59–1.94]	.ns	2.22 [1.76–2.80]	<.001
Alcohol	Non-persistent	2.60 [1.75–3.85]	<.001	1.81 [.89–3.67]	.ns	2.84 [1.80–4.47]	<.001
	Persistent	2.48 [1.75–3.53]	<.001	3.35 [2.04–5.48]	<.001	7.39 [5.45–10.02]	<.001
	Recent	1.49 [1.01–2.21]	0.047	1.30 [.75–2.26]	.ns	5.37 [3.87–7.46]	<.001
Marijuana	Non-persistent	3.47 [2.58–4.67]	<.001	1.50 [.83–2.73]	.ns	1.70 [1.20–2.41]	.003
	Persistent	3.66 [2.81–4.78]	<.001	5.61 [3.66–8.59]	<.001	4.44 [3.52–5.58]	<.001
	Recent	1.11 [.72–1.71]	.ns	1.72 [1.04–2.85]	0.037	3.25 [2.56–4.13]	<.001
Inhalants	Non-persistent	6.06 [4.91–7.48]	<.001	4.99 [3.61–6.89]	<.001	1.61 [1.28–2.03]	<.001
	Persistent	4.20 [2.90–6.09]	<.001	12.68 [9.06–17.75]	<.001	3.61 [2.79–4.67]	<.001
	Recent	3.09 [2.24–4.26]	<.001	4.52 [3.22–6.35]	<.001	4.08 [3.39–4.90]	<.001

Note: The reference group for sex = male, income = $75k+, race = White, parental status = dual parent household, population density = CBSA > 1M, and for each type of substance = nonuser. All odds ratios and *p*-values are the weighted estimate.