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Supplement Article

Cross-sectional Patterns and Longitudinal Transitions of Premium and Non-Premium Cigar Use in the United States

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Abstract

Introduction: Cigar use is common in the United States; however, knowledge about trends and longitudinal patterns of premium and non-premium cigar use is limited. We analyzed cross-sectional and transition patterns of cigar use in the United States by cigar type, age, race/ethnicity, and socioeconomic status.

Aims and Methods: Using data from the Population Assessment of Tobacco and Health (PATH) Study, we compared characteristics of cigar users by Wave (1–5) and type; premium versus non-premium traditional cigars, cigarillos, and filtered cigars. We then calculated longitudinal transition rates of cigar and cigarette use between PATH Study Waves and longitudinal trajectories across all five Waves.

Results: Premium cigars were predominantly used by males, non-Hispanic White individuals, and those with high educational attainment. Premium cigar use was mostly non-daily and less likely to be dual with cigarettes or other cigar types. About three-quarters of exclusive premium cigar users remained so after one year. However, dual-use of premium cigars with either other cigar types or cigarettes was transient. Those who smoked premium cigars fairly regularly for at least one year were more likely to be exclusive premium cigar users or have dropped combustible tobacco product use by Wave 5.

Conclusions: Cigar use patterns vary significantly by cigar type. Premium cigar users have distinctive characteristics compared to other cigar-type users. When studying cigar use and related health outcomes, it is critical to distinguish cigar type.

Implications: Continuous monitoring of longitudinal use patterns of premium and non-premium cigar use and their co-use and transitions to other tobacco products, including inhalation and a more precise measure of the intensity of use, is essential for a better assessment of their health implications.

Introduction

Since 1993, cigar use has been increasing in the United States, driven partly by the promotion of premium cigars. Cigar consumption increased by almost 50% (remarkably, with premium cigar usage increasing by nearly 250%) from 1993 to 1997,[1] followed by a 145% increase in prevalence from 1998 to 2020.[2] While premium cigar use is relatively common in the United States, studies of the prevalence and use patterns of premium cigars are limited. The little evidence available comes from analyses of the National Adult Tobacco Survey (NATS) and the Population Assessment of Tobacco and Health (PATH) Study.[3,4] In particular, Corey et al. analyzed adult cigar-smoking patterns by cigar type, including premium cigars and sociodemographic factors in the PATH Study Wave 1 (2013–2014).[3] The study found a prevalence of current established adult premium cigar smoking in 2013–2014 of 0.7% (95% confidence interval [CI] = 0.6%–0.7%), with more commonly used in males, non-Hispanic White individuals, those with some college or more education and with incomes of 200% of the federal poverty line or more.

Corey et al. also analyzed cigar use characteristics such as the number of days smoked in the past 30 days, the number of cigars or cigarettes used per day, age at first regular use, duration of use, and concurrent use of cigars and cigarettes. The analysis found that compared with users of other cigar products, premium cigar users smoke fewer days in the past 30 days (median = 1.7, interquartile range [IQR] = 0.0–4.8), smoke fewer cigars per day (median = 0.1, IQR = 0.0–0.2), and have a lower prevalence of concurrent cigarette smoking (29.9%, 95% CI = 25.5%–34.3%). However, as this was a cross-sectional study, no information was available on either rate of initiation or cessation of premium cigar or other cigar type use or information about transition rates of use between cigar types and cigarettes. Using PATH Study Waves 1–3, some studies have evaluated longitudinal patterns such as initiation, cessation, reuptake, and relapse of tobacco product use (cigarettes, electronic nicotine delivery systems [ENDS], cigars, hookah, and smokeless tobacco). However, they did not investigate differences by cigar type.[5]

In this study, initially requested to inform a report on premium cigars by a National Academies of Sciences, Engineering, and Medicine report,[2] we conducted analyses of PATH Study data from Waves 1 to 5 that extend the Corey et al. analysis in several ways. First, we replicated the Corey et al. analysis for Waves 1 to 5, providing annual estimates of premium cigar and other cigar type use prevalence and patterns of use for 2013–2014, 2014–2015, 2015–2016,

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2016–2017, and 2018–2019. We then calculated longitudinal transitions of use between premium cigars and other cigar types and cigarettes, differentiating premium cigar use by frequency (number of days used in the past 30 days).

Methods

Data

The PATH Study is a longitudinal study of the civilian, non-institutionalized US population aged 12 and older by the National Institutes of Health and the Food and Drug Administration, started in 2013–2014. PATH Study participants periodically answer detailed questions about tobacco product use using Audio Computer-Assisted Self-Interviewing (ACASI). PATH Study collected data annually from Waves 1 to 4 but switched to biennial data collection beginning in Wave 5. For the cross-sectional analysis, we used all adult samples aged 18 and older in each corresponding Wave: Wave 1 (September 2013–December 2014; $N = 32{,}320$ with weighted response rate [WRR] = 74.0%), Wave 2 (October 2014–October 2015; $N = 28\ 362$ with WRR = 83.2%), Wave 3 (October 2015–October 2016; $N = 28\ 148$ with WRR = 78.4%), Wave 4 (December 2016—January 2018; $N = 27\ 757$ with WRR = 73.5% for Wave 1 cohort and $N = 6065$ with WRR = 68.0% for Wave 4 replenishment sample), and Wave 5 (December 2018–November 2019; $N = 28\ 970$ with WRR = 69.4% for Wave 1 cohort and $N = 32\ 687$ with WRR = 88.0% for Wave 4 cohort). Analyses used the PATH Study restricted-use files (RUF).[6]

Measures

We followed a similar approach as Corey et al.,[3] extending their Wave 1 estimation to Waves 2–5 and updating the estimation for Wave 1. A study question about whether an individual had ever seen or heard of cigars, cigarillos, or filtered cigars before this study was asked to Wave 1 participants and replenished Wave 4 individuals at their study entry. Another set of questions assessed whether an individual smoked each cigar type, even one or two puffs, in the past 30 days. This second set of questions was asked to all adult respondents (continuing and aged-up adult respondents or new cohort adult respondents who have ever seen or heard of traditional cigars, cigarillos, or filtered cigars) in Waves 2–5. Details of these questionnaires and other characteristics of cigar smoking are given in Supplement A, Text A1.

Current Established Cigar and Cigarette Users

Current established cigar users were defined as ever smoking the specific cigar type "fairly regularly" and currently smoking every day or some days. Traditional cigar users were further differentiated into premium versus non-premium users according to their usual brand smoked (Supplement A, Table A1). Traditional cigar brands reported by PATH Study participants were classified based on expert opinion.[2] Three brands were coded differently from Corey et al.,[3] who categorized Acid, Optimo, and Marsh Wheeling as premium cigars. In contrast, these brands were coded as non-premium for this analysis (see Supplement A, Text A1 for more details). For individuals with missing usual brand information, those who reported paying ≥$2 per cigar were classified as premium cigar users, with those who reported paying <$2 per cigar classified as non-premium cigar users. The analysis considered then four cigar types: traditional premium cigars, traditional non-premium cigars, cigarillos, and filtered cigars.

Current established cigarette smoking was defined as smoking at least 100 manufactured or roll-your-own cigarettes during a lifetime and currently smoking cigarettes every day or some days.

Demographic Characteristics

Participants reported their demographic characteristics, including sex (male, female), age in years (18–24, 25–34, 35–54, or 55+), race/ethnicity (non-Hispanic White, non-Hispanic Black/African American, non-Hispanic other/multirace, or Hispanic), education (less than high school diploma, GED, high school diploma, some college/associate's degree, completed college or more). Poverty status was assigned based on annual household income and household size as <100% federal poverty level (FPL), 100–199% FPL, and ≥200% FPL. Information for poverty status was available only in Wave 1.

Cross-sectional Analyses by Wave

Cross-sectional unweighted counts, weighted prevalence, and 95% confidence intervals of cigar and cigarette use were estimated for adults in all PATH Study Waves 1–5.

Prevalence of cigar smoking by type and cigarette smoking were calculated using the "survey" package in the R statistical software version 4.1.1.[7] Prevalence was estimated overall and according to sociodemographic characteristics, tobacco use patterns, purchasing behaviors, and reasons for use. Adjusted prevalence ratios (APRs) were calculated using a survey-weighted generalized linear model ("svyglm" function in R) with a logit link function to examine associations between dual cigar and cigarette smoking versus cigar-only smoking accounting for demographics and cigar use behaviors (daily vs. non-daily smoking). To account for the PATH Study's complex survey design, all analyses were conducted using replicate weights, and balanced repeated replication methods (BRR), Fay's method with a factor $\epsilon = 0.3$ as recommended by the PATH Study Restricted Use Files User Guide.[6] Prevalence with a denominator less than 50 observations or a relative standard error greater than 30% was suppressed. Missing values for more than 5% of all eligible responses were treated as a separate category (e.g., poverty status); otherwise, observations with missing values were dropped. For cross-sectional analyses, we estimated weighted prevalence and confidence intervals using cross-sectional single Wave weights, and their corresponding 100 replicate weights in each Wave.

Transition Analysis of Cigar and Cigarette Use

We calculated longitudinal transition rates (percentage of users transitioning from one use state to another) for each PATH Study Wave pair (10 pairings), using all-Wave weights at each pair's end Wave. For example, the analysis for Wave 1 to 4 (W1–W4) looked at the transition rates between Wave 1 and Wave 4 in people who participated in both Waves and used all-Waves weights in Wave 4 (Supplement A, Table A2). We considered the following nine cigar/cigarette use states: (1) Never cigar and cigarette use, (2) Non-current cigar and cigarette use, (3) Exclusive current established premium cigar use, (4) Exclusive current established use of other cigar types (non-premium cigars, cigarillos, or filtered cigars), (5) Exclusive current established cigarette use, (6) Dual current established use of premium cigars and other cigar types, (7) Dual current

established use of premium cigars and cigarettes, (8) Dual current established use of other cigar types and cigarettes, (9) Polytobacco use, that is, current established use of premium cigars, other cigar types, and cigarettes. The use of other tobacco products was not considered in this analysis. We also did a sensitivity analysis by using single-Wave weights at each Wave-pair's end Wave. The study sample for the longitudinal transition analysis consisted of all individuals who participated in all PATH Study Waves 1-5 ($N = 18\ 925$). Transition estimates were calculated using the all-Wave weights for the Wave 1 cohort, and the corresponding 100 replicate weights. We estimated the transition rates for all adults (ages 18+) and stratified them by age (ages 18–34 and 35+).

Transition Analysis of Premium Cigar Users

We conducted another transition analysis to better illustrate the trajectories of ever premium cigar use, restricting the analysis sample to only those who participated in all five Waves and reported smoking premium cigars fairly regularly in at least one Wave ($N = 466$). This analysis considered the same use states as in the previous analyses, with the addition of a "not in sample" state for aged-up youth while they were not in the adult sample. Transitions out of the "not in sample" state thus represent youth to adulthood transitions. In this analysis, we used the all-Waves weights and the corresponding 100 replicate weights. We estimated the transition rates for all adults (ages 18+).

Results

We analyzed use patterns of four cigar types (premium, non-premium, cigarillos, and filtered cigars) and cigarettes among US adults across different periods from 2013 to 2019. For illustration, we describe the results for PATH Study Wave 4 (2016–2017) in the main text since PATH Study Wave 4 added a new sample of users (replenishment sample) to address loss to follow up in previous Waves and produce a truly nationally representative sample as in Wave 1. Results for PATH Study Waves 1-5 are available in Supplement B, Tables B1-B5. Results using cigar use definitions without the fairly regular use restriction or the 100 cigarettes in their lifetime criteria for cigarette smoking are also presented in Supplement B, Table B6.

Demographic Characteristics and Smoking Patterns of Cigar and Cigarette Users

Overall adult prevalence of current established adult tobacco use in PATH Study Wave 4 (2016–2017) was 0.7% (95% CI = 0.6%–0.8%) for premium cigars, 0.5% (95% CI = 0.4%–0.5%) for non-premium cigars, 1.5% (95% CI = 1.4%–1.6%) for cigarillos, 0.8% (95% CI = 0.8%–0.9%) for filtered cigars, and 17.7% (95% CI = 17.3%–18.1%) for cigarettes (Table 1). Absolute use prevalence for each cigar type varied slightly by Wave, but the general use patterns by sociodemographic groups for all cigar types were consistent across Waves (Supplement A, Figure A1 &

Table 1. Demographic Characteristics of Adult Current Established Traditional Cigar (Premium, Non-Premium), Cigarillo, Filtered Cigar, and Cigarette Smokers, PATH Study Wave 4, 2016–2017

	Premium cigars[a] (*n* = 338)	Non-premium cigars[a] (*n* = 238)	Cigarillos (*n* = 992)	Filtered cigars (*n* = 486)	Cigarettes (*n* = 9915)
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Overall adult prevalence	0.7 (0.6–0.8)	0.5 (0.4–0.5)	1.5 (1.4–1.6)	0.8 (0.8–0.9)	17.7 (17.3–18.1)
Sex					
Male	97.7 (95.2–98.9)	86.6 (79.9–91.3)	70.2 (67.2–73.0)	71.7 (67.2–75.9)	53.9 (52.8–55.1)
Female	2.3 (1.1–4.8)	13.4 (8.7–20.1)	29.8 (27.0–32.8)	28.3 (24.1–32.8)	46.1 (44.9–47.2)
Age group (years)					
18–24	9.7 (6.3–14.7)	8.1 (4.9–13.1)	21.7 (18.5–25.2)	10.9 (8.2–14.5)	10.1 (9.4–10.8)
25–34	27.3 (21.4–34.3)	20.5 (15.5–26.4)	33.1 (28.9–37.5)	20.6 (16.9–25.0)	24.3 (23.2–25.6)
35–54	28.2 (22.1–35.2)	38.3 (29.7–47.8)	33.0 (28.5–37.8)	38.2 (32.8–43.9)	38.9 (36.8–41.0)
55+	34.8 (30.8–38.9)	33.1 (25.8–41.4)	12.2 (9.6–15.5)	30.3 (24.8–36.3)	26.6 (25.2–28.2)
Race/ethnicity					
White, non-Hispanic	79.5 (73.5–84.5)	60.9 (50.2–70.7)	47.4 (41.4–53.6)	57.6 (49.3–65.6)	68.4 (67.2–69.6)
Black/AA, non-Hispanic	6.2 (3.4–11.1)	24.1 (15.4–35.7)	34.1 (29.2–39.4)	20.2 (14.7–27.0)	13.2 (12.5–14.0)
Other or multi-race, non-Hispanic	5.0 (2.8–8.9)	4.0 (2.3–6.8)	4.6 (3.3–6.3)	5.2 (3.6–7.5)	5.6 (5.0–6.3)
Hispanic	9.2 (5.9–14.2)	11.1 (7.7–15.7)	13.9 (11.0–17.3)	17.0 (13.2–21.7)	12.7 (11.7–13.9)
Education					
Less than high school diploma	4.0 (2.0–7.5)	14.2 (9.2–21.4)	17.0 (14.8–19.4)	23.0 (18.8–27.8)	16.3 (15.3–17.3)
GED	4.6 (2.6–8.2)	7.9 (4.7–13.0)	9.2 (6.7–12.4)	12.0 (8.9–16.1)	11.5 (10.4–12.7)
High school diploma	14.3 (9.0–22.0)	30.4 (23.3–38.5)	28.0 (24.7–31.5)	27.8 (23.3–32.8)	29.6 (27.9–31.4)
Some college/ associate degree	30.8 (25.5–36.6)	34.3 (27.1–42.4)	37.0 (32.5–41.8)	28.5 (25.8–31.3)	32.0 (30.1–34.0)
Complete college or more	46.3 (37.7–55.1)	13.1 (7.5–22.1)	8.9 (7.0–11.1)	8.7 (5.6–13.2)	10.5 (9.7–11.4)

CI, logit-transformed Wald-type confidence interval; AA, African-American; GED, General Education Development certificate.
[a]Among traditional established cigar smokers, 4.8% (n = 29) could not be assigned as either a premium or non-premium smoker after assessing responses to usual brand (Supplement A, Table A1).

Supplement B, Table B1). The majority of adult cigar users were male (range 70.2%–97.7%). In contrast, 53.9% (95% CI = 52.8%–55.1%) of cigarette users were males. Cigarillos were smoked by young adults aged 18–34 at relatively higher rates than other cigar types and cigarettes (54.8% vs. 37.0% for premium cigars, 28.6% for non-premium cigars, 31.5% for filtered cigars, and 34.4% for cigarettes). The proportion of adult non-Hispanic Black users was higher for cigarillos (34.1%, 95% CI = 29.2%–39.4%) compared to premium cigars (6.2%, 95% CI = 3.4%–11.1%), and other cigar types and cigarettes (range 13.2%–24.1%). Most adult premium cigar users were non-Hispanic white individuals (79.5%, 95% CI = 73.5%–84.5%). High school diploma, GED or less comprised 52.5% of the non-premium cigar, 54.2% of the cigarillo, 62.8% of the filtered cigar, and 57.4% of the cigarette users, whereas it comprised only 22.9% of the premium cigar users. Premium cigar users were predominantly male, non-Hispanic White, with some college or more education. Results for other Waves are presented in Supplement B, Table B1.

Cigar and Cigarette Smoking Patterns

Cigar smoking patterns and use behaviors varied by cigar type. Specifically, in Wave 4, about half of the established premium, non-premium cigar, and cigarillo smokers had smoked >50 cigars in their lifetime (range 46.1%–51.8%), while filtered cigar smokers had similar distribution across the categories (only 35.3% smoked >50 filtered cigars in their lifetime). The prevalence of daily cigar smoking was highest among filtered cigar smokers (39.6%, 95% CI = 35.2%–44.3%) and lowest among premium cigar smokers (5.2%, 95% CI = 2.2%-11.4%). In contrast, the prevalence of daily use for cigarette smokers was 76.4% (95% CI = 75.4%–77.4%) (Table 2)

The number of cigars smoked per day was greater for filtered cigars (median = 1.0 cigars/day. IQR = 0.0–8.3) compared with the other cigar type users (median range 0.1–0.3 cigars/day), and lowest for premium cigar users (median = 0.1 cigars/day, IQR = 0.0–0.2). For cigarette users, the number of cigarettes smoked per day had a median of 10.0 (IQR = 4.7–20.0). Age at first regular use was older for filtered cigars (median = 30.0 years) compared to the other

Table 2. Smoking Patterns Among Adult Current Established Traditional Cigar (Premium, Non-Premium), Cigarillo, Filtered Cigar, and Cigarette Smokers, PATH Study Wave 4, 2016–2017

	Premium cigars[a]	Non-premium cigars[a]	Cigarillo	Filtered cigars	Cigarettes[a]
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Lifetime cigars smoked					
<1–10 cigars	5.5 (2.3–12.9)	23.9 (17.7–31.4)	14.0 (10.8–17.8)	28.8 (21.3–37.7)	NA
11–50 cigars	47.9 (38.2–57.8)	30.1 (19.3–43.6)	34.2 (30.5–38.2)	25.9 (18.6–34.8)	NA
51 or more cigars	46.5 (36.5–56.8)	46.1 (36.4–56.1)	51.8 (47.6–55.9)	35.3 (37.6–53.3)	NA
Now smoke product every day	5.2 (2.2–11.4)	22.3 (14.8–32.1)	19.1 (16.7–21.8)	39.6 (35.2–44.3)	76.4 (75.4–77.4)
Days smoked in past 30 days[b] (median, IQR)	1.0 (0.0–4.0)	5 (1–25.1)	5 (1–25)	19.3 (1.0–30.0)	30 (30–30)
Number of cigars or cigarettes per day[c] (median, IQR)	0.1 (0.0–0.2)	0.2 (0.0–1.0)	0.3 (0.0–1.5)	1.0 (0.0–8.3)	10.0 (4.7–20.0)
Age (years) at first regular use[d] (median, IQR)	25 (20–31)	22 (18–35)	19 (16–25)	30.0 (19.0–43.1)	17 (15–19)
Duration (years) since first regular use (median, IQR)	13 (6–25)	18.0 (10.1–26.0)	11 (6–17)	9 (5–18)	24 (14–38)
Currently use ≥ 1 other cigar type(s)[e,f]	16.4 (11.2–23.3)	52.8 (44.5–60.8)	32.8 (29.1–36.7)	42.2 (36.8–47.9)	8.2 (7.7–8.7)
Currently use ≥ 1 non-cigar, non-cigarette product(s)[g]	26.1 (21.0–31.9)	28.8 (21.5–37.4)	28.3 (24.2–32.9)	26.8 (21.1–33.2)	15.4 (14.1–16.8)
Cigarette smoking status[h]					
Current established smoker	25.7 (19.3–33.3)	50.1 (43.8–56.4)	60.2 (57.2–63.2)	70.5 (64.9–75.6)	NA
Former established smoker	40.6 (33.1–48.6)	25.9 (16.7–37.8)	15.1 (11.9–18.9)	12.4 (8.8–17.1)	NA
Never smoker	33.7 (26.4–41.8)	24.0 (14.7–36.8)	24.7 (21.9–27.8)	17.1 (13.1–22.0)	NA

CI, logit-transformed Wald-type confidence interval; IQR, interquartile range (25th and 75th percentiles); NA, not applicable.
[a]When respondents reported smoking both manufactured cigarettes and roll-your-own (RYO) cigarettes (n = 753), for certain topics they were asked separate questions about each product. For dual manufactured cigarette and RYO smokers, the responses to manufactured cigarette products are provided; otherwise, responses reflect the single cigarette type the respondent reported smoking.
[b]Number of days using the product in past 30 days was asked of those who now smoke cigars some days; every day smokers assumed to smoke on all 30 days.
[c]Respondents reporting smoking less than one cigar per day on the days smoked were assigned as smoking 0.5 cigars per day.
[d]Those reporting age at first regular use <6 years were assigned a value of 6 years.
[e]For current cigarette smokers, "currently use >=1 other cigar products" refers to current smoking of one or more cigar products.
[f]If respondent was missing status for one cigar product and did not smoke the other cigar product, then treated as not smoking other cigar types.
[g]Current use of ≥1 non-cigar, non-cigarette product(s) defined as having ever used one or more of the following tobacco products "fairly regularly" and now using that product every or some days: ENDS, pipe tobacco, hookah, smokeless tobacco, or snus. If respondent reported not using any other tobacco product, or some combination of not using and missing tobacco product use status, then treated as not using any non-cigar, non-cigarette products.
[h]Former established cigarette smokers had to have smoked at least 100 cigarettes in their lifetime and now smoke cigarettes not at all; never cigarette smokers had to smoke less than 100 cigarettes in their lifetime.

types of cigars (median range 19–25 years) and cigarettes (median = 17.0 years). The current use percentage of one or more other cigar types among cigar smokers was highest in non-premium cigar smokers (52.8%, 95% CI = 44.5%–60.8%) and lowest in premium cigar smokers (16.4%, 95% CI = 11.2%–23.3%). This was lower for cigarette users (8.2%, 95% CI = 7.7%–8.7%). The usage of one or more non-cigar/non-cigarette products was similar across smokers of all cigar types but lower for cigarette smokers. Concurrent cigarette smoking was the lowest among premium cigar users (25.7%, 95%CI = 19.3%–33.3%), with smoking prevalence ranging from 50.1% to 70.5% for the other cigar type users. These patterns were consistent for the other PATH Study Waves, except for the proportion of cigar smokers who smoked >50 cigars in their lifetime, which decreased over time, especially for premium and non-premium cigar smokers (Supplement B, Table B2).

While other types of cigars and cigarettes were purchased in convenience stores/gas stations, premium cigars were purchased in cigar bars, smoke shops/tobacco specialty, or outlet stores. Note that these findings on where products are purchased are limited to those who report usually purchasing in-person; online sales are not currently addressed in this paper. Premium cigar users were less likely to use flavored or mentholated brands than users of the other cigar types or cigarettes. Dual use of cigars and cigarettes was less likely among non-Hispanic black compared to non-Hispanic white individuals, daily compared to non-daily users, and those with some college/associate degree or more compared to those with an education level of GED, High school diploma, or less. Two common reasons for smoking cigars were "socializing while smoking" or "availability of products in favorite flavors." Affordability was another common reason for smoking non-premium cigars, cigarillos, and filtered cigars, but not for premium cigars. Detailed summaries for these measures are described in Supplement A, Text A2-A4.

Longitudinal Transition Analyses of Cigar and Cigarette Use

Here we describe the transition estimates for one year averaged across Waves 1 through 4 for all adults ages 18+ (Supplement A, Figure A2; https://tcors.umich.edu/PremiumCigarTransition/). About 75% of exclusive premium cigar users kept smoking premium cigars (sum of 69.2% as exclusive premium cigar users, 2.5% and 2.8% as dual users with other cigar types and cigarettes, respectively, and 0.5% as ploytobacco users) in the following year. Most exclusive premium cigar users transitioning away do so to non-current use (18.8%), with only a tiny fraction transitioning to other products (6.1%). About 59% of exclusive other cigar type (non-premium cigars, cigarillos, or filtered cigars) users kept smoking cigars as exclusive users (46.9%) or dual users with premium cigars (2.2%) or cigarettes (9.6%), or poly tobacco users (0.3%) in the following year. More than a quarter of other exclusive cigar users discontinued use within a year (32.1%). Dual use of premium cigars with either other cigar types or cigarettes was relatively transient, with only slightly more than 40% of individuals staying as dual users in the following year. In particular, about 34% of dual users of premium cigars and cigarettes became exclusive cigarette users within a year. The sensitivity analysis by using single-Wave weights instead of all-Waves weights provided similar results.

Figure 1 shows longitudinal trajectories of adult-exclusive premium cigar users at baseline (Wave 1). Slightly more than half remained as exclusive premium cigar users in all Waves. About 35% of exclusive premium cigar users discontinued use, and 7.2% switched to other tobacco products by Wave 5. Similar alluvial plots of longitudinal trajectories for other use categories at baseline and analyses stratified by age (ages 18–34 vs. 35+) are shown in https://tcors.umich.edu/PremiumCigarTransition/.

Transition Analysis of Ever Premium Cigar Users

Figure 2 shows longitudinal trajectories of cigar and cigarette use for those who participated in all five Waves and smoked premium cigars fairly regularly in at least one Wave. About 3.7% of ever premium cigar adult users included in this analysis were not present at Wave 1 (Not in sample) but entered the study in the following years (aged up from the youth sample). The figure shows that premium cigar users in Wave 5 are predominantly exclusive users, even those who at some point used other combustible tobacco products. The figure also shows that exclusive premium cigar users are more likely to remain as exclusive premium cigar users or drop premium cigar use than pick up the use of other cigar types or cigarettes. Regarding dual users, the figure shows that dual premium cigar and cigarette users are more likely to drop premium cigar use than cigarette use.

Discussion

Using nationally representative longitudinal survey data on tobacco use, we estimated the annual prevalence and patterns of use for premium cigars, other cigar types, and cigarettes from 2013 to 2019. Premium cigars were predominantly consumed by males, non-Hispanic white individuals, and individuals with some college or more education, and the majority of premium cigar users were non-daily users. The proportion of cigar users who smoked>50 cigars in their lifetime decreased over time, especially among premium and non-premium cigar users. Premium cigar users were considerably less likely to smoke cigarettes or other cigar types than other cigar-type users.

We also estimated longitudinal transition rates between premium cigar and other cigar types or cigarette use, either as exclusive use, dual or poly use of these tobacco products. About three-quarters of exclusive premium cigar users kept smoking premium cigars in the following year. Dual use of premium cigars with either other cigar types or cigarettes was found to be transient. Among those who smoked premium cigars fairly regularly for at least one year, they were more likely to either be exclusive premium cigar users or have dropped combustible tobacco product use by Wave 5.

This study has many strengths. We used a large nationally representative longitudinal survey data, which has detailed information on patterns of use for cigars by type (premium vs. non-premium, cigarillo, filtered cigar) and cigarettes, which allowed us to evaluate distinctive use behaviors for premium cigars compared to the other cigar types or cigarettes. Our findings are consistent with previous studies using the 2012–2013 National Adult Tobacco Survey and the 2013–2014 PATH Study, which showed that the percentage of premium cigar users was higher among non-Hispanic white individuals compared to the other racial/ethnic groups and individuals with higher education and household income had a higher

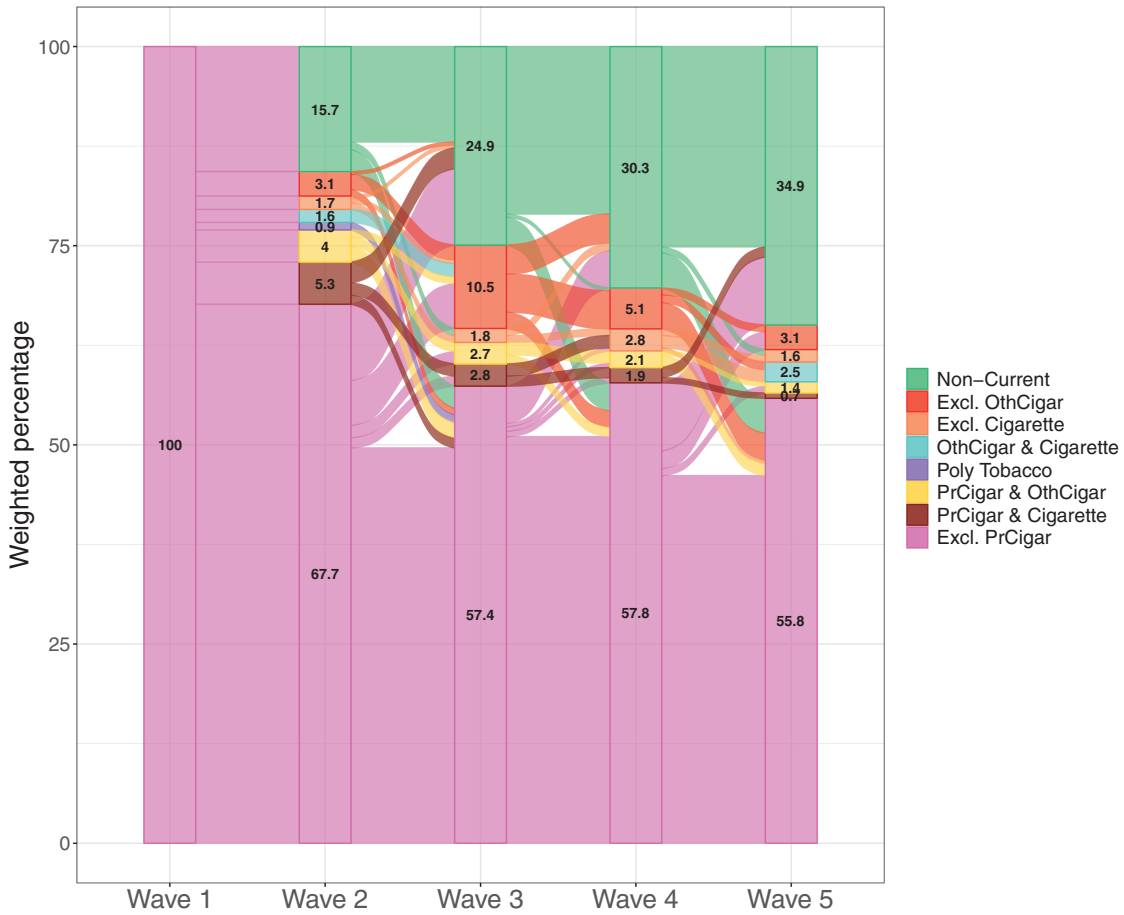

Figure 1. Longitudinal trajectories of adults aged 18+ exclusive premium cigar users in PATH Study Wave 1, who participated in all subsequent Waves. Cigar and cigarette use categories in Waves 2–5 include: Non-current cigar and cigarette use (Non-Current); Exclusive current established premium cigar use (Excl. PrCigar); Exclusive current established use of other cigar types (Excl. OthCigar); Exclusive current established cigarette use (Excl. Cigarette); Dual current established use of premium cigars and other cigar types (PrCigar & OthCigar); Dual current established use of premium cigars and cigarettes (PrCigar & Cigarette); Dual current established use of other cigar types and cigarettes (OthCigar & Cigarette); Poly use of premium cigars, other cigars, and cigarettes (Poly tobacco use).

prevalence of premium cigar use.[3,4] These studies also consistently found that the premium cigar users mostly smoked some days or rarely and were less likely to smoke jointly with cigarettes. To the best of our knowledge, our study was the first to examine the transition dynamics of usage between premium cigars and the other cigar types or cigarettes, which showed that about three-quarters of exclusive premium cigar users remained the same in the following year.

There are some limitations to this study. The designation of premium versus non-premium traditional cigar use was based on the usual brand or price reported, not on a direct assessment by study participants. While this approach was previously validated[3] and three experienced coders performed the brand classification; some traditional cigar users might have been misclassified. Like Corey et al.,[3] we did not adjust estimates of the number of cigars smoked by size or weight, precluding comparisons of exposure dose and amount smoked. Another significant limitation is the lack of information in the PATH Study about the level of inhalation of cigar users, which precluded characterization of inhalation patterns and analyses of dependence by inhalation. Inhalation is a critical determinant of the health effects of cigar smoking,[1,2] so understanding the inhalation behaviors of cigar users, particularly of premium and non-premium traditional cigars versus those of other cigar types, is crucial for health effects risk assessment. One more limitation is the relatively short period of analysis. While PATH Study allows for cross-sectional trends and longitudinal analyses of cigar use, it covers only six years (2013–2019), precluding analyses of long-term trends and patterns of use. Another limitation of our study is that we focused on cigar and cigarette use and did not adjust for other combustible tobacco products, such as hookah, in the main analyses. Future analyses should investigate the role of other combustible and non-combustible products on the use patterns of premium and other cigar types. Finally, while we evaluated the use patterns of different cigar types and cigarettes, we did not estimate the use of other tobacco products, such as smokeless tobacco, e-cigarettes, and other electronic nicotine delivery systems, hookah, or pipe. The analysis, however, did evaluate the proportion of cigar users that use cigarettes or other tobacco products at each PATH Study Wave.

There is no evidence that premium cigars are less hazardous than other combustible tobacco products per exposure unit.[2] Their harmful effects relative to other products likely depend on their use patterns, such as frequency, intensity, duration, and inhalation pattern.[1,2] Our results show that premium cigars have different use patterns from the other cigar types or cigarettes. In particular, premium cigar users were more likely

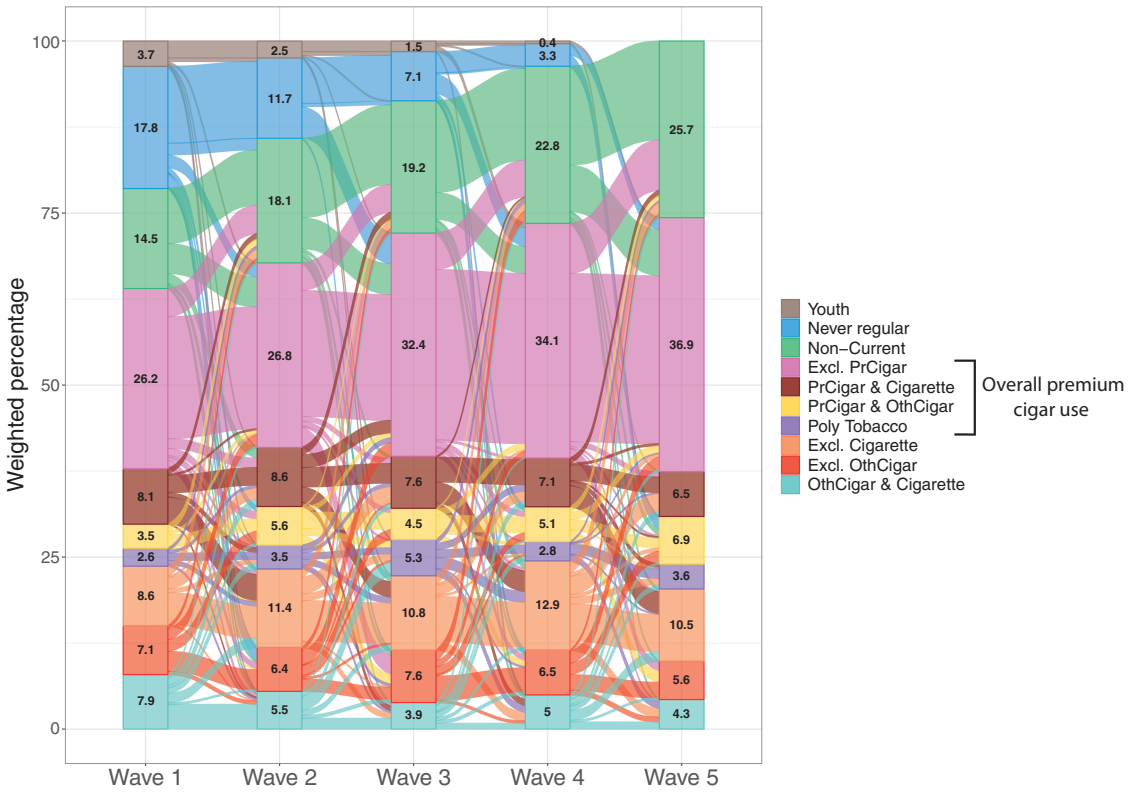

Figure 2. Longitudinal trajectories of cigar and cigarette use among adults aged 18+ who participated in all five Waves and smoked premium cigars fairly regularly in at least one Wave. Cigar and cigarette use categories include: Not in the sample; Never cigar and cigarette use (Never regular); Non-current cigar and cigarette use (Non-Current); Exclusive current established premium cigar use (Excl. PrCigar); Exclusive current established use of other cigar types (Excl. OthCigar); Exclusive current established cigarette use (Excl. Cigarette); Dual current established use of premium cigars and other cigar types (PrCigar & OthCigar); Dual current established use of premium cigars and cigarettes (PrCigar & Cigarette); Dual current established use of other cigar types and cigarettes (OthCigar & Cigarette); Polyuse of premium cigars, other cigars, and cigarettes (Polytobacco use).

occasional users and smoked fewer cigars per day than users of the other cigar types or cigarettes. This might suggest that their use could be associated with fewer health consequences than other types of cigar products, given the higher risks associated with daily versus nondaily use.[8,9] However, due to the lack of data on more precise measures of tobacco exposure and inhalation patterns on premium cigar use, it is hard to assess the precise risks of premium cigar use for overall mortality and tobacco-related diseases. Continuous monitoring of the use patterns of premium cigar users and their co-use and transitions to other tobacco products, including inhalation and more precise measure of the intensity of use, are thus needed for a better assessment of their health effects.

In summary, cigar use patterns vary greatly by cigar type. Premium cigar users have distinctive characteristics compared to other cigar-type users. When studying cigar use and related health outcomes, it is critical to distinguish cigar type and to consider more precise measures of intensity and frequency of use, inhalation patterns, and co-use of cigar products with other addictive substances like alcohol and cannabis, especially given the presence of flavors and social cues for co-use of these other products.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at https://academic.oup.com/ntr.

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Declaration of Interests

The authors do not report any conflicts of interest.

Data Availability

Data used is available for download through the PATH study repository https://www.icpsr.umich.edu/web/NAHDAP/studies/36231

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