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Youth or Young Adults: Which Group Is at Highest Risk for Tobacco Use Onset?

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Abstract

Purpose: Historically, adolescence has been regarded as the time when most tobacco use initiation occurs. This study examines the initiation of tobacco product use, including cigarettes, e-cigarettes, cigar products, and hookah, among contemporary youth and young adults, to determine whether the developmental timing (youth vs. young adulthood) of initiation has changed.

Methods: Three cohort studies were used to examine the onset of ever use and current (past 30 days) use of each tobacco product among never-using youth (11 to <17 years) and young adults (18–24 years) at baseline (2013–2015) to one-year follow-up (2015–2016). These studies include the national Population Assessment of Tobacco and Health Study, and two Texas cohort studies, the Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS), and the Marketing

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and Promotions Across Colleges in Texas (M-PACT) project. Estimations of onset were computed using generalized linear mixed models for TATAMS and M-PACT. The rates of initiation in Population Assessment of Tobacco and Health Study were compared to standardized incidence rates from TATAMS to M-PACT.

Results: Young adults had significantly higher incidence rates than youth to initiate ever and current use of each/all tobacco products for all comparisons.

Conclusions: These findings extend prior research on the timing of the onset of tobacco use by using longitudinal analyses from three contemporary cohort studies to include not just cigarettes, but also e-cigarettes, cigar products, and hookah. Among those who were never-users of tobacco products, young adults began to ever and currently use all tobacco products more than youth in these samples, a marked departure from prior decades of research.

Keywords

Initiation; Youth; Young adults; Adolescents; Current use; Cigarettes; E-cigarettes; ENDS; Cigars; Hookah

Historically, the developmental stage of adolescence is the time when cigarette smoking is initiated and progression to daily smoking is observed [1,2]. The first major conclusion of the 1994 Surgeon General's Report stated: "Nearly all first use of tobacco occurs before high school graduation; this finding suggests that *if adolescents can be kept tobacco-free, most will never start using tobacco*" (p.5). The conclusion was informed by data from the 1991 National Household Surveys on Drug Abuse. Among adults, ages 30–39, who had ever smoked daily, 89% first tried a cigarette and 71% began to smoke daily by age 18 (p. 65) [2]. These analyses were replicated for the 2012 Surgeon General's Report (p. 136) [1]. These data strongly suggest that the onset and regular use of cigarettes began in adolescence for adults who were smokers in 1991 and 2010 [1]. However, these data are somewhat limited since they are retrospective data from adults. Other prospective data, from the Add Health longitudinal study, are consistent with this conclusion (p. 248) [1].

There have been several major changes in tobacco-related products, marketing methods, and policies in the past decade [3,4], that could affect the ways in which youth and young adults initiate and use tobacco products. The most notable change is the introduction of new tobacco products, particularly electronic cigarettes (e-cigarettes), to the U.S. market in 2007, and their rapid adoption by adolescents and young adults [4]. Data from the National Youth Tobacco Survey indicate that 37.7% of high school students had ever used e-cigarettes and 16% were current users in 2015 [5]. Among young adults, ages 18–24, from the National Adult Tobacco Survey in 2013–2014, 35.8% had ever used e-cigarettes and 13.6% were current users [6]. A second change in the past decade involves increased access to and exposure to digital media, including marketing of a variety of products, including tobacco products, via digital and social media [7]. The iPhone's introduction in 2007 and other smartphones have made access to digital media and marketing nearly ubiquitous [8,9]. Unfortunately, exposure to digital marketing appears to affect subsequent tobacco use [10–12], with adolescents who reported seeing e-cigarette marketing on the internet having 2.2 times the odds of being current e-cigarette users six months later (compared with those who

did not report exposure) [11]. A third change involves the implementation of the Family Smoking Prevention and Tobacco Control Act (TCA), which gave the Food and Drug Administration (FDA) the authority to regulate the manufacturing, distribution, and marketing of tobacco products [13]. The TCA originally included cigarettes, smokeless, and loose tobacco, but FDA's authority was extended to all tobacco products in 2016 [14]. One of the major charges of the TCA is to reduce tobacco use among adolescents under the age of 18. For example, the TCA banned some flavors of cigarettes and sponsorship at entertainment/sports events, prohibited free sampling of tobacco products and nontobacco branded items, and required manufacturers to seek approval or exemptions from FDA before introducing new tobacco products [15]. These regulations, in addition to those placed on marketing to youth by the 1998 Master Settlement Agreement, have all changed the potential for tobacco companies to market or appeal to youth [16]. As a possible response to these changes, among high school students, from 2011 to 2016, the use of cigarettes, cigars, and smokeless tobacco significantly decreased, while the use of e-cigarettes and hookah significantly increased [17].

Importantly, Thompson and colleagues [18] analyzed cross-sectional national data from 2006 to 2013, on adolescent (12–17 years old) and young adult (18–25 years old) cigarette use, using the National Survey on Drug Use and Health. They found that the rate of onset of cigarette smoking among adolescents was significantly less (1.9%) than onset among young adults (6.3%) during this time. Because this is such a notable departure from decades of research on the age of the onset of cigarette use, the current study extends this work by analyzing data from our ongoing longitudinal studies of youth and young adults in Texas, as well as the national Population Assessment of Tobacco and Health (PATH) study. The current study builds on prior work, by using contemporary data, from 2013 forward, examining the onset of ever and current (past 30 days) use of tobacco by age group (youth vs. young adults) and by product type (cigarettes, e-cigarettes, cigar products, and hookah). If young adults have become a higher risk group for tobacco use onset, then greater attention to preventing use prior to consolidation and addiction in adulthood will be crucial to future efforts to prevent tobacco-related morbidity and mortality.

Methods

Study design

Data in this study are derived from three longitudinal studies described below. These studies include two parallel, longitudinal studies of youth and young adults living in the five counties surrounding the four largest cities in Texas (Austin, Dallas/Fort Worth, Houston, San Antonio) between 2014–15 and 2016. The third study provides nationally-representative data on youth and young adults between 2013–14 and 2014–2015.

The Texas Adolescent Tobacco and Marketing Surveillance System (TATAMS) surveyed 6th, 8th, and 10th grade students at wave 1 (October 2014 to June 2015; $n = 3,907$), wave 2 (March 2015 to September 2015), and wave 3 (November 2015 to January 2016). Since there was an overlap in the overall timing of the first two waves of data collection, the TATAMS student surveys at wave 2 began at two time points to accommodate the long survey period in wave 1. The average time between waves for all students was 6 months. At

wave 3, there was a 70% retention rate ($n = 2,733$; $N = 308,460$). TATAMS applies sampling weights to account for the complex design and to represent the population of the five counties [19]. Students completed the wave 1 survey using tablets in the 79 participating schools; participants in waves 2 3 responded to survey questions administered and completed online. Active, informed consent, and assent were obtained from parents and students.

The Marketing and Promotions Across Colleges in Texas project (M-PACT) surveyed students from 24 two-year and four-year colleges who were 18–29 years old ($n = 5,482$ at wave 1). The students were surveyed online at wave 1, and every six months thereafter, for waves 2 3, during similar dates as TATAMS, and from the same cities/counties. There was a 79% response rate at wave 3 ($n = 4,321$) [20]. Active and informed consent were obtained from young adults in M-PACT.

PATH study is a nationally-representative study of the civilian noninstitutionalized population of the United States who are 12 years and older. The sample size at baseline included 9,112 young adults of ages 18–24, and 13,651 youth of ages 12–17 [21]. Wave 1 data were collected via interviews with subjects from September 2013 to December 2014. Wave 2 data were collected one year later, 2014–2015 [21]. Data for this study come from the public and restricted use PATH data files [21].

From the PATH studies, subjects in our study were defined as “youth” if at baseline (wave 1) they were 12 years old and <17 years old. From the TATAMS study, subjects were defined as youth if at wave 1 they were 11 and <17 years old. TATAMS surveyed students by grade level, whereas PATH used age (rather than grade) as an inclusion criteria. Therefore, we excluded .3% of the TATAMS participants who were <11 years old and 1.3% who were 17 or older in wave 1, but retained those >11 because they comprise a large proportion of the sixth grade sample. In PATH, we excluded 16.5% of youth participants who were 17. This means that all youth were, at one-year follow-up, 12 and <18 years old, and all were strictly youth (<18) if/when they initiated tobacco use. “Young adults” were defined as those who were 18–24 at wave 1 in either PATH or M-PACT.

All study protocols and procedures were approved by the University of Texas Health Science Center at Houston’s and the University of Texas at Austin’s institutional review boards.

Measures

At each wave, subjects in all three studies were asked if they had “ever used” and if they had “used in the past 30 days” each of these tobacco products: cigarettes, e-cigarettes, cigars (little filtered cigars, cigarillos, and large cigars), and hookah. For this study of the onset of tobacco use, only never-users of each tobacco product at wave 1 were included. We then examined what percent of never-users at wave 1 of each cohort were ever users or past 30-day (current) users of each product at one-year follow-up, by wave 3 (for TATAMS and M-PACT), and at wave 2 for PATH. For TATAMS and M-PACT, participants were considered current users if they reported current use by wave 3 (either wave 2 or wave 3). Covariates included race/ethnicity (Hispanic, non-Hispanic white, non-Hispanic black, Asian, and other), sex (male and female), and age, using standardized measures [21–23]. These

covariates were selected since significant differences by race/ethnicity, sex, and age have recently been documented for tobacco use at the national level [24].

Data analysis methods

Weighted estimates are reported from PATH [25] and TATAMS [19] accounting for their complex design and nonresponse. M-PACT estimates account for the cluster and design effect from participants within colleges. Wave 1 descriptive statistics are shown in Table 1 for the cohorts—before restricting the data to never-users—for reference purposes.

In TATAMS, sampling weights from all three waves were normalized to conduct the longitudinal estimation of the prevalence of new tobacco product use at one-year follow-up (by wave 3) among never-users at wave 1. Estimates are reported for both ever use or current use of each one of the five tobacco product categories (cigarettes, e-cigarettes, cigars, hookah, and any tobacco product), after controlling for race/ethnicity, sex, age, and design effects. Therefore, ten (2 5) generalized linear mixed models (GLMM) of waves 1 3, with a logit link using 150 quadrature points, were used to estimate these prevalence rates; data for wave 3 are reported to compare with PATH.

In M-PACT, similar to TATAMS, 10 separate GLMMs, with a logit link using 150 quadrature points, were used to estimate the prevalence of tobacco use initiation, for either ever use or current use of each of the five tobacco product categories, after controlling for race/ethnicity, sex, age, and design effects (college attended; and type of college, two-year or four-year).

In PATH, after appropriate weighting, the proportion of never-users at wave 1 who became ever users and current users by wave 2 (one-year follow-up) was used for comparisons.

Because TATAMS is a representative sample of the five previously mentioned counties in Texas, while M-PACT is a convenience sample of students in colleges within the five counties, the two samples were not deemed comparable. Instead, we utilize PATH estimates as the national reference standard, and then examine how youth and young adults differed in comparison to those in PATH. All analyses estimating the prevalence of tobacco use by wave 3 were conducted using SAS 9.4 [26].

Comparisons of youth and young adults

Youth and young adult onset (of ever and current use among wave 1 never-users) of each tobacco product category—cigarettes, e-cigarettes, cigar products, hookah, and any (of these) tobacco products—was assessed using five comparisons. First, we compared the difference in proportions at wave 2, between the prevalence of new ever and current users among PATH youth (12 to <17, wave 1) and PATH young adults (18–24, wave 1). Second, we evaluated whether the estimated prevalence rates of tobacco use initiation at wave 2 from PATH young adults (18–24) (population estimate) was inside the standardized 95% confidence interval (CI) for prevalence rates from TATAMS youth (11 to <17) by wave 3. Third, we evaluated whether the estimated prevalence rates of tobacco use initiation (population estimate) from PATH youth (12 to <17) was inside the standardized 95% CI for the prevalence rates from TATAMS youth (11 to <17) by wave 3. Fourth, we evaluated

whether the prevalence of tobacco use initiation from PATH youth (12 to <17) (population estimate) at wave 2 was within the 95% CI for the prevalence rates for M-PACT young adults (18-24) by wave 3. Fifth, we evaluated whether the prevalence of tobacco use initiation from PATH young adults (18-24) (population estimate) at wave 2 was within the 95% CI for proportions for M-PACT young adults by wave 3.

Importantly, we used the 2014 population estimates of the United States [27] to standardize the prevalence estimates from TATAMS and M-PACT by gender and ethnicity. TATAMS data are standardized to correspond to the U.S. population of 11 to <17 years old in 2014; M-PACT data are standardized to correspond to the U.S. population of 18-24 years old in 2014. PATH data are also standardized by design of the national study [25].

Results

Table 2 provides the demographic data for the analytic samples of never-users of any tobacco product at wave 1 for PATH youth, PATH young adults, TATAMS youth, and M-PACT young adults. PATH youth and young adults were older than TATAMS youth and M-PACT young adults, respectively. While the youth populations of PATH and TATAMS were nearly evenly split between males and females; the young adult populations of PATH and M-PACT had a higher proportion of females among the never-users. PATH youth and young adults were predominantly white (>50%), followed by Hispanic and non-Hispanic black participants. TATAMS youth were predominantly Hispanic (>50%), followed by white, and non-Hispanic black. M-PACT young adults were more likely to be white, Hispanic or Asian (>25% each). Comparisons of demographic characteristics of other sub-groups (never-users of cigarettes, e-cigarettes, cigars, and hookah) were similar to the never-users of any tobacco product within each of the studies (data not shown). Because of these demographic differences between the studies, all comparisons with PATH, using TATAMS and M-PACT data are: (1) standardized to the U.S. population in 2014 (for comparable age groups, and by gender and ethnicity) and (2) adjusted for age, sex, and race/ethnicity in analyses.

Table 3 presents the data comparing PATH youth (12 to <17) and PATH young adults (18-24) who were never-users of any product, and each product, at wave 1, and who became ever users or current users of each tobacco product (or any tobacco product) by wave 2. *PATH young adults were significantly more likely to initiate ever and current use of all tobacco products than PATH youth by wave 2: cigarettes, e-cigarettes, cigar products, and hookah (and all combined).*

Table 4 presents the data comparing PATH youth (12 to <17) and young adults (18-24) and TATAMS youth (11 to <17), who were never-users at these ages at wave 1, and who became ever users or current users at wave 2 (PATH) or by wave 3 (TATAMS). Importantly, *PATH young adults at wave 2 were significantly more likely than TATAMS youth by wave 3 to ever use, and currently use, any tobacco product and each tobacco product.*

In addition, at one-year follow-up, PATH youth were significantly more likely than TATAMS youth to ever use: any tobacco product, e-cigarettes, and hookah. PATH youth and TATAMS youth were equally likely to ever use cigarettes and cigars. In addition, at follow-

up, PATH youth were significantly more likely than TATAMS youth to currently use any tobacco product and cigarettes. They were equally likely to currently use e-cigarettes, cigars, and hookah.

Table 5 presents the data comparing PATH youth (12 to <17) and PATH young adults (18–24) with M-PACT young adults (18–24), who were never-users at wave 1, and who became ever users or current users at wave 2 (PATH) or by wave 3 (M-PACT). *M-PACT young adults were significantly more likely than PATH youth to ever and currently use: any tobacco product, cigarettes, e-cigarettes, cigars, and hookah at one-year follow-up.*

M-PACT young adults (wave 3) were significantly *more* likely than PATH young adults (wave 2) to ever use: any tobacco product, cigarettes, cigars, and hookah by one-year follow-up. M-PACT young adults were equally likely as PATH young adults to be current users of each and any tobacco product.

Discussion

Our findings extend prior research on the timing of the onset of tobacco use by using longitudinal analyses from three contemporary cohort studies to include not just cigarettes, but also e-cigarettes, cigar products, and hookah. Among those who were never-users of tobacco products, young adults, from 2013 to 2016, began to ever and currently use all tobacco products more than youth in these samples—a marked departure from prior decades of research on when tobacco use was initiated, and contrary to the conclusion that adolescence is the primary developmental stage of highest risk of onset [1,2].

One factor that may account for the shift from youth to young adult onset, is that tobacco marketing methods are less appealing, or have less exposure, to youth than to young adults, after coming under regulation [13,17]. Now, tobacco company marketing is more explicitly aimed at their youngest legal target group, young adults, and a marked shift from the 1990s [28]. Marketing methods currently involve point-of-sale at retail establishments, price discounts, samples, adult public entertainment, digital media, and magazines [29]. Price discounts accounted for 80% of cigarette marketing dollars in 2014 [30], and is a key strategy for tobacco companies to make cigarettes less expensive for price-sensitive populations, such as youth and young adults. Several marketing methods were regulated during the Master Settlement Agreement, so that there would be less exposure to appealing marketing for youth (under age 18) [16]. Importantly, although youth have been exposed to marketing via point-of-sale, there is high compliance with the Synar Amendment that mandated that all states prohibit the sale of tobacco to minors by 1995. Data on compliance show that while 60% of tobacco retail outlets in the United States were compliant in 1997; this has increased to over 90% by 2012 [31]. Thus, while price discounts are appealing to youth and young adults, compliance with age-of-sale laws may have made these discounts less directly relevant to youth. In all, efforts to reduce the appeal and exposure to the marketing of cigarettes to youth have likely been impactful [1], while few prevention programs or policies have directly focused on young adults.

A second factor to consider is that many of the behaviors associated with adolescence also may be shifting to young adulthood. For example, in 2000, 50% of 12th graders in the Monitoring the Future Study reported drinking alcohol in the past 30 days; this decreased to 33% of 12th graders by 2016 [32]. Also, 8th, 10th, and 12th graders are much *less* likely to engage in traditional activities of adolescents, such as hanging out with friends (without their parents), wanting to get their driver's licenses, or going on a date in 2016, than they were in 2010 [33]. Since these behaviors covary with tobacco use, the reduction of tobacco use onset among youth may be part of an overall trend to extend or delay this constellation of risk behaviors.

In addition, traditional young adult behaviors, such as starting a career, getting married, or having children, also are delayed, and so the entire developmental trajectory from adolescence to adulthood may be increasing in duration [34]. For example, age of first marriage is now 28 years old, compared with 24–25 in 1990 [35]. In addition, young adults are more likely to be living with their parents than previous generations [36]. Thus, there may be a trend for young adults to initiate behaviors that were previously started in adolescence, while they (young adults) delay their own traditional developmental tasks until their late 20s or 30s.

While young adults from PATH or M-PACT were more likely to initiate all forms of tobacco use than youth in PATH or TATAMS, from 2014–2016 using three separate comparisons, the TATAMS youth were generally initiating at lower rates than PATH youth. This may be due to the sampling method of recruiting by grade, so that the overall age of the TATAMS cohort was younger, even though the data were controlled by age and nationally standardized. Interestingly, the M-PACT young adults had similar rates of onset of current use compared with their national counterpart. However, M-PACT young adults were more likely to initiate tobacco use (ever use, except e-cigarettes) than their PATH counterparts, even if they were not current users. This difference was not expected, given that college students generally have lower tobacco use than noncollege students [37]. It may be that Texas college students have been exposed to more tobacco industry advertising, given that Texas is the #1 state in spending by the tobacco industry for marketing [38]. Alternatively, Texas college students may be more likely to exhibit characteristics of “emerging adults” including behaviors that are associated with identity development, such as tobacco use [39]. However, these reasons are speculative and they do not alter the primary findings of the substantial differences found in onset rates between youth and young adults at regional and national levels. The above comparisons, though, do reinforce demographic and regional similarities and differences in the prevalence of tobacco products and the need to continue to monitor youth and young adult use at the regional level [40].

There are limitations to our study. The most important is the lower prevalence of tobacco use among youth (vs. young adults) at wave 1. This suggests that for the young adults in our samples, some *may* have first used tobacco products while they were youth. The restriction of the analyses to never-users of each tobacco product and especially the finding that many of these never-users became current users over one year during young adulthood, strengthens the conclusion that young adults are now at risk of onset of tobacco use—contrary to prior conclusions [1,2]. However, continuing longitudinal analyses from

adolescence to young adult-hood will be needed to definitively confirm that most onset occurs from age 18 and older, and to identify which subgroups are at highest risk for initiation including specific gender and racial/ethnic groups.

This study reveals that initiation across multiple tobacco products among never-using young adults at both the national and regional (Texas) levels is now greater than among youth. This recent and unprecedented change in the age of onset is likely to have many causes, such as successful policies, programs, and communications concerning tobacco use and youth since the late 1990s [40]. These efforts have been implemented in the context of changes in the social environments of youth that reinforce social monitoring (via social media) and a decline in other risky covarying behaviors. These data clearly point to greater attention and action needed to prevent onset with young adults—to prevent long-term adult tobacco use and associated health consequences.

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IMPLICATIONS AND CONTRIBUTION

This study reveals that the initiation of tobacco products among never-using young adults at the national and regional levels is now greater than among youth. This recent, unprecedented change suggests that young adults should receive greater attention so that their tobacco use does not become long-term with associated health consequences.

Demographic characteristics and tobacco use prevalence of the entire sample of PATH, TATAMS, and M-PACT youth and young adults at wave 1

Table 1

	PATH (Ages 12 to <17) n = 11,539 ^d (N = 20,754,826)	PATH (Ages 18–24) n = 9,112 (N = 30,706,753)	TATAMS (Ages 11 to <17) n = 3,830 (N = 452,449)	M-PACT (Ages 18–24) n = 5,073
Mean age (standard error)	14.0 (.00015) ^d (N) %	21.1 (.03) ^c n (N) %	13.4 (.17) n (N) %	20.0 (.02) n %
Sex				
Female	5,616(10,098,250) 48.6^d	4,496(15,272,700) 49.7^e	2,147(221,310) 48.9	3,227 63.6
Male	5,923(10,656,575) 51.4^d	4,614(15,434,053) 50.3^e	1,683(231,139) 51.1	1,843 36.4
Race/ethnicity				
White	5,539(11,280,395) 54.4^d	4,712(16,842,509) 54.9^e	1,201(97,816) 21.6	1,785 35.2
Hispanic	2,454(3,384,235) 16.3^d	1,575(4,736,149) 15.4^e	1,466(247,768) 54.8	1,593 31.4
Black/African-American	1,777(3,162,062) 15.2^d	1,529(4,487,878) 14.6^e	608(77,304) 17.1	408 8.0
Asian	348(1,002,007) 4.8^d	1,294(4,640,217) 15.1^e	555(29,561) 6.5	902 17.8
Other ^a	1,421(1,926,126) 9.3^d			385 7.6
Any Tobacco product use^b				
Ever use	2,043(3,623,622) 17.5^d	7,277(20,318,527) 66.5^e	813(109,100) 24.1	3,355 66.1
Current use	920(1,632,810) 7.9^d	4,706(11,840,597) 39.0^e	309(46,343) 10.3	1,788 35.3
Cigarettes				
Ever use	1,227(2,158,164) 10.4^d	5,963(16,339,145) 53.2^e	329(48,199) 10.7	2,337 46.1
Current use	378(655,138) 3.2^d	3,593(8,839,176) 28.8^e	85(15,853) 3.5	1,010 19.9
E-cigarette use				
Ever use	998(1,778,388) 8.6^d	3,887(9,834,710) 32.1^e	661(87,056) 19.2	2,396 47.2
Current use	274(494,047) 2.4^d	1,516(3,818,883) 12.5^e	249(33,657) 7.5	848 16.7
Cigars				
Ever use	571(992,549) 4.9^d	5,092(13,760,119) 45.4^e	189(26,773) 5.9	1,723 34.0

	PATH (Ages 12 to <17) n = 11,539 ^d (N = 20,754,826)	PATH (Ages 18–24) n = 9,112 (N = 30,706,753)	TATAMS (Ages 11 to <17) n = 3,830 (N = 452,449)	M-PACT (Ages 18–24) n = 5,073
Current use	174(294,601) 1.5^d	1,933(4,737,429) 15.7^e	63(8,634) 1.9	479 9.2
Hookah				
Ever use	612(1,098,915) 5.3^d	5,061(13,621,120) 44.4^e	195(27,471) 6.1	2,721 53.6
Current use	130(229,804) 1.7^d	1,261(3,295,066) 10.7^e	64(10,722) 2.4	865 17.1

M-PACT = Marketing and Promotions Across Colleges in Texas; PATH = Population Assessment of Tobacco and Health Study; TATAMS = Texas Adolescent Tobacco and Marketing Surveillance System.

^aOther (TATAMS and PATH Young Adults) includes Asian, other, and multiple race/ethnicity.

^bAny product use includes cigarettes, e-cigarettes, cigars, and hookah.

^cPATH restricted file received disclosure to publish: May 19, 2017. United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services, Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v13. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], June 19, 2017. <https://doi.org/10.3886/ICPSR36231.v13>.

^dPATH restricted file received disclosure to publish: January 18, 2018. United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services, Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v13. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], June 19, 2017. <https://doi.org/10.3886/ICPSR36231.v13>.

^ePATH public file: United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services, Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Public-Use Files. ICPSR36498-v6. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], June 14, 2017. <https://doi.org/10.3886/ICPSR36498.v6>.

Demographic characteristics of the analysis sample PATH, TATAMS, and M-PACT youth and young adult never users of any tobacco product at wave 1

Table 2

	PATH (ages 12 to <17) n = 9,314 (N = 16,805,457)	PATH (ages 18–24) n = 1,804 (N = 10,231,916)	TATAMS (ages 11 to <17) n = 3,025 (N = 344,679)	M-PACT (ages 18–24) n = 1,718
Mean age (standard error)	13.8 (.01) ^b n(N) %	20.7 (.06) ^b n(N) %	13.1 (.17) n(N) %	19.6 (.04) n %
Sex				
Female	4,565(8,243,620) 49.2^b	1,046(5,654,157) 55.4	1,728(168,038) 48.8	1,131 65.8
Male	4,719(8,508,887) 50.8^b	755(4,557,669) 44.6^b	1,297(176,641) 51.2	587 34.2
Race/ethnicity				
White	4,339(8,862,003) 56.3^b	838(5,150,278) 52.3^b	1,020(81,001) 23.5	558 32.5
Hispanic	2,194(3,046,220) 19.3^b	361(1,705,306) 17.3^b	1,103(182,397) 52.9	443 25.8
Black/African American	1,270(2,290,511) 14.6^b	328(1,510,181) 15.3^b	455(58,037) 16.8	145 8.4
Asian	249(807,401) 5.1^b	109(1,146,976) 11.6^b	447(23,245) 6.7^a	444 25.8
Other	563(741,779) 4.7^b	91(343,358) 3.5^b		128 7.5

M-PACT = Marketing and Promotions Across Colleges in Texas; PATH = Population Assessment of Tobacco and Health Study; TATAMS = Texas Adolescent Tobacco and Marketing Surveillance System.

^aIncludes Asian, other, and multiple race/ethnicity.

^bPATH restricted file received disclosure to publish: February 12, 2017. United States Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services, Food and Drug Administration, Center for Tobacco Products, Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v13. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor], June 19, 2017. <https://doi.org/10.3886/ICPSR36231.v13>.

Table 3

Comparing the prevalence of PATH youth and young adult use of tobacco products at wave 2 (one-year follow-up) among wave 1 never users of each product

Of wave 1 never users of:	Youth ^b (ages 12 to <17) n(N) % users at wave 2	Young adults ^c (Ages 18–24) n(N) % users at wave 2	Difference in proportions ^d youth–adults (95% CI), SE	p value of chi-square statistic for test of independence
Any Tobacco product^a				
Ever use by follow-up	829(1,703,309) 10.5 ^e	215(1,369,565) 13.9 ^e	–.034 (–.0593, –.0088), .0127	.0048 ^e
Current use by follow-up	276(567,314) 3.5 ^e	125(774,671) 7.9 ^e	–.0437 (–.0625, –.0249), .0095	<.0001 ^e
Cigarettes				
Ever use by follow-up	333(683,138) 3.8 ^e	215(945,559) 6.8 ^e	–.0297 (–.0414, –.018), .0059	<.0001 ^e
Current use by follow-up	137(280,898) 1.6 ^e	146(625,208) 4.5 ^e	–.0291 (–.0381, –.0201), .0045	<.0001 ^e
E-cigarettes				
Ever use by follow-up	808(1,675,248) 9.2 ^e	740(2,947,552) 14.6 ^e	.1204 (.1118, .129), .0043	<.0001 ^e
Current use by follow-up	217(457,997) 2.5 ^e	227(901,931) 4.5 ^e	–.02 (–.0294, –.0105), .0048	<.0001 ^e
Cigars				
Ever use by follow-up	267(566,752) 3.1 ^e	290(1,172,870) 7.4 ^e	–.043 (–.0544, –.0317), .0057	<.0001 ^e
Current use by follow-up	78(159,062) .9 ^e	183(659,496) 4.1 ^e	–.0328 (–.0409, –.0246), .0041	<.0001 ^e
Hookah				
Ever use by follow-up	288(596,626) 3.1 ^e	378(1,630,828) 9.8 ^e	–.067 (–.0802, –.0538), .0067	<.0001 ^e
Current use by follow-up	76(157,343) .8 ^e	193(834,126) 5.0 ^e	–.042 (–.0509, –.0332), .0044	<.0001 ^e

CI = confidence interval; PATH = Population Assessment of Tobacco and Health Study.

^a Any tobacco product use includes cigarettes, e-cigarettes, cigars, and hookah.

^b Youth ages 12 to <17 at wave 1 and ages 13 to <18 at wave 2.

^c Young adults ages 18–24 at wave 1 and ages 19–25 at wave 2.

^d Each subset of never users for a tobacco product for youth was appended to the same subset of never users for the same tobacco product among the adults for the purpose of the comparison.

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Comparing the prevalence of tobacco use at one-year follow-up among PATH youth and young adults with TATAMS youth among wave 1 never users

Table 4

	PATH youth ^b (Ages 12 to <17)	PATH young Adults ^c (Ages 18–24)	TATAMS youth ^d (Ages 11 to <17)	
Of wave 1 never users of:	n(N) % users at wave 2	n(N) % users at wave 2	n	% users by wave 3 (95% CI) adjusted and standardized ^{e,f}
Any tobacco product^a				
Ever use by follow-up	829(1,703,309) 10.5^g	215(1,369,565) 13.9^g	2,164	6.3 (4.3–9.1)
Current use by follow-up	276(567,314) 3.5^g	125(774,671) 7.9^g	2,164	1.6 (.7–3.3)
Cigarettes				
Ever use by follow-up	333(683,138) 3.8^g	215(945,559) 6.8^g	2,472	3.6 (2.6–5.0)
Current use by follow-up	137(280,898) 1.6^g	146(625,208) 4.5^g	2,472	.4 (.2–1.2)
E-cigarettes				
Ever use by follow-up	808(1,675,248) 9.2^g	740(2,947,552) 14.6^g	2,258	5.1 (3.3–7.7)
Current use by follow-up	217(457,997) 2.5^g	227(901,931) 4.5^g	2,258	2.0 (1.1–3.7)
Cigars				
Ever use by follow-up	267(566,752) 3.1^g	290(1,172,870) 7.4^g	2,568	2.9 (2.0–4.3)
Current use by follow-up	78(159,062) .9^g	183(659,496) 4.1^g	2,568	.4 (.2–1.2)
Hookah				
Ever use by follow-up	288(596,626) 3.1^g	378(1,630,828) 9.8^g	2,579	1.3 (.7–2.5)
Current use by follow-up	76(157,343) .8^g	193(834,126) 5.0^g	2,579	.3 (.1–1.3)

CI = confidence interval; PATH = Population Assessment of Tobacco and Health Study; TATAMS = Texas Adolescent Tobacco and Marketing Surveillance System.

^a Any tobacco product use includes cigarettes, e-cigarettes, cigars, and hookah.

^b Youth ages 12 to <17 at wave 1 and ages 13 to <18 at wave 2.

^c Young adults ages 18–24 at wave 1 and ages 19–25 at wave

^d . Youth ages 11 to <17 at wave 1 and ages 12 to <18 at wave 3.

^e Adjusted for study design (point-of-sale proximity), gender, and race/ethnicity.

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f_{TATAMS} ages 11–16 at baseline standardized by gender and ethnicity (Hispanic vs. non-Hispanic). Results are standardized to corresponding U.S. population of 11–16 years old in 2014.

^g PATH restricted file received disclosure to publish: November 21, 2007. United States Department of Health and Human Services. National Institutes of Health. National Institute on Drug Abuse, and United States Department of Health and Human Services. Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v13. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research [distributor], June 19, 2017. <https://doi.org/10.3886/ICPSR36231.v13>.

Comparing the prevalence of tobacco use at one-Year follow-up among PATH youth and young adults with M-PACT young adults among wave 1 never users

Table 5

Of wave 1 never users of:	PATH youth ^b (ages 12 to <17) n(N) % users at wave 2	PATH young adults ^c (ages 18–24) n(N) % users at wave 2	M-PACT young adults ^d (ages 18–24) n	% users by wave 3 (95% CI) adjusted and standardized ^{f,g}
Any tobacco product^a				
Ever use by follow-up	829(1,703,309) 10.5 ^e	215(13,69,565) 13.9 ^e	1,411	17.6 (14.3–22.7)
Current use by follow-up	276(567,314) 3.5 ^e	125(774,671) 7.9 ^e	1,411	7.9 (5.2–13.2)
Cigarettes				
Ever use by follow-up	333(683,138) 3.8 ^e	215(945,559) 6.8 ^e	2,209	9.6 (7.4–12.6)
Current use by follow-up	137(280,898) 1.6 ^e	146(625,208) 4.5 ^e	2,209	4.1 (2.6–6.8)
E-cigarettes				
Ever use by follow-up	808(1,675,248) 9.2 ^e	740(2,947,552) 14.6 ^e	2,125	15.0 (13.0–17.5)
Current use by follow-up	217(457,997) 2.5 ^e	227(901,931) 4.5 ^e	2,125	5.2 (3.8–7.2)
Cigars				
Ever use by follow-up	267(566,752) 3.1 ^e	290(1,172,870) 7.4 ^e	2,641	15.2 (13.2–17.7)
Current use by follow-up	78(159,062) .9 ^e	183(659,496) 4.1 ^e	2,641	5.1 (3.5–7.5)
Hookah				
Ever use by follow-up	288(596,626) 3.1 ^e	378(1,630,828) 9.8 ^e	1,874	19.9 (17.0–23.5)
Current use by follow-up	76(157,343) .8 ^e	193(834,126) 5.0 ^e	1,874	5.6 (4.4–7.6)

CI = confidence interval; M-PACT = Marketing and Promotions Across Colleges in Texas; PATH = Population Assessment of Tobacco and Health Study.

^a Any tobacco product use includes cigarettes, e-cigarettes, cigars, and hookah.

^b Youth ages 12 to <17 at wave 1 and ages 13 to <18 at wave 2.

^c Young adults ages 18–24 at wave 1 and ages 19–25 at wave 2.

^d Young adults ages 18–24 at wave 1 and ages 19–25 at wave 3.

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^e PATH restricted file received disclosure to publish: November 21, 2017. U. S. Department of Health and Human Services. National Institutes of Health, National Institute on Drug Abuse, and United States Department of Health and Human Services. Food and Drug Administration. Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] Restricted-Use Files. ICPSR36231-v13. Ann Arbor, MI: Interuniversity Consortium for Political and Social Research [distributor], June 19, 2017. <https://doi.org/10.3886/ICPSR36231.v13>.

^f Adjusted for institution type (two- or four-year), college attended, gender, race/ethnicity, and age at wave 1.

^g Standardized by gender and ethnicity (Hispanic vs. non-Hispanic) for ages 18–24 at baseline. Results are standardized to corresponding U.S. population of 18–24 years old in 2014.