Differences in Smoking Habits by Gender

Sophia Toubian[1]
[1] University of California, Los Angeles, Information Studies Department

I. INTRODUCTION

Tobacco consumption through cigarette smoking and other combustible products remains the leading preventable cause of morbidity and mortality in the United States, responsible for over 480,000 premature deaths each year.[1] The vast majority of adult smokers initiate tobacco use during adolescence, with nearly 9 in 10 smoking their first cigarette before age 18.[2] Earlier age of uptake and progression to heavier smoking during the critical developmental stage of adolescence is associated with reduced ability to quit, and lifelong smoking persistence across groups.[3, 4, 5] A substantial body of research has examined associations between biological factors, particularly genetic sex, and the vulnerability towards smoking adoption and progression from experimental to regular use during adolescence.[6, 7, 8] Analyses of national longitudinal and cross-sectional youth survey data have found male adolescents to be more likely to experiment with cigarettes and transition to daily smoking before adulthood compared to girls.[7, 8] This dose-response effect of consistent smoking at a young age has been tied to reduced perceptions of smoking risks and lower self-efficacy in quitting over time for adolescents specifically.[4]

Earlier onset of first tobacco use during childhood or very early teens has additionally been linked to heavier lifetime smoking patterns across studies, even after controlling for current age. Retrospective analysis using PATH study data found that among adult daily smokers, men were more likely to have initiated smoking before age 15 compared to women (21% vs 15%).[5] The PATH study also revealed that women smoking before age 15 went on to smoke 7.7 cigarettes daily 13 years later versus 1.3 per day if initiating after age 20.[5] The National Longitudinal Survey of Adolescent Health demonstrated teens smoking more than 1 cigarette per day already had 2 times higher odds of adult daily smoking persistence.[11]

This paper analyzes correlations between biological sex, age at smoking initiation, and past 30-day cigarette smoking frequency and intensity using NHANES survey data on adults who are currently established smokers (smoked ≥100 lifetime cigarettes and now smoke “every day” or “some days”). I hypothesize that being assigned male at birth will predict earlier smoking onset age, greater number of days smoked, and greater average daily cigarettes smoked in the previous 30 days within this adult smoking sample.

II. METHODS & MATERIALS

A. Data Set

Data for this study are cross-sectional and were drawn from the 2017-2018 National Health and Nutrition Examination Survey (NHANES) conducted by the Centers for Disease Control and Prevention (CDC). Demographic data can be found here and cigarette use data can be found here. Variable code books can be found here for demographic data and here for cigarette use data. Participants were randomly selected through stratified, clustered four-stage samples, and are representative of the noninstitutionalized population living in the 50 states, including Washington D.C.

Data was collected through in-person interviews, physical exams, and laboratory tests. Exclusion criteria from the NHANES excluded those living in supervised care or custody institutional settings, active duty military personnel, and active duty family members living overseas or living outside of the 50 states and Washington District of Columbia.

The cigarette use questionnaire data was added to the demographic survey data matching on a unique identifying variable, SEQN. Key variables for this study include SEQN, gender, age started smoking cigarettes regularly, number of days smoked cigarettes regularly in the last 30 days, and average number of cigarettes smoked per day in the last 30 days.

Responses of “don’t know” or “refused” for age started smoking cigarettes regularly, number of days smoked cigarettes regularly in the last 30 days, and average number of cigarettes smoked per day in the last 30 days were considered missing and excluded from the analysis. Listwise deletion was applied to missing data, where any observation missing one or more values for any variable included in the analysis was removed for analysis. **Figure 1** depicts the exclusion criteria and final sample size for this study.

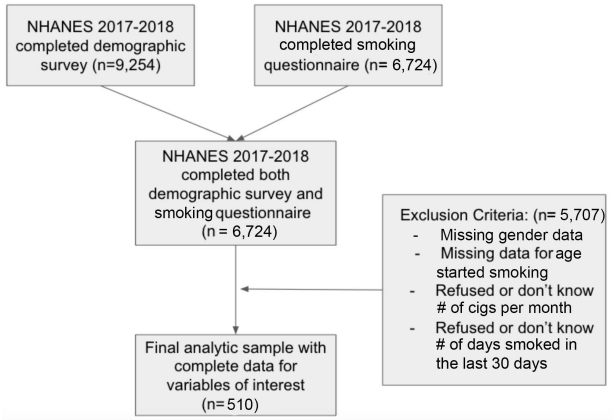

Figure 1: *Final Sample Exclusion Criteria*

B. Study Population

As seen in **Table 1**, among the study population (N=510), 40.6% were female and the average age respondents started smoking was 18.84 years old. The average number of cigarettes smoked per day in the last 30 days was 9.45, and the average number of days participants smoked within the last 30 days was 24.45.

Table 1: *Descriptives*

Variables	N (%)	Mean (SD)	Min/ Max
Female	207 (40.6)		
Age Started Smoking		18.84 (6.45)	0 56
# of Cigarettes /day in last 30 days		9.45 (7.58)	1 40
# of days smoked in last 30 days		24.45 (8.96)	1 30

C. Statistical Methods

Different hypothesis testing methods were used to calculate demographic and other key variables included in the models. Gender is a binary variable, Age started smoking, number of cigarettes smoked in the last 30 days, and average number of cigarettes smoked every day for the last 30 days are continuous variables.

Non-parametric tests were used in the analysis. To assess the relationship between gender and age started smoking a Welch Two Sample t-test was used. A Wilcoxon rank sum test with continuity correction was used to assess the relationships between gender and number of cigarettes smoked in the last 30 days and between gender and average number of cigarettes smoked every day for the last 30 days.

Analyses were conducted using R version 4.3.2 (The R Foundation).

III. RESULTS

Table 2 presents the median, mean, and standard deviation for three different smoking-related variables broken down by gender. The variables examined are age started smoking, number of cigarettes smoked per day in the last 30 days, and number of days smoked in the last 30 days

Table 2: *Mean, Media, and Standard Deviation of 3 Variables by Gender*

Variables	Median	Mean (SD)	p-value
Age Started Smoking			
Female	18	18.50 (6.34)	0.307
Male	18	19.09 (6.52)	0.307
# of Cigarettes /day in last 30 days			
Female	6	8.96 (7.48)	<2.2e-16
Male	8	9.80 (7.64)	<2.2e-16
# of days smoked in last 30 days			
Female	30	24.50 (9.11)	<2.2e-16
Male	30	24.43 (8.87)	<2.2e-16

For age started smoking, the median for both females and males is 18. The mean age for females is 18.50 years with a standard deviation of 6.34, while for males the mean age is 19.09 years with a standard deviation of 6.52. The p-value of 0.307 indicates there is no statistically significant difference between the age females and males started smoking.

For the number of cigarettes smoked per day in the past 30 days, the median is lower for females (6) than for males (8). The mean number

smoked by females is also lower at 8.96 cigarettes per day (SD=7.48) compared to 9.80 per day for males (SD=7.64). The p-value is highly significant (p<2.2e-16), indicating the difference in number of daily cigarettes between females and males over the past 30 days is statistically significant. **Figure 2** details this visually.

For the number of days smoked in the last 30 days, the median for both females and males is 30. The mean number of days for females is 24.50 (SD=9.11) and the mean for males is nearly identical at 24.43 days (SD=8.87). However, despite the similar means, because the p-value remains highly significant (p<2.2e-16) this indicates the small difference in number of smoking days over the past 30 days between females and males is still statistically significant.

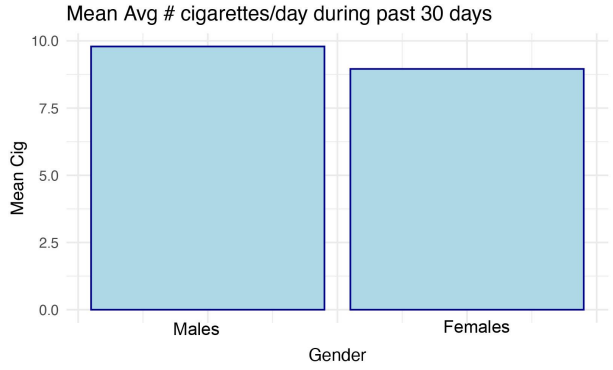

Figure 2: *Mean Average Cigarettes Smoked Per Day During the Last 30 Days by Gender*

IV. CONCLUSIONS

Based on the data presented in Table 2 and the stated aims of this study, we can conclude that biological sex does correlate with certain aspects of smoking behavior among established adult smokers. Specifically, the results indicate that being male is associated with smoking more cigarettes per day over the past 30 days, lending support for the hypothesis that assigned sex at birth predicts intensity of cigarette smoking. The data also showed males reported slightly higher numbers of days smoked over the past month. However, there was no evidence found to support sex differences in age of smoking initiation, as median age started was 18 years old for both men and women. Additional research is still needed to better understand the relationships between sex, age of uptake, and smoking patterns over time. But this study takes an important initial step in demonstrating sex-based associations in frequency and intensity among current adult smokers in the US, including significantly higher intensity in men based on number of daily cigarettes. Public health efforts may need to further tailor smoking cessation messaging and interventions based on biological sex to best support reductions in smoking behavior.

V. DISCUSSION

I will be comparing these results to that of previous literature by variable. Regarding age first started smoking, Kasza et al. 2020 looked at factors associated with tobacco initiation, including differences by gender and age. No differences were found by biological sex in age of first onset of smoking between males (mean 19.09 years) and females (mean 18.50 years) in this study so unlike Kasza et al., the current analysis did not find differences in age of first ever cigarette use by sex.

However, **Table 2** did show significant differences between males and females in intensity/frequency of current smoking behaviors (more daily cigarettes and days smoked among males) This aligns with findings that male tobacco users tend to show higher frequency of use compared to females, as also identified by Kasza et al. 2020. So in summary - the two studies show alignment in regards to sex differences in intensity/regularity of tobacco use, but differ in regards to associations between sex and age of FIRST onset/initiation.

In terms of the daily intensity of smoking, Davis et al. 1997 reports on tobacco use rates in male high school athletes. Davis et al. found 41% of adolescent males surveyed (mean age 15.8 years) reported using one or more tobacco products, with 31% reporting cigarette smoking specifically. **Table 2** reported males smoked a mean of 9.80 cigarettes per day over the past 30 days. The adolescent male smoking rate of 31% aligns somewhat with the frequent daily smoking rate seen in the adult males in **Table 2**. In summary, Davis et al. provides additional evidence suggesting relatively high rates of smoking among males - between 31-41%.

When comparing the number of days smoked, Dierker et al. analyzed transitions to nicotine dependence among a sample who were current smokers. 32.8% of ever smokers progressed to daily smoking in this study. **Table 2**

looked at established smokers - both men and women smoked a median of 30 days out of the past 30 days. The median of 30 days suggests most adults were daily smokers over the full past month.

So the studies differ in populations examined (adolescents vs adults) and exact metrics analyzed (progression to daily smoking vs number of days smoked in the past month), however, both demonstrate high rates of regular/daily smoking - around 30% reaching daily in Dierker et. al and a median of 30 days out of 30 reporting smoking in **Table 2**. This suggests that among established smokers, frequent daily smoking is common regardless of age. But direct comparisons are limited by the different designs.

The limitations of the study is that the small sample size reduces generalizability, there is a lack of control groups or random assignment, there are possible selection biases and confounding factors not accounted for like geography, race, and education to name a few. There are also possible issues with the fact that is it self-reported data, and there is an inability to establish causation due to observational nature

In summary, additional high-quality studies are still needed to confirm and expand on these results. Many opportunities remain for further exploration through robust randomized trials or prospective studies that address the limitations of the current analysis.

ACKNOWLEDGEMENTS

I would like to thank Dr. Kim and Brendon Chau for their support on this project.

REFERENCES

1. Fast Facts. Centers for Disease Control and Prevention. Published November 2, 2023. https://www.cdc.gov/tobacco/data_statistics/fact_sheets/fast_facts/index.htm#:~:text=In%202021%2C%2011.5%25%20of%20U.S.,cigarettes%20remain%20e%2Dcigarette%20users.
2. USDHHS. Smoking Cessation: A report of the Surgeon General – Key findings. HHS.gov. Published March 12, 2021. https://www.hhs.gov/surgeongeneral/reports-and-publications/tobacco/2020-cessation-sgr-factsheet-key-findings/index.html#:~:text=2020%20Surgeon%20General%27s%20Report%20Findings,a%20decade%20to%20life%20expectancy.
3. Kasza KA, Ambrose BK, Conway KP, et al. Tobacco-Product use by adults and youths in the United States in 2013 and 2014. *The New England Journal of Medicine*. 2017;376(4):342-353. doi:10.1056/nejmsa1607538
4. Morrell HER, Song AV, Halpern-Felsher B. Predicting adolescent perceptions of the risks and benefits of cigarette smoking: A longitudinal investigation. *Health Psychology*. 2010;29(6):610-617. doi:10.1037/a0021237
5. Kasza KA, Edwards KC, Tang Z, et al. Correlates of tobacco product initiation among youth and adults in the USA: findings from the PATH Study Waves 1–3 (2013–2016). *Tobacco Control*. 2020;29(Suppl 3):s191-s202. doi:10.1136/tobaccocontrol-2020-055671
6. Davis TC, Arnold CL, Nandy I, et al. Tobacco use among male high school athletes. *Journal of Adolescent Health*. 1997;21(2):97-101. doi:10.1016/s1054-139x(97)00032-3
7. Trucco EM, Colder CR, Bowker JC, Wieczorek WF. Interpersonal goals and susceptibility to peer influence: Risk factors for intentions to initiate substance use during early adolescence. *The Journal of Early Adolescence*. 2010;31(4):526-547. doi:10.1177/0272431610366252
8. Brook JS, Zhang C, Burke L, Brook DW. Trajectories of cigarette smoking from adolescence to adulthood as predictors of unemployment status. *Nicotine & Tobacco Research*. 2014;16(12):1559-1566. doi:10.1093/ntr/ntu107
9. Substance Abuse and Mental Health Services Administration (SAMHSA). *Key Substance Use and Mental Health Indicators in the United States: Results from the 2019 National Survey on Drug Use and Health*. Substance Abuse and Mental Health Services Administration (SAMHSA); 2020. https://www.samhsa.gov/data/sites/default/files/reports/rpt29393/2019NSDUHFFRPDFWHTML/2019NSDUHFFR1PDFW090120.pdf
10. Pokhrel P, Schmid S, Pagano I. Physical activity and use of cigarettes and E-Cigarettes among young adults. *American Journal of Preventive Medicine*. 2020;58(4):580-583. doi:10.1016/j.amepre.2019.10.015
11. Dierker L, Swendsen J, Rose J, He J, Merikangas KR. Transitions to regular smoking and nicotine dependence in the Adolescent National Comorbidity Survey (NCS-A). *Annals of Behavioral Medicine*. 2011;43(3):394-401. doi:10.1007/s12160-011-9330-9