ABSTRACT

Title of Dissertation: MULTILEVEL FACTOR INFLUENCE ON ALTERNATIVE TOBACCO PRODUCT USE AMONG U.S. FOREIGN-BORN RESIDENTS

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Background: In the United States, the use of alternative tobacco products (ATPs), such as e-cigarettes, cigars, little cigars, hookah, or smokeless tobacco, has been rising even as conventional cigarette smoking continues decreasing. Broadly speaking, smoking behaviors are influenced by multiple factors at the intrapersonal, interpersonal, organizational, and community levels, including individual harm perceptions toward ATPs, peer and family use of tobacco products, ATP marketing and promotions targeted at specific races and ethnicities and acculturation. However, data on ATP use among U.S. foreign-born residents are limited and factors influencing ATP use among this population are not yet well understood. The primary purpose of this dissertation was to understand multilevel factors, addressed in Social Ecological Model (SEM), that influence ATP use among U.S. foreign-born residents. **Purpose:** The aim of study one was to assess the association between acculturation, harm perceptions, and peer and family use of tobacco products, and ATP use among U.S. foreign-born residents using waves 3

and 4 of the Population Assessment of Tobacco and Health (PATH) Study. The aim of study two was to assess the association between acculturation, peer and family use of ATPs and exposure to ATP advertisements, marketing and promotions, and ATP use among U.S. foreign-born residents using the same dataset. The aim of study three was to obtain a deeper understanding of how multilevel factors influence ATP use among non-U.S. citizen Korean residents. **Methods:** In studies one and two, quantitative data analyses were conducted from 2,507 foreign-born adult residents using PATH waves 3 and 4. Chi-square test and multivariate logistic regressions were used, and moderation and mediation analyses were conducted. In study three, twenty-one non-U.S. citizen Korean residents who currently or formerly smoked or used any ATPs and were aged 18-39 years in District of Columbia (DC), Maryland (MD) or Virginia (VA) completed 60-minute semi-structured in-depth interviews. Interviews were transcribed verbatim, coded, and analyzed thematically. **Findings:** In study one, findings suggest that certain acculturation factors predicted current and lifetime ATP use among U.S. foreign-born residents. For example, less acculturated foreign-born residents in the U.S. perceived ATPs as very or extremely harmful to their health and were less likely to use ATPs compared to the U.S.-born counterparts. In study two, findings indicated that less acculturated foreign-born residents were less likely to have peer and family who use ATPs and to be exposed to ATP advertisements, marketing and promotions compared to the U.S.-born counterparts. In study three, e-cigarettes were the most popular ATPs with participants, followed by hookahs and heated tobacco products (specifically IQOS). Participants showed more ambivalence or regarded e-cigarettes and hookahs as less harmful than conventional cigarettes. Additionally, smoking initiation was influenced mainly by peers who smoked. **Conclusion:** Multiple factors at different determinant levels influence tobacco product use behaviors among U.S. foreign-born residents. Acculturation factors, along with harm

perceptions, peer and family influence, and ATP advertisements, marketing, and promotions exposure, seem to influence ATP use among U.S. foreign-born residents. **Implications:** This research calls for culturally tailored interventions and smoking cessations for U.S. foreign-born residents. Future research should investigate multiple tobacco product use among foreign-born residents as well as how the country of origin influences ATP use behaviors.

MULTILEVEL FACTOR INFLUENCE ON ALTERNATIVE TOBACCO PRODUCT USE AMONG U.S. FOREIGN-BORN RESIDENTS

by

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Dissertation submitted to the Faculty of the Graduate School of the
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Dedication

This dissertation is dedicated to God, in whom I believe. You showed me your endless love through the cross. You gave me opportunities to share your love and to understand your works throughout this process. You made a way where there seemed to be no way in my life and gave me strength and wisdom to finish this journey.

I praise and honor your name alone.

The Lord is my shepherd; I shall not want. He makes me lie down in green pastures. He leads me beside still waters. He restores my soul. He leads me in paths of righteousness for his name's sake…Surely, goodness and mercy shall follow me all the days of my life, and I shall dwell in the house of the LORD forever. (Psalm 23)

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List of Abbreviations

ATP	Alternative Tobacco Products
FDA	U.S. Food and Drug Administration
GAIN	The Global Appraisal of Individual Needs
HBM	Health Belief Model
HTP	Heated Tobacco Product
ICPSR	The Inter-university Consortium for Political and Social Research
NAHDAP	The National Addiction & HIV Data Archive Program
NHANES	The National Health and Nutrition Examination Survey
PATH	The Population Assessment of Tobacco and Health Study
PROMIS	The Patient Reported Outcomes Measurement Information System
SEM	Social Ecological Model
TUS-CPS	Tobacco Use Supplement to the Current Population Survey
U.S.	United States

Chapter 1: Introduction

1.1 Problem Statement

Smoking is the leading cause of premature death. Smoking causes 80% of all lung cancer deaths (Miller et al., 2008). Although the prevalence of conventional cigarette smoking among U.S. adults has decreased continuously over the past 50 years, use of alternative tobacco products (ATP), such as electronic cigarettes (or e-cigarettes); cigars, cigarillos, or filtered little cigars; smokeless tobacco; and pipes, water pipes, or hookahs has gained popularity in recent years. For example, in 2019, 10.9 million (4.5%) used e-cigarettes, approximately 8.7 million U.S. adults (3.6%) used cigars, cigarillo, or filtered little cigars, 5.9 million (2.4%) used smokeless tobacco, and 2.4 million (1.0%) used pipes (Cornelius, 2020). Moreover, among current tobacco product users, 80.5% used combustible products (cigarettes, cigars, or pipes), and 18.6% used two or more tobacco products (Cornelius, 2020).

The general U.S. populations perceive ATPs as safer substitutes for conventional cigarettes. For example, some people who smoke cigars, little cigars, and cigarillos consider themselves at a lower risk for health-related illnesses because they smoke at a lower frequency and/or do not inhale the smoke (Majeed et al., 2018; Sterling et al., 2016; Sterling, Majeed, et al., 2017). Some people who use hookahs believe that hookahs are safer than cigarettes because the smoke is filtered through water (Aljarrah et al., 2009; Majeed et al., 2017). Those who use e-cigarettes feel that e-cigarettes are less harmful and less addictive because liquid-vapor contains fewer toxins and carcinogens than cigarette smoke (Coleman et al., 2016; Huerta et al., 2017; Wiseman et al., 2019). Some individuals who use smokeless tobacco products believe that they are safer than cigarettes because they do not produce smoke thus they or those around them are not exposed to

harmful substances them (Liu et al., 2015). Although many ATPs are perceived and marketed as having lower health risks than cigarettes, ATPs are still addictive and often used with cigarettes or multiple tobacco products (Cornelius, 2020; Doran & Brikmanis, 2016; Klein, 2015; Wetter et al., 2002; White et al., 2009). For instance, a prior study suggested a correlation between ATP use and the increased use of cigarettes among light smokers (Doran & Brikmanis, 2016). Further, the concurrent use of two or more tobacco products increase more exposure to nicotine and other harmful chemicals and may lead to nicotine addiction and many adverse health consequences (Choi et al., 2017; Khan et al., 2020; Wetter et al., 2002). Moreover, these products increase the risk of heart disease, cancers, chronic lung diseases, and many other tobacco-related morbidities and mortalities (Aruni et al., 2019; Mamtani et al., 2017).

Smoking behavior, as well as harm perceptions toward ATPs, differs by culture, gender, and socioeconomic status. Notably, for individuals with multiple cultural backgrounds, individual beliefs and social norms depend on how one defines his or her referent group in a given context. When immigrants enter a new host culture, they often encounter adaptation challenges, such as different customs and norms for social interactions and communications, different belief systems, unfamiliar rules and laws, and extreme lifestyle changes. Many studies have suggested that immigrants negotiate and modify their behaviors, attitudes, and beliefs to adjust to their host country (Berry, 2003, 2005; Berry & Annis, 1974; Moon & Park, 2007; Ward & Geeraert, 2016). These modifications, also known as acculturation, may result in positive or negative health behaviors and outcomes (Brand et al., 2017; Choi et al., 2009; Choi et al., 2008b; Dahlan et al., 2019; Kondo et al., 2016; Kraeh et al., 2016; Logan et al., 2017; Lui & Zamboanga, 2018; Reiss et al., 2015b; Shor et al., 2017). Unique acculturation experiences may influence foreign-born residents' values and belief systems that promote or reduce tobacco product use and may

influence the type of tobacco products they choose. Despite an increase in ATP use, not much is known about ATP use among foreign-born residents in the United States. Thus, it is vital to understand how acculturation factors, individual, interpersonal, and organizational factors influence ATP use among U.S. foreign-born residents.

Additionally, the tobacco industry's marketing and promotion may also influence ATP use. Tobacco companies spend billions of dollars each year to market their products (Federal Trade Commission, 2018a, 2018b). Mainly, marketing and promotion of certain tobacco products are being specifically targeted to minority groups in the United States, resulting in increasing tobacco use (Acevedo-Garcia et al., 2004; Fellows & Rubin, 2006; Iglesias-Rios & Parascandola, 2013). Many studies have suggested the "immigrant paradox" that recent immigrants often outperform established immigrants and native-born individuals on health outcomes (Azagba et al., 2019; Blue & Fenelon, 2011; Shor et al., 2017). However, tobacco industry's effort to target tobacco products to immigrant groups is alarming because it is having a deleterious effect on the "immigrant paradox". Some studies suggested that the tobacco industry's marketing strategies to target immigrants in the United States is resulting in increased tobacco product use among these populations (Acevedo-Garcia et al., 2004; Alcalá et al., 2017; Baumann et al., 2015). Therefore, investigating the influence of tobacco marketing and promotion on ATP use among U.S. foreign-born residents is important.

To address the limitations of previous research, this dissertation has three research aims: 1) to examine the relationship between acculturation, harm perceptions of ATP and their ATP use among U.S. foreign-born residents quantitatively; 2) to examine the relationship between acculturation, peer and family use of tobacco products, exposure to ATP marketing advertisement and promotion, and ATP use among U.S. foreign-born residents quantitatively;

and 3) to explore acculturation and ATP experiences, and individual, interpersonal and organizational factors that influence ATP use among non-U.S. citizen Koreans living in the U.S. qualitatively.

1.2 Conceptual Framework

This dissertation is framed within the Social Ecological Model (SEM), which assesses multi-level influences of health, including individual (or intrapersonal), interpersonal, organizational, community, and policy levels (McLeroy et al., 1988). *Figure 1* depicts the SEM framework for this dissertation, with five levels of influence aligned with each study.

The study used some constructs often associated with the Health Belief Model (HBM) and the Social Learning Theory to address each level of the SEM. The HBM addresses an individual's perceptions of threat or risk posed by a health problem, the benefits of avoiding or engaging in risky behavior, and factors influencing the decision to act (Champion & Skinner, 2008; Skinner, 1938). For example, individuals who see ATP as less harmful to their health than conventional cigarettes may have more permissive views regarding these tobacco products. Such individuals would believe that using ATP would reduce exposure to nicotine or other harmful chemicals, in turn, become less addicted to any tobacco products or decrease their risk of getting smoking-related diseases or (Bernat et al., 2017; Czoli et al., 2017). Another study suggested that U.S. adults who smoke conventional cigarettes had lower harm perceptions for ATPs and misconception about the chemicals in these products (Bernat et al., 2017). These low harm perceptions and misbelief about ATP may cause individuals to experiment with ATP. In this dissertation, questions on ATP harm perceptions from the Population Assessment of Tobacco and Health (PATH) Study were used to examine its influence on ATP use among U.S. adult, foreign-born residents.

The Social Learning Theory is an interpersonal-level theory, which states that individual's behavior is based on their own experiences, observations of the others' actions and evaluation of the benefits of those actions (Bandura, 1977). Prior studies suggested that smoking status of family members or friends is a strong predictor of tobacco product use among individuals, particularly among younger age population (Leonardi-Bee et al., 2011; Thomeer et al., 2019; J. W. Wang et al., 2018). In this dissertation, questions on peer and family use of tobacco products and ATP marketing, advertising and promotion exposure from the PATH Study were used to measure the interpersonal and organizational levels of influence on ATP use.

The dissertation is split into three smaller studies. Study one focuses on the intrapersonal, interpersonal and cultural level influence of ATP use among U.S. foreign-born residents. Study two focuses on the interpersonal, organizational and cultural factors that influence ATP use among U.S. foreign-born residents. Study three explores perceptions and experiences with ATP among non U.S.-citizen Korean residents and provides deeper understandings of findings from study one and study two.

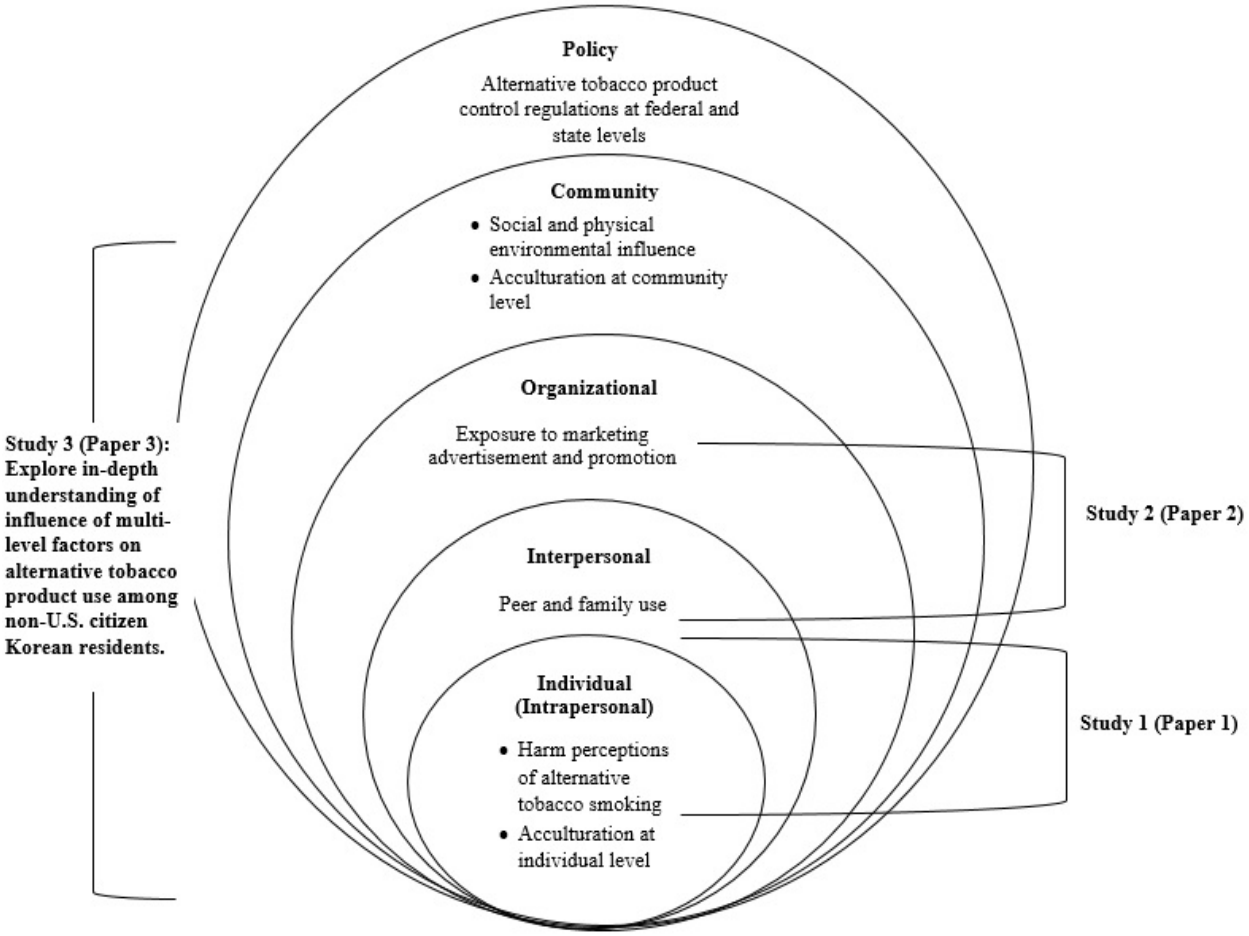


Figure 1. *Conceptual Framework for Dissertation Framed in the Social Ecological Model (SEM)*

1.3 Brief Justification for the Problem

While traditional cigarette smoking rates have decreased over time, ATP use has continued to increase among U.S. adults. For example, 5.9 million (2.4%) U.S. adults who are 18 years old and older were current smokeless tobacco users in 2019 (Cornelius, 2020). Moreover, a study found that total consumption of smokeless tobacco has increased 23.1% from 2011 to 2015 (Wang et al., 2018). A study using the National Health Interview Survey found that between 2000 and 2015, the prevalence of cigar smoking has remained stable at 2.3% among U.S. adults who are 18 years old and older but increased among female and non-Hispanic Black adults (Rostron et al., 2019). Further, another study using the 2002-2016 National Survey on Drug Use and Health found that between 2002 and 2016, the prevalence of past-month cigar use was significantly higher among non-Hispanic Blacks. From 2014 to 2018, current use of e-cigarette has increased significantly among U.S. young adults by 46.2% (Dai & Leventhal, 2019). Although ATP use is more common behavior among Caucasians, use of some ATP, such as e-cigarettes, hookahs, and cigars are seen among minority groups (Huh & Leventhal, 2016; Maglalang et al., 2016; Nguyen, 2019).

Many studies highlight heterogeneity and complex health patterns among immigrant groups (Alcalá et al., 2016; Alvarez et al., 2007; Argeseanu Cunningham et al., 2008; Azagba et al., 2019; Frisco et al., 2019; Pampel et al., 2019; Wang et al., 2016). For example, numerous studies describe an “immigrant health paradox” that recent immigrants tend to have a better health status and mortality profile than native born and established immigrants, especially from the same racial and ethnic group (Alcalá et al., 2016; Azagba et al., 2019; Frisco et al., 2019; Pampel et al., 2019). However, some researchers argue that significant health disparities exist among recent immigrants (Alvarez et al., 2007; Argeseanu Cunningham et al., 2008; John et al., 2012). It is

unclear whether findings from these studies extend to tobacco product use behavior among these immigrants.

To date, not much is known about ATP use among foreign-born adult residents in the United States. A prior study suggested that naturalized U.S. citizens and non-U.S. citizens have a similar prevalence of e-cigarette use, but have a lower prevalence than U.S. natives (Alcalá et al., 2016; Wang et al., 2016). Another study found that foreign-born residents, regardless of years living in the U.S., were less likely to use e-cigarettes than native-born population (Azagba & Shan, 2021). However, other studies have suggested that the likelihood of tobacco use increases as their acculturation measures increase, such as the length of stay in the United States and English proficiency (Choi et al., 2008; Kaplan et al., 2014; Pampel et al., 2019). Another study found that foreign-born residents with greater than 15 years of U.S. residency were 39% more likely to smoke than those with less than ten years of U.S. residency (Koya & Egede, 2007). Although these prior studies provided important information about tobacco use behavior among immigrant groups, these studies reported mixed findings about the impact of acculturation on tobacco use behavior. Moreover, very limited information on ATP use behavior among U.S. foreign-born residents is available. Given these limitations, it is necessary to investigate the impact of acculturation on ATP use behavior among this population. To fill this research gap, this dissertation include studies that examine ATP use using the nationally representative samples.

Different ethnic sub-groups display different tobacco use patterns. Their use of tobacco products varies by ethnic sub-groups as a result of cultural, social, environmental, and individual factors. For example, Asian American immigrants tend to be light, non-daily smokers who use some ATPs like e-cigarettes, hookahs, and cigars (Huh & Leventhal, 2016; Maglalang et al.,

2016; Nguyen, 2019; Romero & Pulvers, 2013). Some minority groups are less likely to seek health professional help for smoking cessation; instead they turn to ATP as an alternative solution for cigarette addictions (Popova & Ling, 2013). Although tobacco product use behaviors are different by ethnic sub-groups, previous studies provide a very limited knowledge about ATP use behavior among such groups. Thus, efforts in collection and dissemination of ethnic sub-group data is essential. To improve knowledge in the scientific community and fill the current research gap, this dissertation study also includes a study that assesses ATP use among U.S. Korean residents, one immigrant ethnic sub-groups.

1.4 Specific Aims, Hypotheses, and Research Questions

Primary Research Question

The overarching research questions for this dissertation were: "How do acculturation, harm perceptions about ATPs, peer and family use of tobacco product and exposure to ATP marketing and promotion influence ATP use behavior among U.S. foreign-born residents?" The dissertation investigated this research question both quantitatively and qualitatively with three research aims.

Study Aim 1 (Paper 1)

To assess the association between acculturation, harm perceptions, peer and family use of tobacco products and ATP use (i.e., e-cigarettes, hookah, smokeless tobacco, pipe, and cigars including traditional cigars, little cigars, and cigarillos) among U.S. foreign-born residents who are 18 years and older (n=2,507) using waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study (Figure 2).

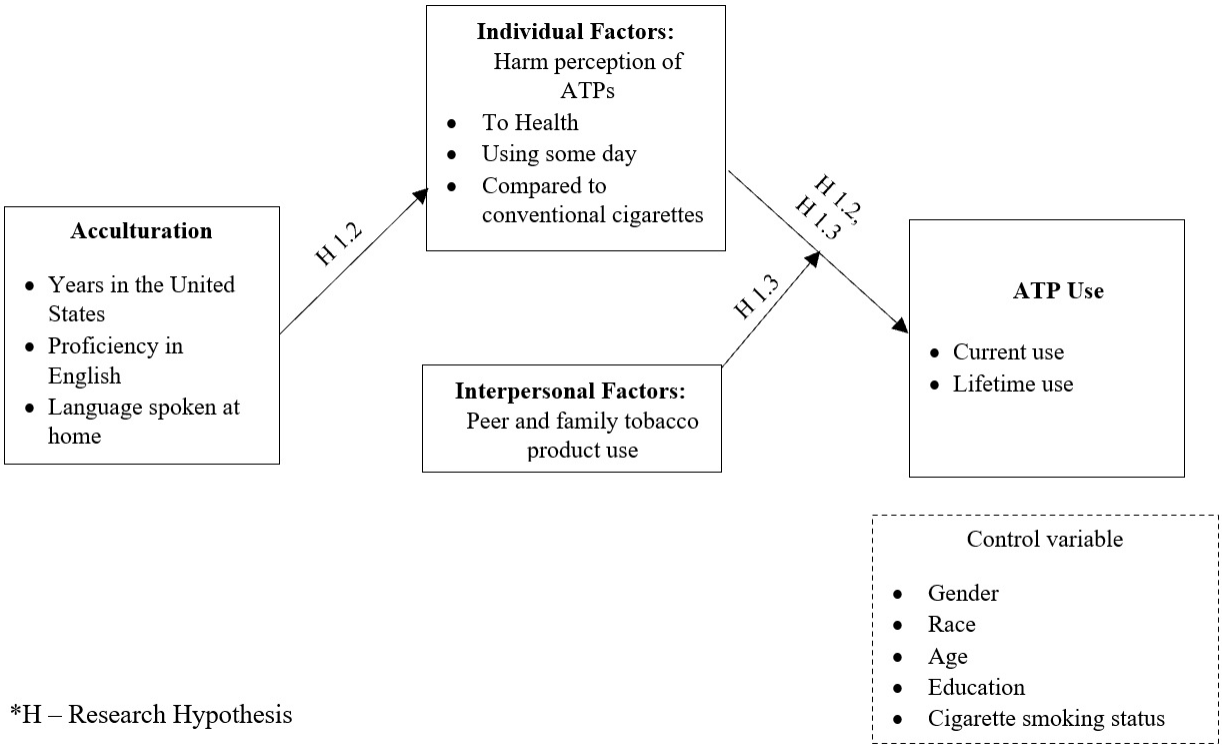
Research Question 1.1: Do differences in sociodemographic characteristics, harm perceptions, peer and family use of tobacco products, and ATP use exist between U.S.-born and U.S. foreign-born residents?

Research Question 1.2: What is the relationship between acculturation, harm perceptions about ATPs, and ATP use among foreign-born residents in the United States?

Research Question 1.3: Does peer and family use of tobacco products moderate the relationship between harm perceptions and ATP use among foreign-born residents in the United States?

Hypothesis 1.2: Foreign-born residents who are more acculturated to the United States are likely to perceive ATPs as less harmful, and in turn, are more likely to use ATPs.

Hypothesis 1.3: Foreign-born residents with lower harm perceptions toward ATPs who have more peer or family who use tobacco products are more likely to use ATPs.



*H – Research Hypothesis

Figure 2. *Relationship between Acculturation, Harm Perceptions, Peer and Family Tobacco Product Use, and ATP Use among U.S. Foreign-Born Residents*

Study Aim 2 (Paper 2)

To examine the relationship between acculturation, peer and family use of tobacco products, exposure to ATP advertisements, marketing, and promotions and ATP use (i.e., e-cigarettes, hookah, smokeless tobacco, pipe, and cigars including traditional cigars, little cigars, and cigarillos) among U.S. foreign-born residents (n=2,507) using waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study (Figure 3).

Research Question 2.1: What is the relationship between acculturation, peer and family use of tobacco products, and ATP use among foreign-born residents in the United States?

Research Question 2.2: What is the relationship between acculturation, exposure to ATP advertisements, marketing, and promotions, and ATP use among foreign-born residents in the United States?

Research Question 2.3: Does exposure to ATP advertisements, marketing, and promotions moderate the relationship between peer and family use of tobacco products and ATP use among foreign-born residents in the United States?

Hypothesis 2.1: Individuals who are more acculturated to the United States are more likely to be influenced by peer and family use of tobacco products, and, in turn, are more likely to use ATPs.

Hypothesis 2.2: Individuals who are more acculturated to the United States are more likely to be exposed to ATP advertisements, marketing, and promotions and, in turn, are more likely to use ATP.

Hypothesis 2.3: Individuals with greater exposure to ATP advertisements, marketing, and promotions who have more peer or family who use tobacco products are more likely to use ATPs.

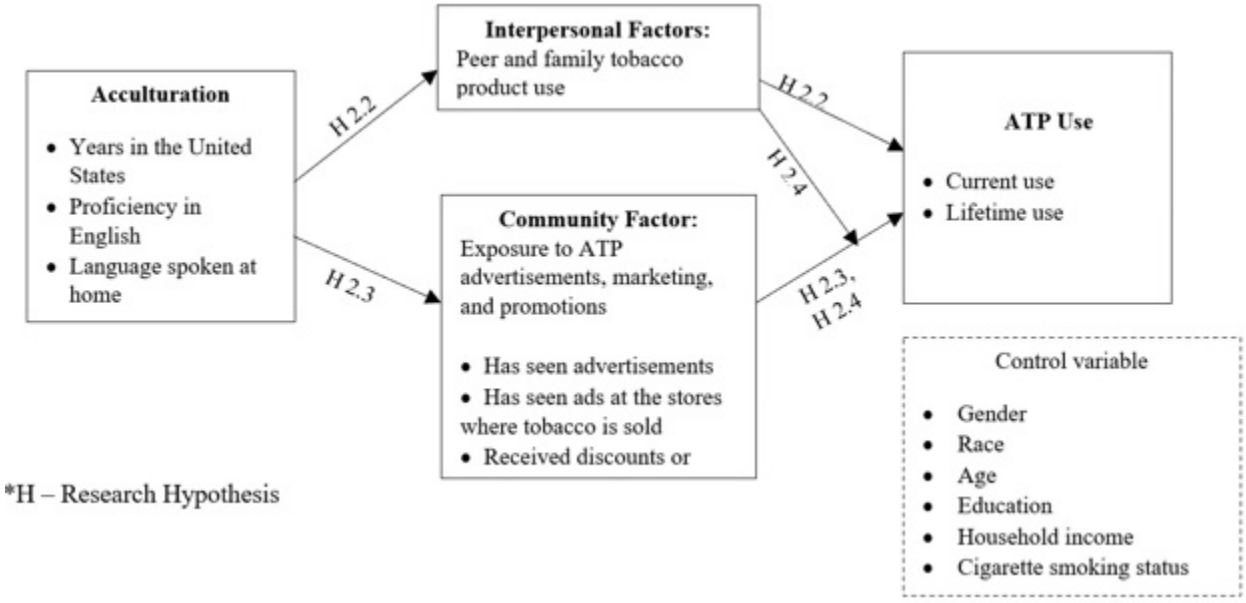


Figure 3. *Relationship between Acculturation, Peer and Family Tobacco Product Use, Exposure to ATP advertisements, marketing, and promotions and ATP Use among U.S. Foreign-Born Residents*

Study Aim 3 (Paper 3)

To better understand ATP use patterns, factors that shape ATP use and opinions on acculturation and harm perceptions regarding ATP among non-U.S. citizen Koreans living in the Washington D.C. metropolitan area (DC, MD, and VA). To accomplish this aim, twenty-one semi-structured in-depth interviews were conducted with non-U.S. citizen Korean smokers who are over 18 years old in the Washington D.C. metropolitan area. This aim explored the in-depth understanding of the importance of cultural values, norms, and beliefs on ATPs among non-U.S. citizen Koreans living in the Washington D.C. metropolitan area.

Research Question 3: How do non-U.S. citizen Koreans in the Washington D.C. metropolitan area describe acculturation and its influence on ATP use, as well as their harm perceptions regarding ATPs, peer and family use of tobacco products and ATP marketing and advertisements, and other influence on ATP use?

1.5 Summary

Using multiple methodologies, the primary purpose of this dissertation was to understand multi-level factors that influence ATP use among U.S. foreign-born residents. Given that the existing information on tobacco use among U.S. foreign-born residents is limited, this dissertation examined how acculturation, harm perceptions, and peer and family use of tobacco products influence ATP use among U.S. foreign-born residents in waves 3 and 4 of the PATH Study. The study then investigated how acculturation, peer and family use of tobacco products and ATP advertisement, marketing, and promotion exposure influence ATP use among U.S. foreign-born residents using the same dataset. Finally, this dissertation further explored the nature of this association among U.S. Korean residents, one of the largest Asian immigrant subgroups. They have the highest smoking rates in the U.S among Asian immigrants (B. Martell et al., 2016). The results of the study may provide information that could contribute to designing effective culturally tailored smoking prevention programs and smoking cessations targeted toward U.S. foreign-born residents. The dissertation also may inform efforts for reducing tobacco-related health disparities among U.S. foreign-born residents, which in turn, would promote better health for them.

1.6 Definition of Terms

Acculturation	"The dual process of cultural and psychological changes that takes place as a result of contact between two or more cultural groups and their individual members (J. W. Berry, 2005, par. 1)." Acculturation is typically assessed by length of residency in the U.S., age at migration, English proficiency, nativity, and years of education in a hosting or original country.
Alternative tobacco products (ATP)	Alternative tobacco products are any non-cigarette tobacco products including electronic cigarettes (also known as "e-cigarettes"), hookah (also known as "water pipes"), smokeless tobacco, pipe, "roll your own," cigars, little cigars, and cigarillos.
Cigars	**"**A roll of tobacco wrapped in leaf tobacco or in a substance that contains tobacco. They vary in size, filter, tip, and characterizing flavors" (U.S. Food and Drug Administration, 2019f, par.1)
Conventional cigarettes or regular cigarettes	Fine cut tobacco, chemical additives rolled in paper with a filter
E-cigarettes	Battery-operated devices that convert liquid containing nicotine into a vapor that the consumer inhales. Other commonly used terminology in literature is electronic cigarettes, electronic nicotine delivery system, and ENDS.
Hookahs ("water pipes")	**"**A type of combustible tobacco that is smoked with a hookah (water pipe). Hookah smoke exposes people to the addictive chemical nicotine and contains many of the same toxic chemicals that are in cigarette smoke" (U.S. Food and Drug Administration, 2019b, par.1)
Light and non-daily smokers	Smoking cigarettes some days or smoking ten or fewer cigarettes per day (Blanco et al., 2014)
Little cigars and cigarillos	Cigarette-like products that often sold in singles or small packs that have been heavily marketed as inexpensive and less harmful alternatives to cigarettes (Majeed et al., 2018)
Harm Perceptions	An individual's perception of harm or risk caused by ATPs, including e-cigarette, cigars, cigarillos, little cigars, smokeless tobacco, and pipe
Heated Tobacco Products (HTPs or Heat-Not-Burn Products)	Heated tobacco products heat processed tobacco leaf including dry, moist, or liquid ingredients, allowing

	users to inhale nicotine into their lungs. These products appear in a wide variety of shapes (U.S Food and Drug Administration, 2020; U.S. Centers for Disease Control and Prevention, 2022). Some brands of heated tobacco products include IQOS and Eclipse (U.S. Centers for Disease Control and Prevention, 2022).
IQOS	One brand of heated tobacco products. The U.S. Food and Drug Administration authorized the marketing of this tobacco product as modified risk tobacco products (MRTPs). "The IQOS Tobacco Heating System includes the electronic IQOS device that generates a nicotine-containing aerosol by heating tobacco-filled sticks wrapped in paper" (U.S. Food and Drug Administration, 2020).
U.S. foreign-born residents	Individuals who were born outside the United States. These individuals include naturalized U.S. citizens, permanent residents, temporary residents such as foreign students (documented) and unauthorized (undocumented) residents (U.S. Census Bureau, 2021b)
Native-born or U.S.-born residents	Individuals who are native and were born in the United States (U.S. Census Bureau, 2021b)
PATH Study	A national longitudinal cohort study of tobacco use and how it affects the health of people in the United States. The PATH Study started in 2013, and about 46,000 people ages 12 years and older participated in this study (United States Department of Health and Human Services. National Institutes of Health. National Institute on Drug Abuse, and the United States Department of Health and Human Services. Food and Drug Administration. Center for Tobacco Products, 2018)
Smokeless Tobacco	It is a noncombustible tobacco product, such as chewing tobacco, dry snuff, moist snuff, and snus. Most smokeless tobacco use involves placing the product between the gum and the cheek or lip (U.S. Food and Drug Administration, 2019c)
Smoking (tobacco use or tobacco product use)	Individual behavior that involves smoking any tobacco products

Chapter 2: Literature Review

The purpose of this chapter is to present a summary of the literature concerning what is currently known about alternative tobacco products (ATP) and identify gaps in the literature regarding factors associated with ATP use among immigrants in the United States.

2.1 Background on ATP and Health Consequences

2.1.1. E-cigarettes

E-cigarettes, also known as e-cig, vapes, vape pen, vaporizer, e-hookahs, e-pipes, and electronic nicotine delivery systems (ENDS), are "battery-powered devices that heat a liquid containing cartridge to produce an aerosol that is inhaled by the user" (Patel et al., 2016, par. 1). These products typically contain nicotine, flavorings, propylene glycol, vegetable glycerin, and other chemicals (Breland et al., 2014; Goniewicz et al., 2014; Sleiman et al., 2016). Aerosols of e-cigarettes can contain harmful constituents, such as heavy metals, ultrafine particulate, and volatile organic compounds (Goniewicz et al., 2014; Sleiman et al., 2016). E-cigarettes are available in a wide range of designs, appearances and flavors. They can resemble conventional cigarettes, cigars, pipes, USB flash drives, and pens, and include those that use cartridges, tank systems, or mods. In 2016, the U.S. Food and Drug Administration (FDA) issued a final rule deeming regulatory authority over e-cigarettes as a tobacco product. Under this authority FDA regulates the manufacture, import, packaging, labeling, advertising, promotion, sale, and distribution of e-cigarettes (U.S. Food and Drug Administration, 2019).

E-cigarette use may lead to several negative health consequences. For example, a study found that even in small doses of two primary ingredients found in e-cigarettes–propylene glycol and vegetable glycerin–may expose users to toxins (Glantz & Bareham, 2018; Kosmider et al.,

2014). Other studies found that inhaling emissions that originate from e-cigarettes may cause lung damage and diseases (Ghosh et al., 2019; Muthumalage et al., 2019; Sleiman et al., 2016). Additionally, the nicotine in e-cigarettes is addictive and can harm the parts of the brain that control attention, learning, mood, and impulse control (Heldt et al., 2020; Kuntic et al., n.d.; Prasedya et al., 2020). Prior studies have also suggested that using nicotine may also increase the risk of future addiction to other illicit drugs such as alcohol, opiates and marijuana (Chamberlain et al., 2019; Temple et al., 2017).

2.1.2. Cigars, Cigarillos, Filtered Cigars

According to the FDA, a cigar is defined as "a roll of tobacco wrapped in leaf tobacco or in a substance that contains tobacco" (U.S. Food and Drug Administration, Center for Tobacco Products, 2019, para.1). Different types of cigar products are available on the market that vary in size and shape from smaller cigars, such as little filtered cigars or cigarillos, and premium cigars to large cigars. Cigarillos and little filtered cigars may contain candy or fruit flavors and are commonly sold as a single stick. These characteristics raised concerns that these products appeal to youth and young adults (Harrell et al., 2017; Villanti et al., 2013). The Deeming Rule, issued in 2016, gave the FDA regulatory authority over the manufacture, import, packaging, labeling, advertising, promotion, sale, and distribution of cigars that includes rolling papers and filters, but not including accessories, such as cutters and lighters (U.S. Food and Drug Administration, 2019).

Cigar smoking is associated with similar negative health consequences as cigarette smoking. Smoke from cigars, cigarillos, and filtered cigars contain levels of toxicants that are comparable to smoke from cigarettes (Atiya et al., 2018). Regular cigar use is responsible for approximately 9,000 premature deaths in the U.S. each year, resulting in losing an economic

value of approximately $23 billion (Nonnemaker et al., 2014). Studies suggested that regular cigar smoking is associated with an increased risk of head, lung, esophagus, larynx, and oral cavity cancer (Malhotra et al., 2017; Shanks & Burns, 1998; Shapiro et al., 2000); heavy cigar smoking increases risk of lung cancer and coronary heart disease (Chang et al., 2015; Shanks & Burns, 1998). A recent study also suggested that individuals who formerly smoked cigars exclusively were more likely to report having had heart conditions, stroke, and cancer compared to those who do not smoke cigars (Rostron et al., 2019).

2.1.3. Hookahs and Pipes

Hookahs are a device defined as "water pipes that are used to smoke specially made tobacco that comes in various flavors, such as apple, mint, cherry, chocolate, coconut, licorice, cappuccino, and watermelon" (Centers for Disease Control and Prevention, 2016a, par.1). The tobacco used in these devices is also known as *waterpipe tobacco, maassel, shisha, narghile, argileh, hubble-bubble,* and *goza* (U.S. Food and Drug Administration, 2019). A typical hookah contains a fired-clay head with holes in the bottom, a metal body, a water bowl, and a flexible hose with a mouthpiece (Cobb et al., 2010). The hot coals are placed on top of the metal screen, which causes the tobacco in a bowl to heat up and smoke (Cobb et al., 2010). Individuals who use hookahs usually inhale smoke through a hose from which the individual's act of sucking draws in more heat toward the tobacco and helps accelerate the heat transfer, and produces smoke that travels through the body of the waterpipe, the water, and the hose allowing the user to inhale the smoke (Cobb et al., 2010). Individuals who use hookahs tend to smoke hookahs in groups and may pass the same mouthpiece around from person to person.

Health risks associated with hookahs are similar to those associated with cigarette smoking, including lung, bladder and oral cancers, heart disease, infections, and complications

during pregnancy (Akl et al., 2010; Awan et al., 2017; Westra et al., 2018). Smoke from hookahs contains several toxic agents, such as carbon monoxide, metals, and cancer-causing chemicals that can cause clogged arteries and heart disease (Akl et al., 2010). Short-term hookah use is associated with increased heart rate and blood pressure, reduced pulmonary function, and carbon monoxide intoxication (El-Zaatari et al., 2015). Tobacco juices from hookahs irritate the mouth and increase the risk of developing oral cancers (Dar et al., 2012), and smokers may pass infections to other smokers from sharing a hookah mouthpieces (Corral et al., 2018). Babies born to women who smoked hookahs every day while pregnant had birth weights that were at least one-third less than the birth weights of babies born to those who did not smoke (Waziry et al., 2017). Studies found that in a typical hookah smoking session, individuals were exposed to high levels of nicotine, carbon monoxide and smoke (Eissenberg & Shihadeh, 2009; Helen et al., 2014). Another study found that the quantity of tobacco consumed in a typical one hour hookah session can be equivalent to smoking 10 cigarettes a day (Neergaard et al., 2007). This is alarming because those who use hookahs may be exposed to more toxic chemicals (Primack et al., 2016) and may be more addicted to nicotine when compared to cigarette smokers (Kassem et al., 2018).

2.1.4. Smokeless Tobacco (Snus and Other smokeless Tobacco)

Smokeless tobacco is defined as "a noncombustible tobacco product," including chewing tobacco, snuff, snus, and dip (U.S. Food and Drug Administration, 2019). Chewing tobacco is cured tobacco in the form of loose-leaf, plug, or twist (Hatsukami et al., 2007). Dry snuff is loose, finely cut, or powdered dry tobacco that is sniffed through the nostrils, and moist snuff and snus are cut tobacco that can be loose or pouched and placed in mouth (Hatsukami et al.,

2007). Smokeless tobacco products contain nicotine, lead, formaldehyde, and carcinogens, like cadmium and arsenic (Song et al., 2016).

Smokeless tobacco is associated with many negative health outcomes. Using smokeless tobacco can lead to the oral, esophagus, and pancreas cancers, gum disease, complications during pregnancy, heart disease, and stroke (Westra et al., 2018). For example, smokeless tobacco can cause white or gray patches inside the mouth that can lead to cancer (Asthana et al., 2019; Niaz et al., 2017). It can also cause gum disease, tooth decay, and tooth loss (Malhotra et al., 2017) and increases the risk of premature death from heart disease and stroke (Piano et al., 2010). The use of smokeless tobacco products during pregnancy can increase the risk of stillbirth and premature delivery and can affect babies' brain development in utero (Suliankatchi & Sinha, 2016).

2.2.5. Dual or multiple tobacco product use

Multiple tobacco product use is a public health issue given an increasing popularity of ATPs among U.S. populations. A study found that in 2019, 18.6% of individuals who currently smoked or used any tobacco products use two or more tobacco products (Cornelius, 2020). Moreover, another study found that approximately 40% of U.S. adults and youths who smoked or used tobacco products used multiple tobacco products in 2013 and 2014 (Kasza et al., 2017). The common combination of tobacco products were conventional cigarettes and e-cigarettes, conventional cigarettes and hookah, conventional cigarettes and traditional cigars and conventional cigarettes and smokeless tobacco products (Fix et al., 2014; Merianos et al., 2018; Simon et al., 2022). A study suggested that multiple tobacco product use correlates with marijuana and other substance use (Osibogun et al., 2018). Another study also suggested that multiple tobacco product use is also associated with the nicotine dependence (Gomez et al.,

2020). Currently, much remains unknown about the patterns of multiple tobacco use among foreign-born residents.

2.2 Prevalence of ATP among U.S. Immigrants

2.2.1. Prevalence of E-cigarettes

E-cigarettes have gained popularity in the United States in recent years. For example, a study suggested that sales of e-cigarette have increased significantly by an average of 14.4% by each year between 2011 to 2015 (Marynak et al., 2017). Another study showed that flavored e-cigarette sales as a percentage of all e-cigarette sales increased nationally from 2.4% in 2012 to 19.8% in 2016 (Kuiper, 2018). JUUL, one of the popular e-cigarette brands, sales increased 641% (from 2.2 million to 16.2 million dollars) from 2016 to 2017 (King et al., 2018). In 2017, 2.8% of U.S. adults aged 18 years or older U.S. reported that they used e-cigarettes every day or some days (Wang et al., 2018). E-cigarettes are also most likely to be used concurrently with cigarettes. A study suggested that combinations of cigarette and e-cigarette use was 30.1% in 2017 (Wang et al., 2018).

Historically, foreign-born residents reported lower e-cigarette use compared to U.S. natives. For example, in 2014, a study found that approximately 6% of naturalized U.S. citizens used e-cigarettes at least once in the past, and that approximately 2% were current users (Wang et al., 2016). The same study also found that less than 6% of non-U.S. citizen residents used e-cigarettes at least once, and approximately 1% of non-U.S. citizens were current users (Wang et al., 2016). Another study suggested that adolescents who were non-U.S. citizen residents were less likely than adolescents who were U.S. natives to use e-cigarettes in their lifetime (Alcalá et al., 2016). The same study also suggested that e-cigarette use was lower among U.S. immigrant adolescents who spoke their native countries' languages at home than adolescents who spoke

English-only at home (Alcalá et al., 2016). Some evidence showed that e-cigarette use may increase with the length of residency in the United States (Kaplan et al., 2014; Pampel et al., 2019; Wang et al., 2016).

2.2.2. Prevalence of Cigars, Cigarillos, Filtered Cigars

The prevalence of cigars, cigarillos, and filtered cigars have been increasing over the past years. According to the 2016 National Survey on Drug Use and Health, 4.8% of all adults reported that they currently smoked cigars, and an estimated 12.3 million people in the United States aged 12 years or older said that they currently smoked cigars (Substance Abuse and Mental Health Services Administration, 2017). Moreover, a study found that trends in current cigar smoking was at around 2.3% among U.S. adults over age of 18 between 2000 and 2015, however, female and non-Hispanic Black adults' cigar use was increasing (Rostron et al., 2019). Another study found that in 2013, about 25.6% of young adults who are between 18 and 34 years old had smoked cigarillos (Richardson et al., 2013). Additionally, cigars are also popular ATPs that are used concurrently with cigarettes. A study by Wang et al. (2018) reported that among 3.7% (9.0 million) of U.S. adults who currently used multiple tobacco products, cigarettes and cigars smoking were the second popular tobacco product combinations (29.2%) in 2017.

There is no known data for cigar, cigarillo, and filtered cigar use by immigrant status. Most studies have examined the use of these products by racial groups regardless of their immigrant status. For example, according to the 2016 National Survey on Drug Use and Health, about 4.8% of African American adults, 2.0% of Asian American adults, 1.2% of Hispanic adults currently smoked cigars (Substance Abuse and Mental Health Services Administration, 2017). The studies indicated that flavored cigars, cigarillos, and filtered cigars seemed to appeal to these racial minority groups. For example, a study suggested that Hispanic, African American, and

Asian young adult college students have greater odds of choosing flavored cigars over non-flavored cigars as compared to their non-Hispanic White counterparts (Hinds et al., 2018). Another study found that more male African Americans and Hispanic young and middle-aged adults reported any unflavored and flavored little cigar and cigarillo smoking than White non-Hispanics (Sterling, Fryer, et al., 2017).

2.2.3. Prevalence of Hookahs and Pipes

In 2017, 2.6 million adults in the United States used hookahs, water pipes, or pipes, and 10.6% of them use these products daily (Wang et al., 2018). The prevalence of hookah use was significantly higher among men (1.8%) and the uninsured (1.9%) than female (0.4%) and the insured (0.9% for private insurance, 1.0% for Medicaid, and 1.4% for other public insurance) (Wang et al., 2018). The estimated prevalence rate of current hookah use among young adults in the United State was 2% and the estimated prevalence rate of lifetime use was 12% in 2014-2015 (Soulakova et al. 2018). According to the Fall 2018 National College Health Assessment, 14.7% of college students had used hookahs in their lifetime, and 3.1% had used it in the past month (American College Health Association, 2019). Moreover, studies suggested that dual use of cigarettes and hookahs is common in young adults (Grinberg & Goodwin, 2016; Soneji et al., 2015), and hookah use is also correlated with the use of other substances, such as alcohol and marijuana use (Shepardson & Hustad, 2016).

Hookah or water pipe is a popular tobacco product among immigrants from Middle East, East Africa, South Asia and South America (Cavazos-Rehg et al., 2015; El Hajj et al., 2017; Hrywna et al., 2016; Kidanu et al., 2019; Marigi et al., 2013). For example, a study found that about 80% of Ethiopian and Eritrean immigrants in the United States had tried hookahs in their lifetime, and among these individuals, about 43% of them currently used hookahs (Kidanu et al.,

2019). Other studies suggested hookah use is widespread among Somali and Oromo immigrants in the Twin Cities, MN (Marigi et al., 2013), and 21% of Arab immigrants living in Colorado reported that they currently used hookahs (El Hajj et al., 2017). Among South Asian Americans, hookah use was described as common behaviors at social gatherings or after meals (Hrywna et al., 2016). Moreover, another study suggested that Hispanics and Latinos were more likely to try and had the intention to use hookahs than non-Hispanic Caucasians (Cavazos-Rehg et al., 2015).

2.2.4. Prevalence of Smokeless Tobacco Products

According to the 2017 National Health Interview Survey, about 3.8% of U.S. adults currently used smokeless tobacco products (Centers for Disease Control and Prevention, 2019). During 1985 and 2015, the prevalence of smokeless tobacco use in the United States increased among males but slightly decreased among females according to a report of the U.S. Surgeon General (U.S. Department of Health and Human Services, 2014). A study found that the prevalence of smokeless tobacco product use among minority adults (0.6% for African Americans, 0.7% for Hispanics) was lower compared to Caucasian adults (2.8%) in 2017 (T. Wang et al., 2018). Data suggested that individuals who used smokeless tobacco products are more likely to consume multiple tobacco products: a report from the 2012 National Survey on Drug Use and Health indicates that about 1 in every 100 adults at age 26 and over (1.2%) currently used smokeless tobacco products with at least one other tobacco product (U.S. Department of Health and Human Services, 2014).

Many studies suggested that smokeless tobacco product use is prevalent among Southeast Asian immigrants (Han et al., 2019; Mukherjea et al., 2018; Mukherjea & Modayil, 2013). For example, a study conducted in 2013 showed that the prevalence of smokeless tobacco use among South Asian immigrants ranges from 12% to 28% (Mukherjea & Modayil, 2013). Another study

found that a total of 28.2% South Asian immigrants living in New York City reported that they tried smokeless tobacco and a total of 12.9% reported that they currently used smokeless tobacco (Han et al., 2019). Moreover, a separate study suggested that the prevalence of smokeless tobacco product use was high among Asian Indian immigrants in California (Mukherjea et al., 2018). Factors associated with their smokeless tobacco use were English proficiency, language spoken at home, being an immigrant, gender, education, religion, and current or former cigarette smoking status (Han et al., 2019; Mukherjea et al., 2018).

2.3 Acculturation and Tobacco Use

2.3.1. Concepts and Measurement of Acculturation

Acculturation is a process by which people adapt to a new culture (or host culture) while maintaining features of their own heritage. It is a multidimensional process that involves the cultural and behavioral changes that result from intergroup contact, conflict, and adaption (Berry, 2003, 2005). Acculturation through the process of adaption takes place in various ways. These variations determine four acculturation strategies- integration, assimilation, separation, and marginalization (Berry, 2005). Integration exists when the individuals maintain their own cultural identity while at the same time participates in the host culture. Assimilation occurs when the individuals give up their own cultural identity and become absorbed into the host culture. Separation happens when the individuals hold on to their own cultural identity while at the same time avoid involvement with the host culture. Marginalization is when the individuals do not participate or have little or no interest in either their own culture or the host culture. The acculturation strategies that are used by people depends on a variety of cultural and psychological factors; and adaptive consequences are also varied by these factors (Berry, 2005).

Acculturation measurements include years of residency in a hosting country, age at migration, years of education in an original or a hosting country, nativity, citizenship status, language use and proficiency, social contacts or relationships (e.g. ethnicity of close friends, spouse, and neighbors), cultural participation (e.g. dietary choices, media preferences and cultural activities like religious participation), perceived discrimination, specific beliefs or values, the importance of honoring cultural traditions, and a sense of belonging (Gim Chung et al., 2004; Marin et al., 1987; Salant & Lauderdale, 2003; Snowden & Hines, 1999; Suinn et al., 1992). Researchers use different instruments to measure acculturation for different immigrants. Some examples of these instruments include the *Scales To Assess African American Acculturation*, *Suinn-Lew Asian Self-Identity Acculturation Scale*, *Asian American Multidimensional Acculturation Scale (AAMAS)*, and *Short Acculturation Scale for Hispanic (SASH)* (Gim Chung et al., 2004; Marin et al., 1987; Salant & Lauderdale, 2003; Snowden & Hines, 1999; Suinn et al., 1992).

2.3.2. Acculturation and Tobacco Use

Past studies suggested that acculturation process is associated with tobacco use behavior, and patterns of acculturation and their association with tobacco use vary across immigrant groups and host countries (Chen et al., 1999; Choi et al., 2008a; El Hajj et al., 2017; Ma et al., 2004; Marigi et al., 2013; Mukherjea et al., 2018; Mukherjea & Modayil, 2013; Parker et al., 2010; Saint-Fort & Choi, 2019). For example, a study conducted by Parker et al. (2010) suggested that current tobacco use was more prevalent among non-English speaking immigrants in the United States than English speaking immigrants, on the other hands, more acculturated Mexican and Hmong immigrant women were more likely to use tobacco products compared with less acculturated women. Among Asian immigrants in the United States, studies suggested that

less acculturated men and acculturated youth and women have a higher prevalence of tobacco use than more acculturated men and less acculturated youth, respectively (Chen et al., 1999; Choi et al., 2008a; Ma et al., 2004). Among Arab immigrants living in Colorado, individuals who were more integrated into Arabic culture were more likely to smoke cigarettes and hookah than their counterparts (El Hajj et al., 2017). Another study suggested that the country of origin was associated with tobacco use behavior among African immigrants in the United States (Saint-Fort & Choi, 2019).

2.4 Harm Perceptions about ATP

People's perceptions of the harmfulness of ATP influence their product use decision. This section provides the literature review on harm perceptions about each of ATPs among U.S. adult populations.

2.4.1. Harm Perceptions about E-Cigarettes

E-cigarettes are perceived as less toxic and harmful products than conventional cigarettes by certain populations (Chen et al., 2018; Dai & Hao, 2019; Huerta et al., 2017; Persoskie, O'Brien, et al., 2019; Wagener et al., 2012). For example, a study suggested that e-cigarette awareness had increased from 77.1% to 94.3% between 2012 and 2014, and individuals who perceived e-cigarettes as less harmful were less likely to attempt to quit smoking (Huerta et al., 2017). Another study suggested that U.S. adult dual users of e-cigarettes and conventional cigarettes who perceived e-cigarettes as less harmful either became exclusive e-cigarette users or were more likely to remain dual users (Persoskie, O'Brien, et al., 2019). Moreover, studies suggested that flavored e-cigarettes were perceived as less harmful than conventional cigarettes

by young adults, and flavoring was the most common reason for e-cigarette use among these populations (Chen et al., 2018; Dai & Hao, 2019; Patel et al., 2016).

Some prior studies examined racial and ethnic differences in harm perceptions of e-cigarettes regardless of immigration status (Huerta et al., 2017; Webb Hooper & Kolar, 2017). For instance, a study suggested that minority groups, relative to whites, were less likely to believe that e-cigarettes were less harmful than conventional cigarettes (Huerta et al., 2017). Another study suggested that African Americans, compared to Whites and Hispanics, had lower harm perceptions about e-cigarettes (Webb Hooper & Kolar, 2017). Given this limited evidence, minorities tend to perceive e-cigarettes as being just as harmful as conventional cigarettes, but these harm perceptions may vary by race and ethnicity. However, there is a gap in the literature in that it fails to demonstrate how harm perceptions about e-cigarettes influence e-cigarette use among minorities, particularly foreign-born residents.

2.4.2. Harm Perceptions about Cigars, Cigarillo and Filtered Cigars

Some individuals who smoke cigars, cigarillos, and filtered cigars consider themselves at a lower risk for health-related illnesses because they smoke less frequently and do not inhale the smoke (Majeed et al., 2018; Sterling et al., 2016; Sterling, Majeed, et al., 2017). A study found that those who occasionally smoked cigarillos and filtered cigars were more likely to perceive these products as less risky to health than conventional cigarettes (Sterling, Majeed, et al., 2017). In part because these products come in various flavors, are sold as a single stick, and are cheaper than a pack of cigarettes, these individuals believe cigar products are not as addictive as conventional cigarettes and have more favorable feelings about these products than conventional cigarettes (Majeed et al., 2017). Studies suggested that African Americans and Hispanics who smoked conventional cigarettes and had lower educational levels thought that flavored cigarillos

and filtered cigars were less harmful and easier to quit smoking than conventional cigarettes (Nyman et al., 2016; Sterling, Fryer, et al., 2017). The addiction and risk perceptions about cigars and cigarillos are concerning because they are strong public health indicators about whether or not an individual who initiates tobacco use intends to continue using these products (Sterling, Majeed, et al., 2017).

2.4.3. Harm Perceptions about Hookahs

Like many other ATPs, hookahs are perceived as less harmful and addictive than conventional cigarettes. One study suggested that individuals who used hookahs underestimate health risks more than non-smokers (Heinz et al., 2013). Hookahs are more socially acceptable, particularly among college students (Heinz et al., 2013). They enjoy hookahs because they liked various flavors and socializing with friends in group settings (Kothari & Berg, 2018). Some users perceive hookahs as a safer alternative to cigarettes because the smoke is filtered through water (Aljarrah et al., 2009; Majeed et al., 2017). Another study suggested that individuals who perceive hookahs as less harmful than cigarettes are more likely to be current hookah smokers over time (Hair et al., 2017).

2.4.4. Harm Perceptions about Smokeless Tobacco

A prior study suggested that smokeless tobacco was perceived as more harmful than other ATPs and as harmful as conventional cigarettes (Wackowski et al., 2019). However, the trend of believing smokeless tobacco is not less harmful is declining among U.S. adults (Feirman et al., 2018). A systematic review suggested that many individuals, including those who smoked and those who did not smoke, did not know the relative harmfulness of smokeless tobacco products compared to conventional cigarettes and had inaccurate beliefs about these products

(Czoli et al., 2017). For instance, individuals who regularly used *snus* reported that they like it because it is easy to use, provides more significant negative affect relief, craving reduction, and weight control (Meier et al., 2017). Some individuals who used smokeless tobacco products believed that it is safer for both them and those around them than smoking conventional cigarettes because these products do not produce smoke (Liu et al., 2015).

2.5 Peer and Family Influence on Smoking Behavior

Evidence suggests that peers and family have a significant influence on an individuals' smoking behavior (Berg et al., 2018; Cambron et al., 2018; Luk et al., 2018; Vu et al., 2018; Windle et al., 2017). For younger generations, peers have a particularly strong influence (Vu et al., 2018). Notably, college students were more likely to use ATPs when they had a friend who used these products (Windle et al., 2017). More permissive family environments on smoking and having deviant peer influences increased an individual's smoking behavior (Berg et al., 2018; Cambron et al., 2018). Furthermore, a study (Luk et al., 2018) suggested that negative perceived family relationship is significantly associated with multiple ATP use.

Immigrants are influenced significantly by their peers and family members. For example, a study suggested that Arab immigrants were more likely to smoke hookahs if their family members and friends used tobacco products (El Hajj et al., 2017). Another study suggested that having friends and being around parents' friends who smoke increases the risk of tobacco use among Mexican immigrants (Shete & Wilkinson, 2017). Other prior studies suggested that having difficult relationships with family members or having family members and close friends who smoke were associated with smoking behaviors among Asian immigrants (Weiss & Garbanati, 2004; Ma et al., 2003). Specifically, among Asian young adults, parents' use of tobacco products influenced them to develop and maintain their smoking behavior (Lee et al.,

2011). Thus, peer and family influence is an important factor that should be considered when examining tobacco product use among this population.

2.6 ATP Marketing and Promotion Influence on ATP Use

Tobacco product advertisements, marketing and promotions can influence people's product use decision. This section provides the literature review on ATP marketing, ethnic-targeted marketing, advertising and promotion strategies and influence on populations' ATP use.

2.6.1. ATP Marketing and ATP Use

Tobacco companies spend billions of dollars each year to market their tobacco products. ATP marketing expenditures have increased continuously in the United States (Federal Trade Commission, 2018b; Kornfield et al., 2015). According to the Federal Trade Commission, in 2016, the five major U.S. smokeless companies spent $759.3 million on smokeless tobacco advertisement and promotion (Federal Trade Commission, 2018b). A research study also found that promotional expenditures for e-cigarettes have increased sharply between 2011 to 2013 ($12 to $28 million) (Kornfield et al., 2015).

A growing body of evidence shows that tobacco product marketing influences ATP use (Alcalá et al., 2017; Chen-Sankey et al., 2019; Papaleontiou et al., 2019). For example, a prior study found that young adults exposed to e-cigarette marketing were more likely to have tried e-cigarettes (Chen-Sankey et al., 2019). A different study suggested that individuals who reported that they have a favorite tobacco advertisement were more likely to initiate smoking (Pierce et al., 2010). Another study indicated that exposure to any tobacco advertisement was associated with the increased use of e-cigarettes, and exposure to conventional cigarette advertisements was associated with higher consumption of cigars, cigarillos, and filtered cigars (Papaleontiou et al.,

2019). Additionally, some studies examined the effects of tobacco product marketing exposure among minorities (Alcalá et al., 2017; Baumann et al., 2015). For example, a study conducted by Baumann et al. (2015) suggested that e-cigarette marketing on radio and television targeting African Americans resulting in increased e-cigarette use among this population. Another study also suggested that African and Asian minority populations in the United States were more likely to trust tobacco and e-cigarette companies as a source of information (Alcalá et al., 2017).

2.6.2. Targeted ATP Marketing and Promotion to U.S. Immigrants

Tobacco companies have used various tactics to market to racial and ethnic minorities. A prior study suggested that the tobacco industry has used three marketing strategies to target immigrants in the United States: geographically based marketing directly toward immigrant communities, segmentation based on immigrants' assimilation level, and coordinated marketing focusing on their countries of origin (Acevedo-Garcia et al., 2004).

First, tobacco companies used geographic concentration patterns of various national-origin groups and aimed at immigrant communities to market their products (Acevedo-Garcia et al., 2004). For example, a tobacco company targeted seasonal Mexican migratory workers and created seasonal outreach initiatives (Barbeau et al., 2004; Falk, 1985). The same company also monitored Chinese immigrant's purchasing pattern then used it in their marketing strategies to this population (Acevedo-Garcia et al., 2004). This company noted that Chinese immigrants residing in New York City were geographically dispersed and traveled to Chinatown to purchase cigarettes. On the other hand, the company noted that Chinese immigrants in San Francisco purchased cigarettes outside of Chinatown. Then, the company advertised their products heavily in these urban Asian American communities (Muggli et al., 2002). Moreover, tobacco companies also sponsor cultural events, such as Chinese New Year and Vietnamese New Year festivals and

support Asian American business associations (Acevedo-Garcia et al., 2004; Fellows & Rubin, 2006; Muggli et al., 2002).

Second, the tobacco industry divides immigrant markets according to their assimilation levels. For example, several tobacco companies engaged in a systematic effort to understand assimilation patterns among Hispanic immigrants then promoted certain name brands of tobacco products (Acevedo-Garcia et al., 2004; Iglesias-Rios & Parascandola, 2013). A tobacco company characterized Asian immigrants into four largest Asian groups (Chinese, Filipinos, Japanese, and Korean) and tried to understand their assimilation level, then promoted their tobacco products according to the heritage or culture of each of these four ethnic groups (Acevedo-Garcia et al., 2004; Fellows & Rubin, 2006).

Finally, tobacco companies analyze the domestic market performance of their tobacco products among specific immigrant groups in respective countries of origin. For example, a tobacco company evaluates Chinese, Vietnamese and Indian immigrants' smoking patterns and cultural images associated with these products by each group after they migrate to the United States, then the company markets a specific brand of tobacco products according to the preference by each ethnic group (Acevedo-Garcia et al., 2004). These targeted marketing and promotion create a more positive image toward tobacco products among this population, in turn, may encourage tobacco use (Alcalá et al., 2017; Baumann et al., 2015).

2.7 Conclusion

In conclusion, generally, ATPs are perceived as less harmful and addictive than conventional cigarettes; in turn, harm perceptions of ATP influence ATP use. Although the prior literature provided some evidence that harm perceptions about ATPs were varied by different racial and ethnicities, there are very limited literature available on harm perceptions about ATPs

among U.S. foreign-born residents. The different ethnic immigrant groups prefer to use different ATPs. Acculturation, peer and family use, ATP marketing, advertising and promotion are associated with tobacco product use among immigrants in the United States. Peer and family use influence populations' tobacco product use significantly. Race and ethnic-specific targeted ATP marketing and promotion generate positive imagery about ATPs among this population, in turn, promotes ATP use. Moreover, harm perceptions, exposure to ATP marketing and promotion and smoking behaviors among immigrants change as they acculturate more to the U.S. society. However, data on ATP use among U.S. foreign-born residents are limited, and factors affecting ATP use among U.S. foreign-born residents are not yet well understood. Therefore, it is essential to investigate comprehensively on ATP use and how these multi-level factors jointly contribute to ATP use among U.S. foreign-born residents.

Chapter 3: Study 1 - The Influence of Acculturation, Harm Perceptions and Family and Peer Tobacco Product Use on Alternative Tobacco Product Use among U.S. Foreign-born Residents

3.1 Introduction

An estimated 44.9 million foreign-born residents live in the U.S., representing 13.7% of the total U.S. population in 2019 (U.S. Census Bureau, 2019). Foreign-born includes "anyone who is not a U.S. citizen at birth including naturalized U.S. citizens, lawful permanent residents, temporary migrant (e.g., international students, temporary lawful workers), humanitarian migrants (e.g., refugees and asylees) and unauthorized migrants" (U.S. Census Bureau, 2021). The total foreign-born population has increased continuously over the last five decades, from 9.6 million in 1970 to 44.9 million in 2019 (U.S. Census Bureau, 2019, 2021). Studies have suggested that different immigrant groups display different tobacco use behavior patterns (Azagba & Shan, 2021; Blanco et al., 2014; Saint-Fort & Choi, 2019; Wang et al., 2016, 2019). Other studies have suggested that these differences in tobacco use patterns among immigrant groups could be explained by "smoking epidemics" in different countries (Parker et al., 2010; Reiss et al., 2015; Thun et al., 2012).

Acculturation is an important factor in tobacco use behaviors among foreign-born residents (Azagba & Shan, 2021; Berry, 2005). However, the role of acculturation in alternative tobacco product (ATP) use behavior among foreign-born residents has been understudied due to its complexity and multidimensional nature (El Hajj et al., 2017; Maglalang et al., 2016; Mukherjea et al., 2018; Nguyen, 2019; Nguyen et al., 2018; Shete & Wilkinson, 2017). Acculturation is the process by which immigrants modify their values, attitudes, and behaviors while still maintaining elements of their original culture (Berry, 2005). Acculturation predicts

how the immigrants will adopt smoking behaviors and norms in the new society (Cerrada et al., 2016; El Hajj et al., 2017; Huh & Leventhal, 2016; Nguyen et al., 2018; Wang et al., 2016, 2019). Frequently, acculturation has been measured by length of time in the U.S., age at migration, language spoken at home, and English proficiency. Studies suggest that more acculturated immigrants are more likely to engage in smoking and other unhealthy behaviors (Cunningham et al., 2008; Azagba et al., 2019; Azagba & Shan, 2021; John et al., 2012; Wang et al., 2016). For example, a study suggested that immigrants who lived in the U.S. longer were more likely to use e-cigarettes (Wang et al., 2016). Moreover, another study found that high English proficiency increased the odds of using e-cigarettes among U.S. adult immigrants (Wang et al., 2019). However, these studies focused on e-cigarette use only, and did not investigate other alternative tobacco products. The role of acculturation on other ATPs was still unknown.

Tobacco use behaviors are also influenced by individual and social factors, such as harm perceptions about tobacco products and peer and family use of these products. First, harm perceptions about different tobacco products is an important predictor of ATP use behavior (Bernat et al., 2017; Chaffee & Cheng, 2018; Fong et al., 2019; Latimer et al., 2014; Parker et al., 2018; Strong et al., 2019). It influences smoking initiation, product transition, continued use, and cessation efforts (Bernat et al., 2017; Chaffee & Cheng, 2018; Parker et al., 2018; Strong et al., 2019). Generally, ATPs are perceived as less harmful than conventional cigarettes (Bernat et al., 2017; Fong et al., 2019; Liu et al., 2015; Majeed et al., 2018; Pericot-Valverde et al., 2017; Wackowski et al., 2019). Non-smokers who believe that ATPs are not harmful to health may initiate smoking by using ATPs (Parker et al., 2018; Strong et al., 2019). Moreover, individuals who currently smoke conventional cigarettes and believe that ATPs are less harmful than cigarettes may experiment with or switch to ATPs in order to quit smoking or maintain better

health (Pericot-Valverde et al., 2017; Persoskie, O'Brien, et al., 2019; Wackowski et al., 2019; Wetter et al., 2002).

Second, family and peer use of these products is an important factor for tobacco product initiation, continued use, and smoking abstinence. Prior studies suggested that peer use of tobacco products is associated with individual tobacco product use behaviors, especially during adolescent and young adulthood (Steinmetz-Wood et al., 2018; Vitória et al., 2020; Windle et al., 2017). One study indicated that peer influence on tobacco use diminishes as individuals transitioned to adulthood, although pressures do not completely disappear (Shartle, 2021). Moreover, some ethnic groups are influenced more by social environments (e.g. being around friends who smoke and having frequent social gatherings with alcohol and more permissive smoking environments) (Huh et al., 2013, 2016; Vitória et al., 2020). In addition, family, particularly parents and close family members, also influences smoking initiation (Cambron et al., 2018; Vitória et al., 2020). For example, studies found that more permissive family smoking environments and parental smoking were associated with increased individual tobacco use behavior (Cambron et al., 2018; Vitória et al., 2020).

Prior studies have not examined the associations between individual factors, social factors, acculturation, and ATP use among U.S. foreign-born residents. Thus, it remains unclear how these factors jointly influence ATP use among U.S. foreign-born residents. The purpose of this study is to assess the association between acculturation, harm perceptions, and ATP use (i.e., e-cigarettes, hookah, smokeless tobacco, pipe, and cigars including traditional cigars, little cigars, and cigarillos) among U.S. foreign-born residents who are 18 years and older (n=2,507). This study involves quantitative analyses of de-identified, restricted-use data from waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study. The specific objectives of

this study were to (1) assess the different characteristics of U.S.-born and foreign-born residents, (2) examine the relationship between acculturation, harm perceptions about ATPs, and ATP use among U.S. foreign-born residents, and (3) identify whether peer and family use of tobacco products moderates the association between harm perceptions and ATP use among U.S. foreign-born residents.

3.2 Methods

3.2.1. The Population Assessment of Tobacco and Health (PATH) Study

The PATH Study is a longitudinal cohort study of tobacco use and how it affects the health of people in the United States (U.S. Department of Health and Human Services, 2019). Currently, five waves of PATH Study public-use and restricted-use files (Wave 1, Wave 2, Wave 3, Wave 4, and Wave 5) are available online. Participants in the PATH Study are nationally representative institutional and non-institutional samples of over 32,000 adults ages 18 and older and 13,000 youth ages 12 to 17 across all 50 states and the District of Columbia, excluding active-duty military members (U.S. Department of Health and Human Services, 2019). The PATH Study cohort includes tobacco users and nonusers.

3.2.2. Study Population

The study was conducted using PATH Study Wave 3 (2015–2016) and Wave 4 (2016–2017) adult data. The PATH Study began to include acculturation related questions, such as U.S citizenship status, duration in the U.S., and English proficiency, at Wave 3. Wave 4 was the latest dataset available at the time this study began. The study sample was determined from the question of U.S. citizenship status at Wave 3. Individuals who responded as being a “U.S. citizen by naturalization” and “Not a [U.S.] Citizen” to the citizenship question were selected. As a

result, the final analysis included 2,507 foreign-born adult residents. Of 2,507 foreign-born adult residents, 1,144 were naturalized U.S. citizens and 1,357 were U.S. residents but not U.S. citizens.

3.2.3. Sampling Procedure

Sampling procedure for the PATH Study is described in the PATH Study Restricted Files User Guide from the National Addiction & HIV Data Archive Program (NAHDAP) website (https://www.icpsr.umich.edu/files/NAHDAP/documentation/ug36231-all_REST.pdf). The PATH Study sample was selected using a four-stage, stratified probability sample design. At the first stage, stratified samples of geographical primary sampling units (PSUs) composed of a county or group of counties were selected using probability proportional to size (PPU) sampling. At the second stage, sampled PSUs were divided into smaller geographical segments based on Census-defined blocks. At the third stage of sampling, the residential addresses within each segment were ordered by census block using systematic sampling. Finally, at the fourth stage, samples were selected from the sampled households identified by the residential addresses. Two-phase sampling was used for adults within households at the final stage to correct for potential misreporting by the household respondent of the tobacco-use status of other adult members of the household.

Data from Wave 3 of the PATH Study were collected between October 19, 2015 and October 13, 2016. At Wave 3, respondents from Wave 1 were selected and interviewed. All respondents from Wave 1 were eligible for the Wave 3 interview as long as they were still residents of the U.S. and were not incarcerated. Data from Wave 4 of the PATH Study were collected between December 1, 2016 and January 3, 2018. At Wave 4, participants were selected using a probability sample at Wave 1 and a probability replenishment sample at the time of

Wave 4. The replenishment was used to account for the aging of Wave 1 participants and sample attrition. Participants in the Wave 1 Cohort were eligible for Wave 4 as long as they were still residents of the U.S. and not incarcerated. For replenishment samples, participants were selected from residential addresses not selected for Wave 1 in the same sampled PSUs and segments using a similar within-household sampling procedure. Members of the Wave 1 Cohort were combined with the Wave 4 replenishment sample to form the new Wave 4 Cohort. In this study, only the adult samples who were 18 years and older at both Waves 3 and 4 were included in the study.

3.2.4. Validity and Reliability of Measures

Scientists at the National Institute on Drug Abuse (NIDA) and the U.S. Food and Drug Administration (FDA) worked with Westat, a research company with expertise in survey design, questionnaire development, and data collection and analysis to develop a questionnaire for the PATH Study. Questionnaires for the PATH Study included outcome measures, such as tobacco use variables and health-related outcomes, measures related to regulatory decisions, and control measures that are possibly associated with outcome measures such as demographics and peer influences (Hyland et al., 2017). Items in the PATH Study were adapted from well-established existing national surveys, such as the Tobacco Use Supplement to the Current Population Survey (TUS-CPS), the National Epidemiological Survey on Alcohol and Related Conditions Survey, the National Health and Nutrition Examination Survey (NHANES), the Global Appraisal of Individual Needs (GAIN), and the Patient Reported Outcomes Measurement Information System (PROMIS) (Hyland et al., 2017). Some items were adapted from international, state, and privately funded tobacco surveillance surveys, such as the ITC Project, the Visual Media

Influences on Adolescent and Young Adult Smoking Behaviour surveys, and the Minnesota Adult Tobacco Survey (Hyland et al., 2017).

Researchers at Westat conducted series of cognitive tests, with more than 500 respondents of the PATH Study over two weeks to validate responses for the survey instrument (Westat, 2019). Respondents answered the same answers over two interviews. Researchers also collected saliva samples that confirmed whether respondents in the interviews had recently used tobacco (Westat, 2019). Responses for a question about the recent tobacco product use almost always agreed with the saliva test results (biomarker). These data confirm whether or not answers to the PATH Study questions are reliable and valid.

3.2.5. Measures

Acculturation (Wave 3)

Acculturation was assessed using the four items, including duration in the U.S., age at migration, language spoken at home and English proficiency at Wave 3. Each item was assessed separately.

Duration in the U.S.

Duration in the U.S. was assessed using the question: "About how many years have you lived in the United States?" Initial responses were continuous responses with the number of years they lived in the U.S. This variable was re-coded and categorized as *10 years or less*=1, *11-20 years*=2 and *20 years and more*=3 after the examination of the sample distribution.

Age at migration

Age at migration was derived from two existing variables. First, it was calculated by subtracting duration in the U.S. from age at the time of the interview; then, this derived variable was re-coded into binary categories (*before age 18* vs. *at age 18 and after*).

Language spoken at home

Language spoken at home was assessed using a question: "Do you speak a language other than English at home?" The initial responses were binary (*yes* and *no*). The variable was re-coded into *English* and *other languages* with those who responded *yes* categorized into *other languages*, and those who responded *no* categorized into English.

English proficiency

English proficiency was assessed using three questions: "How well do you speak English?", "How well do you read English?", "How well do you write English?" Initial responses were 4-level responses (*very well*=1/*well*=2/*not well*=3/*not at all*=4). The new variable was created by calculating the mean score of these three items; responses with a mean less than 3 were then re-coded into *proficient in English*, and responses with a mean above 3 or equal to 3 were re-coded into *limited in English*.

ATP Harm Perceptions (Wave 3)

Items with identical question stems and response options were used to assess different harm perceptions for each ATP at Wave 3.

Harmfulness of ATPs to Health

For each ATP except "pipe", respondents were asked if smoking or using these products is harmful to health. Initial responses were *not at all harmful*=1, *slightly harmful*=2, *somewhat harmful*=3, *very harmful*=4, or *extremely harmful*=5. The new variable was created to collapse questions for each product by calculating the median score of these seven items. Next, the responses with a median score less than 1 or equal to 1 were recoded into *not at all harmful*=1, responses with a median score greater than 1 and less than or equal to 2 were recoded into *slightly harmful*=2, responses with a median score greater than 2 and less than or equal to 3 were recoded into *somewhat harmful*=3, responses with a median score greater than 3 and less than or

equal to 4 were recoded into *very harmful*=4, and responses with a mean score equal to 5 were re-coded into *extremely harmful*=5. After the observation of skewed distribution of responses, this variable was re-coded into binary responses (*not at all or somewhat harmful* vs. *very or extremely harmful*).

Harmfulness of ATPs for some day use

Respondents were also asked, "How much do people harm themselves when they use [one type of alternative tobacco products] on some days but not every day?" for each product. Initial responses were *no harm*=1, *a little harm*=2, *some harm*=3, or *a lot of harm*=4. The new variable was created to collapse these questions for each product by calculating the median score of these eight items; then, responses with a median score less than 1 or equal to 1 were re-coded into *no harm*=1, responses with a median score greater than 1 and less than or equal to 2 were re-coded into *a little harm*=2, responses with a median score greater than 2 and less than or equal to 3 were re-coded into *some harm*=3, and responses with a median score greater than 3 and less than or equal to 4 were re-coded into *a lot harm*=4. After the observation of skewed distribution of responses, this variable was re-coded into binary responses (*no, little harm or some harm* vs. *a lot of harm*).

Harmfulness of ATPs compared to cigarettes

For each product, respondents were asked if smoking or using [one type of alternative tobacco product] is *less harmful*=1, *about the same*=2, or *more harmful*=3 than smoking cigarettes. The new variable was created to collapse these questions by calculating the median score of these eight items, and then responses with a median score less than 1 or equal to 1 were re-coded into *less harmful*=1, responses with a median score greater than 1 and less than or equal to 2 were re-coded into *about the same*=2, and responses with a median score greater than 2 and less than or

equal to 3 were re-coded into *more harmful*=3. After the observation of skewed distribution of responses, this variable was re-coded into binary responses (*less harmful* vs. *about the same or more harmful*).

Peer and Family Influence (Wave 3)

Peer and family influence was assessed using one item at Wave 3, "Think about people who are important to you, do any of them use any of the following products?" Respondents marked each tobacco products. Then, the new variable for responses was re-coded into binary responses (*yes* vs. *no*). If respondents marked any ATPs in the response, they were categorized into *yes*. If they did not mark anything, they were categorized into *no*.

ATP Use (Wave 4)

Two variables in the study included self-reported current and lifetime use of ATPs.

Current ATP use

Current ATP use was assessed based on derived variables for adults who used each ATP within the past 30 days at Wave 4. Seven variables for each ATP were collapsed into a single variable because sample size of some ATPs were too small and estimates of each ATP use were not statistically reliable. Initial responses were binary (*yes* vs. *no*). Respondents who had smoked or used any ATPs within the past 30 days were categorized into *yes* in the combined variable, and respondents who had not smoked or used ATPs within the past 30 days were categorized into *no*.

Lifetime ATP use (Wave 4)

Lifetime ATP use was assessed using derived variables for adults who had ever used each tobacco product at Wave 4. Seven variables for each tobacco product were collapsed into a single variable because sample size of some ATPs were too small and estimates of each ATP use were not statistically reliable. Responses were binary (*yes* vs. *no*). Respondents who had ever

smoked or used any ATPs were categorized into *yes* in the combined variable, and respondents who had not ever smoked or used ATPs were categorized into *no*.

Control variables

Key socioeconomic covariates of this study included sex, age, marital status, race, educational attainment, household income and past 12-month cigarette smoking status at Waves 3 and 4. Selection of these measures was based on covariates tested in a past study investigating tobacco product use among U.S. adults (Creamer et al., 2019; Fong et al., 2019). Sex was coded into the binary response (*male* vs. *female*) Age was recoded into 5-cateogry response (*18-29*=1, *30-39*=2, *40-49*=3, *50-59*=4, and *60+*=5). Marital status was re-coded into 3-level responses (*never married*=1, *married*=2, and *widowed/divorced/separated*=3). Race was coded into 4-level responses (*White race alone*=1, *Black race alone*=2, *Asian race alone*=3, and *other race, including multi-racial*=4). Educational attainment was re-coded into 5-level responses (*less than high school*=1, *high school equivalent*=2, *associate degree or some college*=3, *bachelor's degree*=4, and *masters'/professional/doctoral degree*=5). Cigarette smoking status at Waves 3 and 4 was re-coded into the binary response (*yes* vs. *no*).

3.2.6. Study Procedure

Codebook and questionnaires for restricted-use data in this study are available on the National Addiction & HIV Data Archive Program (NAHDAP) website (https://www.icpsr.umich.edu/web/NAHDAP/studies/36231/datadocumentation) (U.S. Department of Health and Human Services, 2019). NAHDAP is hosted by the Inter-university Consortium for Political and Social Research (ICPSR) at the University of Michigan's Institute for Social Research (U.S. Department of Health and Human Services, 2019). Waves 3 and 4 of

the PATH restricted-use files were requested from the NAHDAP. All analyses were done within the Virtual Data Enclave (VDE) system. The VDE allows researchers to launch a virtual machine on their own desktop but operates from a server at Inter-university Consortium for Political and Social Research (ICPSR). Data files and software remain on the ICPSR server. In the VDE, Waves 3 and 4 data were combined. The combined data were cleaned and re-coded into new response categories, and new variables were created as necessary (Appendix A). After the data cleaning procedure, data analyses were completed. The principal investigator (PI) submitted a request to obtain generated outputs within the VDE for the final review of output to be used in the study. Upon review by NAHDAP staff, the approved output was sent to the PI. The results of the analyses are presented in this study with tables and graphs.

3.2.7. Data Analyses

Data from Waves 3 and 4 of the PATH Study were combined into one data file. Distribution of samples and characteristics among all adult samples at Wave 3 were examined according to the U.S. citizenship status groups at Wave 3 and ATP use status groups (current ATP use and Lifetime ATP use) at Wave 4. The bivariate analyses using chi-square tests were then performed to determine statistical significance between Wave 3 predictors and Wave 4 ATP use status groups. Then, multivariate logistic regression analyses were conducted to examine the association between acculturation and harm perceptions at Wave 3, the association between acculturation at Wave 3 and ATP use at Wave 4, and between harm perceptions at Wave 3 and ATP use at Wave 4. All estimates were weighted to represent the U.S. adult population. The full-sample weight (Wave 4 adult all-wave weights) of the sample and sample design stratification variables (PSU, strata) were included in all models. Control variables, including gender, age, race, education, household income and cigarette smoking status at Waves 3 and 4 were examined

to determine if any of these variables had relationship with current ATP and lifetime ATP use. Those variables that had a significant relationship with current ATP and lifetime ATP use were controlled in each final logistic regression models.

Next, a series of moderation analyses were conducted to test the hypothesis that peer and family use of tobacco products moderates the relationship between harm perceptions and ATP use. Current and lifetime ATP use significantly related to harm perceptions measures were selected for the moderation analysis. In the first step, harm perceptions and peer and family ATP use were included in the logistic regression models. Next, the interaction term between harm perceptions and peer and family ATP use was added to each logistic regression model. The new logistic regression model with the interaction term was tested and checked for a significant R^2 change and a significant effect by the new interaction term.

Next, a series of mediation analyses were conducted to test the hypothesis that harm perceptions mediates the relationship between acculturation and ATP use. ATP use measures that were significantly related to acculturation measures were selected for mediation analyses. The study used a modified Sobel's test approach adopted from previous studies (Baron & Kenny, 1986; MacKinnon et al., 2007; Pham et al., 2021; Rijnhart et al., 2019; VanderWeele & Vansteelandt, 2010). In the first step, the estimated effect of independent variables (age at migration, language spoken at home or English proficiency) on ATP use (current and lifetime ATP use were examined. Next, the effect of the independent variables on the mediator (harmfulness of ATPs to health, harmfulness of ATPs for some day use or harmfulness of ATPs compared to conventional cigarettes) were examined. Acculturation measures that were significantly related to the mediator were selected for the next step. In the third step, the estimated effect of the independent variable and the mediator on the dependent variable was

examined. In the next step, indirect effect and total effect were calculated. Then Sobel's test statistic was computed, and the significance of the test was evaluated. Lastly, the relative effect size (the proportion of total mediated effect) was calculated. Using Bootstrapping with 100 repetition, correct standard errors were obtained for all logistic models (Bleser et al., 2016; Buis, 2010; Morera & Castro, 2013; Preacher & Hayes, 2004; SAS Institute Inc., 2013). All statistical data analyses for the study were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC). *Proc surveyfreq* were used for bivariate analyses and *proc surveylogistic* procedures were used for logistic regressions. The full-sample weight and 100 replicate weights were used directly in the *proc surveylogistic* procedure when fitting the model to adjust for the complex sample design and nonresponse. Respondents with missing data were interpreted as missing completely at random (MCAR), thus, the analyses included samples with complete data only. The Wave 4 replenishment sample respondents were not included in this study because these respondents were not included in data at Wave 3. As a result, 378 missing cases were identified and excluded from the initial 2,885 foreign-born residents.

3.3 Results

3.3.1. Descriptive Characteristics of U.S.-Born and Foreign-Born

The descriptive characteristics of U.S.-born and U.S. foreign-born residents are shown in *Table 1.1*. Of U.S. foreign-born residents, about 54.23% were female, about 23.38% were 30 to 39 years old, 63.85% were married, and 56.61% were White race alone at Wave 3. About 37.53% graduated from high school or had high school equivalent degrees and about 61.08% had a household income above $50,000. Most characteristics by foreign-born status were statistically significant ($p<0.05$) except for gender.

Both U.S.-born and foreign-born groups showed similar distribution patterns regarding harm perceptions toward ATPs to health. More than half of U.S.-born and foreign-born residents thought that ATPs were either very harmful (38.45% for U.S.-born and 44.12% for foreign-born, respectively) or extremely harmful to health (37.75% for U.S.-born, and 38.14% for foreign-born, respectively. Regarding harm perceptions toward ATPs for some day use, about 47.18% of U.S.-born or natives thought that people somewhat harm themselves if they use ATPs some days but not every day. On the other hand, about 56.60% of foreign-born residents thought that people harm themselves a lot if they use ATPs some days but not every day. Regarding harm perceptions toward using or smoking ATPs compared to smoking conventional cigarettes, the majority of respondents from both groups responded that using or smoking ATPs is as harmful as smoking conventional cigarettes (78.37% for U.S.-born and 76.18% for foreign-born, respectively) or more harmful (16.04% for U.S.-born and 19.89% for foreign-born, respectively). Regarding peer and family influence, about 57.59% of U.S.-born samples responded that people who are important to them use any ATPs, and about 32.72% of foreign-born residents responded that people who are important to them use any ATPs. These results were statistically significant ($p<0.05$). Regarding tobacco product use, overall, foreign-born residents had lower prevalence estimates of any tobacco products at both Waves compared to their U.S.-born counterparts ($p<.05$). The prevalence estimates of current ATP use were decreased slightly from Wave 3 (16.78% for U.S.-born and 6.88% for foreign-born, respectively) to Wave 4 (14.87% for U.S.-born and 5.69% for foreign-born, respectively) for both groups ($p<0.05$). The prevalence estimates of lifetime ATP use slightly increased from Wave 3 (58.87% for U.S.-born and 31.21% for foreign-born, respectively) and Wave 4 (59.61% for U.S.-born and 32.54% for foreign-born, respectively) for both groups ($p<0.05$). The prevalence estimates of lifetime conventional

cigarette use among U.S. born were 70.31% at Wave 3 and 70.64% at Wave 4. The prevalence estimates of lifetime conventional cigarette use among foreign-born residents were 50.23% at Wave 3 and 51.80% at Wave 4.

For both U.S.-born and foreign-born residents, e-cigarettes were the most used ATPs among those who currently use ATPs at both Waves, followed by cigars/cigarillos/filtered cigars and hookahs. A majority of foreign-born residents who currently use ATPs used or smoked a single product at both Waves. E-cigarettes were the most used ATPs among both U.S.-born and foreign-born residents who ever used ATPs at both Waves, followed by cigars/cigarillos/filtered cigars and hookah. A majority of respondents who ever used ATPs at both Waves used or smoked two or more products. Notably, lifetime ATP use increased slightly from Wave 3 and Wave 4 (Table 1.1).

3.3.2. Descriptive Characteristics of Foreign-Born Residents

The sample characteristics of foreign-born residents by ATP use status at Wave 4 are shown in Table 1.2. Of individuals who currently use ATPs at Wave 4, about 68.39% were female, about 39.45% were between 18 and 29 years old, about 45.84% were never married, and 60.34% were White race alone. About 37.79% were high school graduates or had high school equivalent degree and about 63.81% had a household income above $50,000. Most sociodemographic characteristics were statistically significant ($p<0.05$) except for race and household income. About 40.73% of individuals who currently used ATP had lived in the U.S. for 20 years or more, about 52.60% moved to the U.S. before age 18, 76.27% spoke other languages other than English at home and 70.41% were fluent in English. Age at migration by current ATP use was the only acculturation measure that was statistically significant ($p<0.05$). Regarding harm perceptions, about 64.12% of respondents who were currently using ATPs

thought that ATPs are either very or extremely harmful to health, but are not very harmful if people use ATPs some days but not every day (62.64%). Moreover, the majority of respondents who currently use ATPs (91.79%) thought that using or smoking ATPs were as harmful as or more harmful than smoking conventional cigarettes. About 47.02% of respondents who were currently use ATPs responded that they had important people in their lives who used or smoked any ATPs.

Of those who ever used ATPs at Wave 4, 62.85% were male, 26.12% were between 30 and 39 years old, 56.42% were married, and 60.32% were White race alone. About 31.15% of respondents who ever used ATPs at Wave 4 were high school graduates or had high school equivalent degree, and 52.62% had a household income above $50,000. These results were statistically significant except for race. Regarding acculturation, about 45.05% of individuals who ever used ATPs at Wave 4 had lived in the U.S. for more than 20 years or more, about 57.84% moved to the U.S. at age 18 and after, and about 75.81% were proficient in English. Results of acculturation measures by lifetime ATP use were statistically significant except for the number of years living in the U.S. Regarding harm perceptions, about 78.64% of individuals who ever used ATPs at Wave 4 thought that ATPs were very or extremely harmful to health. About 47.99% of them also responded that people harm themselves a lot even if they use or smoke them some days but not every day. About 94.84% of them also responded that ATPs are as harmful as or more harmful than cigarettes. Bivariate tests of these results were statistically significant except for harmfulness of ATPs compared to cigarettes. About 85.49% of individuals who ever used ATPs ever smoked conventional cigarettes at Wave 3. About 86.46% of individuals who ever used ATPs ever smoked conventional cigarettes at Wave 4.

3.3.3. Results of Multivariate Logistic Regression Analyses

Table 1.3 describes the association between acculturation and harm perceptions. After adjusting for covariates, foreign-born residents who migrated to the U.S. at age 18 or older had higher adjusted odds of perceiving ATPs as very or extremely harmful to health (AOR=1.33, 95% CI=1.05, 1.68) than foreign-born residents who migrated before age 18. Foreign-born residents who were limited in English had higher adjusted odds of perceiving ATPs as being very or extremely harmful to health (AOR=1.44, 95% CI=1.02, 2.03) than those who were proficient in English.

Table 1.4 shows the association between acculturation, harm perceptions, peer and family use, and ATP use status. After adjusting for covariates, foreign-born residents who migrated to the U.S. at age 18 and after had lower adjusted odds of currently using ATPs (AOR=0.60, 95% CI=0.42, 0.86) than individuals who migrated to the U.S. before age of 18. Foreign-born residents who perceived ATPs as being not harmful or somewhat harmful to health had higher adjusted odds of currently using ATPs (AOR=2.66, 95% CI=1.93, 3.67) than foreign-born residents who perceived ATPs as being very or extremely harmful to health. Foreign-born residents who perceived using ATPs some days but not every day as not, a little, or somewhat harmful had higher adjusted odds of currently using ATPs (AOR=1.69, 95% CI=1.19, 2.40) than foreign-born residents who perceived using ATPs on some days but not every day as a lot harmful. Foreign-born residents who perceived ATPs as being less harmful than conventional cigarettes had higher adjusted odds of currently using ATPs (AOR=2.34, 95% CI=1.24, 4.42) than those who perceived ATPs as being as harmful or more harmful compared to cigarettes. Foreign-born residents who had important people in their lives who used or smoked any ATPs

had higher adjusted odds of currently using ATPs (AOR=1.83, 95% CI=1.27, 2.64) than foreign-born residents who had important people in their lives who did not use or smoke any ATPs.

Foreign-born residents who migrated to the U.S. at age 18 and after had lower adjusted odds of ever using ATPs at Wave 4 (AOR=0.45, 95% CI=0.33, 0.63) than foreign-born residents who migrated to the U.S. before age 18. Foreign-born residents who were limited in English had lower adjusted odds of ever using ATPs at Wave 4 (AOR=0.43, 95% CI=0.30, 0.61) than foreign-born residents who were proficient in English. Foreign-born residents who had important people in their lives who used or smoked any ATPs had higher adjusted odds of ever using ATPs at Wave 4 (AOR=1.65, 95% CI=1.22, 2.24) than foreign-born residents who had important people in their lives who did not use or smoke any ATPs.

3.3.4. Moderation Effect of Peer and Family Use of ATPs

Results from multivariate logistic regression analyses showed that the association between harm perceptions and current ATP use was statistically significant. To test the hypothesis of whether peer and family use of ATPs moderates the relationship between harm perceptions and current ATP use, three logistic regression models for each harm perceptions item and current ATP use were tested (Table 1.5). Interaction plots for these logistic regression models were examined (Figure 1.1).

The logistic regression model between harmfulness of ATPs to health and current ATP use was tested. In the first step, two variables, including harm perceptions item (harmfulness of ATPs to health, harmfulness of ATPs for some day use, or harmfulness of ATPs compared to conventional cigarettes) and had important people in their lives who used or smoked any ATPs, were included in three separate logistic regression models. Harmfulness of ATPs to health (*b*= 0.46, SE=0.08, t= 5.52, p<.0001), harmfulness of ATPs for some day use (*b*= 0.23, SE= 0.09, t=

2.66, p=0.009), and harmfulness of ATPs compared to conventional cigarettes (*b*= 0.36, SE= 0.16, t= 2.31, p=0.023) positively predicted current ATP use. Peer and family using ATPs also positively predicted current ATP use in each logistic regression model (*b*= 0.55, SE= 0.18, t= 3.00, p=0.004; *b*= 0.57, SE= 0.18, t= 3.06, p=0.003; *b*= 0.58, SE= 0.18, t= 3.21, p=0.002, respectively). Next, the interaction term between harm perceptions and peer and family influence was added to the logistic regression model. Overall, the results revealed no significant moderating role of peer and family use of ATPs on the relationship between harm perceptions and ATP current use (*b*= 0.07, SE= 0.18, t= 3.0, p=0.691; *b*= 0.25, SE= 0.17, t= 1.51, p=0.135; *b*= 0.31, SE= 0.31, t= 1.02, p=0.310, respectively). Examination of the interaction plots in Figure 1.1 showed the parallel lines for peer and family using ATPs (Yes) and peer and family not using ATPs (No).

3.3.5. Mediation Effect of Harm Perceptions

Figure 1.2 shows the results of mediation analyses in the study. In the first mediation analysis, the estimated effect of age at migration on the current ATP use without the mediator, harm perceptions, was significant (*b* = -0.26, t = -3.95, p=0.0001). The estimated effect of age at migration on harmfulness of ATPs to health was also significant (*b* = 0.14, t=2.44, p=0.017). The estimated effect of age at migration on current ATP use in the presence of harmfulness of ATPs to health was significant with the reduction in significant level (*b* = -0.23, t=-7.32, p=0.077). Then, we conducted Sobel's test and found that the test statistic was significant (z = -2.07, p<0.05). Results revealed the partial mediating role of harmfulness of ATPs to health on the relationship between age at migration at Wave 3 and current ATP use at Wave 4. The relative effect size was 0.38. All logistic regression models were adjusted with control variables.

In the second mediation testing, the mediating effect of harmfulness of ATPs to health on age at migration and lifetime ATP use was tested. The estimated effect of age at migration on lifetime ATP use without mediator, harmfulness of ATPs to health, was significant (b = -0.40, t= -6.77, p<0.0001). The estimated effect of age at migration on harmfulness of ATP to health was significant (b = 0.14, t= 2.44, p= 0.017). The estimated effect of age at migration on lifetime ATP use in the presence of harmfulness of ATPs to health was significant without the changes in the significant level (b = -0.39, t= -6.70, p<0.0001). We found that the Sobel's test statistic was not significant (z = -1.44, p= 0.150). Therefore, harmfulness of ATPs to health does not mediate the relationship between age at migration and lifetime ATP use. In the third mediation testing, the mediating effect of harmfulness of ATPs health on English proficiency and lifetime use was tested. The estimated effect of English proficiency on lifetime ATP use without harmfulness of ATPs to health was significant (b = -0.43, t= -6.47, p<0.0001). The estimated effect of English proficiency on harmfulness of ATPs to heath was significant (b = 0.18, t= 2.12, p=0.037). The estimated effect of age at migration on lifetime ATP use in the presence of harmfulness of ATPs to health was significant without the reduction in the significant level (b= -0.43, t= -6.44, p<0.0001). We found that the Sobel's test statistic was not statistically significant (z = -1.45, p= 0.146). Therefore, harmfulness of ATPs to health does not mediate the relationship between age at migration and lifetime ATP use. In the fourth mediation analysis, the mediating effect of harmfulness of ATPs for some day use on the relationship between English proficiency and lifetime ATP use was tested. The estimated effect of English proficiency on lifetime ATP use was significant, but the estimated effect of English proficiency on harmfulness of ATPs for some day use was not statistically significant (b= 0.03, t= 0.43, p= 0.6647). The estimated effect of English proficiency on lifetime ATP use in the presence of harmfulness of ATPs for some day

use was statistically significant (*b*= -0.43, t= -6.35, p<0.0001). Sobel's test statistics was not statistically significant (z = -0.38, p= 0.705). Therefore, harmfulness of ATPs for some day use does not mediate the relationship between English proficiency and lifetime ATP use. In the fifth mediation analysis, the mediating effect of harmfulness of ATPs compared to conventional cigarettes was tested. The estimated effect of English proficiency on lifetime ATP use was significant, but the estimated of English proficiency on harmfulness of ATPs compared to conventional cigarettes was not significant (*b*= 0.19, t= 1.24, p= 0.216). The estimated effect of English proficiency on lifetime ATP use in the presence of harmfulness of ATPs compared to conventional cigarettes was significant (*b*= -0.43, t= -6.48, p<0.0001). Sobel's test statistics was not significant (z = -0.88, p= 0.378). Therefore, harmfulness of ATPs compared to conventional cigarettes does not mediate the relationship between English proficiency and lifetime ATP use.

3.4 Discussion

3.4.1. Interpretation of Results

Findings in the current study suggested that differences exist between U.S.-born and foreign-born residents by sociodemographic factors, harm perceptions, peer and family influence, marketing exposure, cigarette and ATP use status. Regarding harm perceptions, U.S.-born and foreign-born residents had similar distributions in that most individuals believed that ATPs were harmful to health. They also believed that using ATPs on some days use but not every day were harmful, but were about the same or less harmful than conventional cigarettes. The percentage of peer and family using any ATPs were lower for foreign-born residents than their U.S.-born counterparts. Findings in the current study also suggested that foreign-born residents had lower prevalence estimates of tobacco product marketing exposure and all tobacco

product use than their U.S.-born counterparts. Consistent with past literature, these findings suggested that tobacco product use among foreign-born residents were lower than the tobacco product use among the U.S.-born or native population (Azagba et al., 2019; Azagba & Shan, 2021; Wang et al., 2016). However, higher increases in cigarette smoking rates among foreign-born residents between Wave 3 and Wave 4 was observed compared to U.S.-born residents. Moreover, for both groups, current and lifetime ATP use were increased from Wave 3 to Wave 4. This increase in tobacco product use is concerning for public health, and continued monitoring of tobacco product use among both groups is important in order to protect the population's health.

Findings from the current study suggested that e-cigarettes were the most popular tobacco product that foreign-born residents used, followed by cigars/cigarillos/filtered cigars and hookah. One reason for e-cigarettes being the top product used may be the perception that e-cigarettes can help with conventional cigarette smoking cessation (Kalkhoran & Glantz, 2016; Patel et al., 2016; Temple et al., 2017; Vu et al., 2018). Another reason for e-cigarette, cigar products, and hookahs being popular among this population may be the availability of different flavor options (Hinds et al., 2018; Temple et al., 2017; Vu et al., 2018). Findings also suggested that the number of foreign-born residents changed over time in the PATH Study. Current use of e-cigarettes among foreign-born residents decreased from Wave 3 to Wave 4, but lifetime use of e-cigarettes increased from Wave 3 to Wave 4. For cigar products, current use of cigar products among foreign-born residents increased from Wave 3 to Wave 4, but lifetime use of cigar products remained the same. For hookah, current use and lifetime use decreased from Wave 3 to Wave 4 among foreign-born residents. One explanation is that many foreign-born residents who

smoke may smoke occasionally or experiment these products. Future studies should investigate daily use, switching behaviors, and intentions to quit by ATP use status.

Interestingly, findings in the current study suggest that some foreign-born residents used multiple tobacco products. Furthermore, greater proportions of individuals who ever used ATPs at Wave 4 used two or more ATPs than individuals who currently used ATPs at Wave 4. Notably, multiple tobacco product use among foreign-born residents who ever used ATPs at Wave 4 was increased from Wave 3 to Wave 4. On the other hand, foreign-born residents who currently use ATPs smoked or used single tobacco product more than using dual or multiple products, and the number of multiple tobacco product use was slightly decreased from Wave 3 to Wave 4 among this sub-group. Multiple tobacco product use is associated with greater nicotine exposure and dependence and decreased likelihood of smoking cessation (Ali et al., 2016; Osibogun et al., 2018). Prior studies suggested that multiple tobacco product use, particularly the combination of conventional cigarette and one or more other ATPs, is common among young adults and may be on the rise (Cornelius, 2020; Kasza et al., 2017). It still remains unclear what factors contribute to multiple tobacco product use among foreign-born residents and reasons for increases in multiple tobacco product use from one Wave to the next Wave. Thus, further investigation is needed to better understand this phenomenon.

The results in the current study suggested that some acculturation factors, such as age at migration and English proficiency were predictors of harm perceptions toward ATPs. Moreover, findings suggested that acculturation has varying effects on ATP use status. For example, the current study found some associations between age at migration and current ATP use, between age at migration and past 12-month ATP use, between language spoken at home and past 12-month ATP use, and between English proficiency and past 12-month ATP use. Duration in the

U.S. was not significantly related to current ATP use and lifetime ATP use in the current study. These findings suggested that individuals who were less acculturated to the U.S. were more likely to perceive ATPs as very or extremely harmful to health and were less likely to use ATPs. Findings were consistent with past studies that less acculturated individuals display less risky behaviors like tobacco use (Azagba et al., 2019; Azagba & Shan, 2021; Teruya & Bazargan-Hejazi, 2013). A possible explanation is a self-selection process, suggested by health migrant paradox theory, that individuals who are healthiest and most financially stable are most likely to migrate (Anderson et al., 2004). Furthermore, a study suggested that recent immigrants have more health advantages than those individuals who have lived in the host country for more than 10 years (Markides & Rote, 2019). The same study suggested that the effect of the healthy immigrant paradox diminishes after individuals have lived in the host country for 10 to 20 years (Markides & Rote, 2019). It is possible that individuals who were less acculturated to the U.S. in the current study underwent self-selection and chose to maintain good health behaviors.

The current study also suggested that general harm perceptions toward ATPs and harm perceptions compared to conventional cigarettes were associated with current ATP use among foreign-born residents but were not associated with lifetime ATP use. These results suggest that harm perceptions are important predictors for current ATP use among U.S. foreign-born residents (Aljarrah et al., 2009; Bernat et al., 2017; Fong et al., 2019; Latimer et al., 2014; Liu et al., 2015). Although the current study found a significant associations between harm perceptions and current ATP use, it is unclear to what extent harm perceptions towards ATPs may have influenced ATP use behaviors, such as initiation, product switching, and smoking cessation before entering the U.S.

Findings in the study suggested that the peer and family use of any ATPs did not moderate the relationship between harm perceptions and ATP use. Harm perceptions and peer and family use of ATPs influenced current ATP use individually among foreign-born residents in the study but not together. Thus, the peer and family use of any ATPs cannot be included in the model for harm perceptions and current ATP use as a moderator. Particularly, findings suggest that peer and family use of ATPs is a strong predictor of current ATP use. Thus, the peer and family use of ATPs can be included in the logistic regression model as a control variable when fitting the model for harm perceptions measures and current ATP use among foreign-born residents. While the current study examined only one measure of peer and family influence, evidence suggests that other social contexts, such as social support, social gathering, and peer and family perceptions toward ATPs also influenced tobacco product use among immigrants (Cambron et al., 2018; Huh et al., 2016; Windle et al., 2017). In order to better understand the relationship, future studies should test the moderating effect of peer and family use of ATPs using other foreign-born resident samples, or test the moderating effect of other social contexts.

Regarding mediation effects of harm perceptions in the relationship between acculturation and ATP use, the findings in the study suggest that the harmfulness of ATPs to health partially mediates the relationship between age at migration and current ATP use. Different countries have different tobacco product use patterns and smoking culture (Bilano et al., 2015). Evidence suggested different smoking behaviors at the age of migration and pre-migration experiences among foreign-born residents (Fleischer et al., 2017; Sanchez et al., 2022). These individuals' smoking behaviors may be influenced by smoking conditions in their home countries, and their perception toward tobacco products may be shaped by their home countries' smoking conditions before they migrate to the U.S. These results provided scientists

some information regarding ATP use behaviors and determinant factors among foreign-born residents. Thus, no causal inference cannot be made due to the observational nature of the data. Future studies should further investigate how harm perceptions of ATPs differ by foreign-born individuals who came to the U.S. at different ages and how smoking conditions in their home countries shape their harm perceptions and tobacco product use.

3.4.2. Strengths

The current study is the first study to examine how individual, interpersonal and cultural factors jointly influence ATP use among U.S. foreign-born residents using national longitudinal data. The current study provides detailed assessment of different factors influencing ATP use among U.S. foreign-born residents. While prior studies focused mostly on e-cigarette use among this population, the current study includes several emerging tobacco products. The current study also focuses on ATP use among an understudied group provides useful information in the field of tobacco research.

3.4.3. Limitations

This study is subject to some limitations. The self-reported nature of the survey may result in recall-bias. The PATH Study was conducted in English and Spanish only. It remains unclear how potential language barriers for respondents who were limited in English may have affected the survey results. The current study cannot determine whether ATP use causes conventional cigarette smoking or whether use of one particular ATP leads to use of other types of ATPs. We observed multiple tobacco product use behaviors among foreign-born residents in the study but could not assess detailed measures that capture multiple use combinations. Due to

small sample sizes for use of each ATP, the current study could not test hypotheses for each type of ATPs. Instead, each type of ATP use was collapsed into a single variable.

3.5 Conclusions

The study examined the influence of acculturation, harm perceptions and peer and family use of ATPs on ATP use among U.S. foreign-born residents in the PATH Study. Some acculturation factors were predictors of ATP use among foreign-born residents. Less acculturated U.S. foreign-born residents were more likely to perceive ATPs as very or extremely harmful to health and less likely to use ATPs. Harm perceptions and peer and family use of ATPs were predictors of ATP use among U.S. foreign-born residents. However, peer and family use of ATPs and harm perceptions influenced ATP use individually but did not jointly influence ATP use. Perceived harmfulness of ATPs to health partially mediates the relationship between the age at migration and current ATP use. Foreign-born individuals who migrated to the U.S. at age 18 and after were more likely to perceive ATPs as very or extremely harmful, and in turn, were less likely to use ATPs compared to foreign-born residents who migrated to the U.S. before age 18. Future research should further investigate peer and family influence on the relationship between acculturation and ATP use and multiple tobacco product use behaviors in this population.

Table 1.1. *Population Characteristics of U.S.-Born and Foreign-Born Residents of the Population Assessment of Tobacco and Health (PATH) Study Waves 3 and 4*

	U.S. Born or Natives (N=21,760)			**Foreign-born** (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N**[1]	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Gender *(Wave 3)*							
Female	11,270	103,763,488	51.61 (50.59, 52.62)	1,313	190,504,90	54.23 (51.16, 57.29)	0.1071
Male	10,474	97,305,550	48.39 (47.38, 49.41)	1,188	16,080,747	45.77 (42.71, 48.84)	
Age *(Wave 3)*							
18-29	**9,231**	**44,645,529**	**22.19 (21.28, 23.11)**	**835**	**5,525,697**	**15.66 (13.89, 17.43)**	**<0.0001**
30-39	**3,393**	**32,021,993**	**15.92 (15.13, 16.70)**	**524**	**8,247,543**	**23.38 (21.02, 25.74)**	
40-49	**2,758**	**30,231,755**	**15.03 (14.27, 15.79)**	**470**	**81,77,986**	**23.18 (20.97, 25.39)**	
50-59	**3,071**	**37,590,727**	**18.69 (17.85, 19.52)**	**342**	**5,834,585**	**16.54 (14.21, 18.87)**	
60+	**3,305**	**56,675,637**	**28.17 (27.20, 29.15)**	**336**	**7,488,912**	**21.23 (18.71, 23.75)**	
Marital Status *(Wave 3)*							
Never Married	**9,692**	**55,326,293**	**27.92 (26.78, 29.07)**	**828**	**6,450,897**	**18.61 (16.73, 20.50)**	**<0.0001**
Married	**7,871**	**100,708,510**	**50.82 (49.24, 52.40)**	**1,265**	**22,129,269**	**63.85 (61.22, 66.48)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Widowed/Divorced/Separated	**3,898**	**42,118,391**	**21.26 (20.21, 22.30)**	**384**	**6,075,918**	**17.53 (14.97, 20.09)**	
Race *(Wave 3)*							
White race alone	**15,710**	**160,816,332**	**81.08 (78.77, 83.38)**	**1,432**	**18,572,871**	**56.61 (51.79, 61.43)**	**<0.0001**
Black race alone	**3,642**	**25,619,637**	**12.91 (10.84, 14.99)**	**269**	**3,358,392**	**10.24 (8.33, 12.15)**	
Asian race alone	**273**	**3,654,937**	**1.84 (1.35, 2.34)**	**382**	**8,979,659**	**27.37 (23.08, 31.66)**	
Other race, including multi-racial	**1,671**	**8,262,548**	**4.17 (3.70, 4.63)**	**195**	**1,896,090**	**5.78 (4.43, 7.13)**	
Educational Attainment *(Wave 3)*							
Less than high school	**787**	**5,801,154**	**2.89 (2.55, 3.24)**	**272**	**4,176,263**	**11.87 (9.84, 13.90)**	**<0.0001**
High school equivalent	**8,322**	**68,935,960**	**34.37 (32.75, 35.99)**	**986**	**13,201,332**	**37.53 (34.83, 40.22)**	
Associate degree or some college	**7,854**	**67,359,538**	**33.59 (32.39, 34.78)**	**618**	**7,716,108**	**21.93 (19.53, 24.34)**	
Bachelor's degree	**3,133**	**37,944,015**	**18.92 (17.72, 20.12)**	**342**	**5,440,747**	**15.47 (13.37, 17.56)**	
Master's/Professional/Doctoral Degree	**1,581**	**20,519,862**	**10.23 (9.34, 11.13)**	**279**	**4,643,679**	**13.20 (10.88, 15.52)**	
Household Income *(Wave 3)*							
$50,000 or Below	**7,841**	**89,413,044**	**51.93 (50.10, 53.76)**	**725**	**1,275,524**	**38.92 (35.66, 42.19)**	**<0.0001**
Above $50,000	**12,464**	**96,586,722**	**48.07 (46.24, 49.90)**	**1,558**	**19,104,249**	**61.08 (57.81, 64.34)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Harm Perceptions *(Wave 3)*							
Harmfulness of ATPs to Health							
Not at all harmful	**191**	**1,199,606**	**0.60 (0.45, 0.74)**	**46**	**714,035**	**2.02 (1.14, 2.91)**	**<0.0001**
Slightly harmful	**727**	**4,866,347**	**2.42 (2.75, 2.66)**	**43**	**499,388**	**1.42 (0.78, 2.05)**	
somewhat harmful	**5,472**	**41805149**	**20.78 (19.86, 21.69)**	**427**	**5,045,957**	**14.30 (12.26, 16.35)**	
Very harmful	**8,102**	**77,378,049**	**38.45 (37.48, 39.43)**	**1,087**	**15,561,689**	**44.12 (41.02, 47.21)**	
Extremely harmful	**7,268**	**75,954,889**	**37.75 (36.58, 38.92)**	**904**	**13,453,654**	**38.14 (35.12, 41.16)**	
Harmfulness of ATPs for Some Day Use							
No Harm	**261**	**1,546,412**	**0.77 (0.62, 0.92)**	**42**	**661,828**	**1.88 (1.03, 2.72)**	**<0.0001**
A Little Harm	**1,759**	**12,253,054**	**6.09 (5.65, 6.53)**	**113**	**1,208,880**	**3.43 (2.46, 4.40)**	
Some harm	**11,182**	**94,924,072**	**47.18 (45.96, 48.40)**	**1,018**	**13,437,850**	**38.09 (35.05, 41.13)**	
A lot of harm	**8,558**	**92,480,502**	**45.96 (44.70, 47.23)**	**1,334**	**19,966,165**	**56.60 (53.49, 59.72)**	
Harmfulness of APTs Compared to Cigarette							
Less Harmful	**1,188**	**11,252,446**	**5.59 (5.07, 6.11)**	**105**	**1,386,636**	**3.93 (2.74, 5.12)**	**0.0006**
About the same	**16,547**	**157,679,447**	**78.37 (77.54, 79.19)**	**1,873**	**26,872,525**	**76.18 (73.93, 78.44)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
More harmful	**4,025**	**32,272,148**	**16.04 (15.21, 16.87)**	**529**	**7,015,563**	**19.89 (17.55, 22.23)**	
Peer/Family Influence (Yes/No) *(Wave 3)* *Had important people in their lives who used or smoked any ATPs*	**13,290**	**115,416,407**	**57.59 (56.03, 59.15)**	**945**	**11,449,746**	**32.72 (30.28, 35.15)**	**<0.0001**
Cigarette Smoking Status (Yes/No)							
Lifetime Conventional Cigarette Use							
Wave 3	**18,310**	**143,110,748**	**70.31 (68.80, 71.83)**	**1,743**	**17,849,404**	**50.23 (47.52, 52.94)**	**<0.0001**
Wave 4	**16,565**	**142,050,223**	**70.64 (69.13, 72.15)**	**1,596**	**18,170,953**	**51.80 (49.07, 54.54)**	**<0.0001**
Current ATP Use[2] (Yes/No)							
Wave 3	**6,182**	**33,757,575**	**16.78 (16.09, 17.47)**	**356**	**2,425,821**	**6.88 (5.82, 7.94)**	**<0.0001**
Wave 4	**5,590**	**29,922,044**	**14.87 (14.24, 15.50)**	**325**	**2,005,728**	**5.69 (4.72, 6.65)**	**<0.0001**
Current ATP Use (by Product Type)[3] *Wave 3*							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**
E-cigarettes	**2,995**	**15,236,799**	**7.57 (7.17, 7.98)**	**174**	**1,080,726**	**3.06 (2.43, 3.69)**	
Cigars/Cigarillos/Filtered Cigars	**1,985**	**11,151,172**	**5.54 (5.17, 5.91)**	**103**	**776,919**	**2.20 (1.56, 2.85)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Hookahs	**315**	**1,448,455**	**0.72 (0.59, 0.85)**	**48**	**338,303**	**0.96 (0.61, 1.31)**	
Pipe	**117**	**707,146**	**0.35 (0.26, 0.44)**	**8**	**48,306**	**0.14 (0.04, 0.24)**	
Snus	**143**	**1,008,007**	**0.50 (0.38, 0.62)**	**4**	**26,819**	**0.08 (0.00, 0.16)**	
Other Smokeless Tobacco Products	**627**	**4,205,996**	**2.09 (1.85, 2.33)**	**19**	**154,749**	**0.44 (0.15, 0.73)**	
Wave 4							
No ATP Use	**16,170**	**171,281,997**	**85.13 (84.50, 85.76)**	**2,182**	**33,268,995**	**94.31 (93.35, 95.28)**	**<0.0001**
E-cigarettes	**2,486**	**12,492,830**	**6.21 (5.85, 6.57)**	**138**	**781,844**	**2.22 (1.73, 2.70)**	
Cigars/Cigarillos/Filtered Cigars	**1,971**	**10,612,990**	**5.27 (4.91, 5.64)**	**117**	**679,886**	**1.93 (1.42, 2.44)**	
Hookahs	**279**	**1,273,680**	**0.63 (0.53, 0.74)**	**43**	**303,642**	**0.86 (0.52, 1.20)**	
Pipe	**88**	**561,830**	**0.28 (0.20, 0.36)**	**4**	**40,375**	**0.11 (0.00, 0.26)**	
Snus	**176**	**1,186,044**	**0.59 (0.48, 0.70)**	**10**	**113,539**	**0.32 (0.10, 0.55)**	
Other Smokeless Tobacco Products	**590**	**3,794,670**	**1.89 (1.67, 2.10)**	**13**	**86,443**	**0.25 (0.08, 0.41)**	
Current ATP Use (by Multiple Product Use)							
Wave 3							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Single Product Use	**4,429**	**25,433,682**	**12.64 (12.06, 13.22)**	**262**	**1,926,985**	**5.46 (4.46, 6.46)**	
Two or More Product Use	**1,753**	**8,323,893**	**4.14 (3.91, 4.36)**	**94**	**498,836**	**1.41 (1.00, 1.83)**	
Wave 4							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**
Single Product Use	**4,131**	**22,714,400**	**11.29 (10.79, 11.78)**	**240**	**1,517,302**	**4.30 (3.41, 5.19)**	
Two or More Product Use	**1,459**	**7,207,644**	**3.58 (3.34, 3.83)**	**85**	**488,427**	**1.38 (0.10, 1.77)**	
Lifetime ATP Use[4] (Yes/No)							
Wave 3	**16,286**	**118,427,462**	**58.87 (57.33, 60.41)**	**1,302**	**11,007,469**	**31.21 (29.06, 33.35)**	**<0.0001**
Wave 4	**16,549**	**119,917,974**	**59.61 (58.07, 61.14)**	**1,344**	**11,477,299**	**32.54 (30.37, 34.70)**	**<0.0001**
Lifetime ATP Use (by Product Type) [3]							
Wave 3							
No ATP Use	**5,473**	**82,755,890**	**41.13 (39.60, 42.67)**	**1,205**	**24,267,255**	**68.80 (66.65, 70.94)**	**<0.0001**
E-cigarettes	**10,640**	**56,466,040**	**28.07 (26.96, 29.17)**	**748**	**4,759,527**	**13.49 (12.24, 14.74)**	
Cigars/Cigarillos/Filtered Cigars	**4,438**	**50,364,765**	**25.03 (23.94, 26.13)**	**348**	**4,427,766**	**12.55 (10.66, 14.44)**	
Hookahs	**703**	**3,963,337**	**2.23 (1.90, 2.57)**	**168**	**1,231,984**	**3.49 (2.73, 4.25)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Pipe	**244**	**4,493,228**	**1.97 (1.77, 2.17)**	**17**	**202,925**	**0.58 (0.18, 0.97)**	
Snus	**67**	**622,014**	**0.31 (0.22, 0.40)**	**3**	**31,765**	**0.09 (0.00, 0.23)**	
Other Smokeless Tobacco Products	**194**	**2,518,079**	**1.25 (1.00, 1.51)**	**18**	**353,501**	**1.00 (0.34, 1.67)**	
Wave 4							
No ATP Use	**5,210**	**81,265,378**	**40.39 (38.86, 41.93)**	**1163**	**23,797,424**	**67.46 (65.30, 69.63)**	**<0.0001**
E-cigarettes	**11,004**	**58,504,861**	**29.08 (27.94, 30.22)**	**795**	**5,060,857**	**14.35 (13.05, 15.65)**	
Cigars/Cigarillos/Filtered Cigars	**4,370**	**49,976,140**	**24.84 (23.73, 25.95)**	**345**	**4,478,558**	**12.70 (10.83, 14.57)**	
Hookahs	**684**	**3,868,817**	**2.22 (1.89, 2.55)**	**166**	**1,298,988**	**3.68 (2.89, 4.48)**	
Pipe	**239**	**4,466,011**	**1.92 (1.73, 2.12)**	**17**	**204,679**	**0.58 (0.19, 0.97)**	
Snus	**73**	**686,878**	**0.34 (0.25, 0.43)**	**4**	**83,119**	**0.24 (0.00, 0.50)**	
Other Smokeless Tobacco Products	**179**	**2,415,267**	**1.20 (0.95, 1.46)**	**17**	**351,098**	**1.00 (0.33, 1.66)**	
Lifetime ATP Use (by Multiple Product Use)							
Wave 3							
No ATP Use	**5,473**	**82,755,890**	**41.13 (39.60, 42.67)**	**1205**	**24,267,255**	**68.80 (66.65, 70.94)**	**<0.0001**
Single Product Use	**4,025**	**37,283,012**	**18.53 (17.72, 19.35)**	**503**	**5,121,814**	**14.52 (12.76, 16.28)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Two or More Product Use	**12,261**	**81,144,450**	**40.33 (39.02, 41.65)**	**799**	**5,885,655**	**16.69 (14.93, 18.44)**	
Wave 4							
No ATP Use	**5,210**	**81,265,378**	**40.39 (38.86, 41.93)**	**1,163**	**23,797,424**	**67.46 (65.30, 69.63)**	**<0.0001**
Single Product Use	**3,939**	**36,913,530**	**18.35 (17.34, 19.16)**	**495**	**5,347,755**	**15.16 (13.41, 16.91)**	
Two or More Product Use	**12,610**	**83,004,444**	**41.26 (39.92, 42.60)**	**849**	**6,129,544**	**17.38 (15.60, 19.16)**	

1. Only complete cases were used for analyses. Sum of unweighted sample size in each variables may not be equal to the total number of each group's sample size due to different number of missing cases in each variables.

2. Adult respondents who used any ATPs (e-cigarettes, cigars, cigarillos, filtered cigars, pipe, hookah, snus and other smokeless tobacco products) within past 30 days. Those who use multiple products were counted as one case.

3. Each category includes all tobacco product users who use each form of tobacco product irrespective of other tobacco product use including conventional cigarettes

4. Adult respondents who ever used any ATPs. Those who use multiple products were counted as one case.

†Significant percentages ($p<0.05$) are presented in boldface.

Table 1.2. *Population Characteristics of U.S. Foreign-born Residents by ATP Use Status: Waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study*

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Wave 3								
Gender								
Female	**125**	**633,921**	**31.61 (23.94, 39.27)**	**<.0001**	**582**	**4,264,297**	**37.15 (33.59,40.72)**	**<.0001**
Male	**200**	**1,371,807**	**68.39 (60.7, 76.06)**		**762**	**7,213,003**	**62.85 (59.29,66.41)**	
Age								
18-29	**173**	**791,242**	**39.45 (31.19, 47.71)**	**<.0001**	**536**	**2,739,036**	**23.86 (20.83,26.90)**	**<.0001**
30-39	**56**	**393,790**	**19.63 (14.02, 25.25)**		**302**	**2,998,002**	**26.12 (22.90,29.34)**	
40-49	**40**	**378,461**	**18.87 (11.39, 26.35)**		**225**	**2,570,969**	**22.40 (18.91,25.89)**	
50-59	**27**	**19,1313**	**9.54 (6.50, 12.58)**		**149**	**1,630,411**	**14.21 (11.27,17.14)**	
60+	**29**	**250,923**	**12.51 (6.57, 18.46)**		**132**	**1,538,881**	**13.41 (10.07,16.75)**	

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Marital Status								
Never married	**176**	**893,182**	**45.84 (38.40, 53.29)**	**<.0001**	**531**	**3,128,888**	**27.76 (24.56, 30.96)**	**<.0001**
Married	**96**	**784,411**	**40.26 (32.80, 47.72)**		**597**	**6,359,287**	**56.42 (52.78,60.05)**	
Widowed/Divorced/Separated	**46**	**270,714**	**13.89 (9.70, 18.09)**		**197**	**1,783,435**	**15.82 (12.49, 19.16)**	
Race								
White race alone	184	1,115,822	60.34 (52.19, 68.48)	0.4734	781	6,333,446	60.32 (55.39, 65.25)	0.1165
Black race alone	43	215,824	11.67 (8.08, 15.26)		126	945,194	9.00 (6.86, 11.14)	
Asian race alone	39	420,125	22.72 (15.62, 29.82)		196	2,556,984	24.35 (19.85, 28.86)	
Other race, including multi-racial	31	97,547	5.27 (2.96, 7.59)		114	664,820	6.33 (4.64, 8.02)	
Education Level								
Less than high school	**16**	**89,394**	**4.50 (1.59, 7.4)**	**0.0013**	**88**	**746,201**	**6.52 (4.60, 8.44)**	**<.0001**
High school equivalent	**134**	**751,169**	**37.79 (31.27, 44.30)**		**482**	**3,564,330**	**31.15 (27.26, 35.04)**	
Associate degree or some college	**99**	**62,1744**	**31.28 (23.44, 39.11)**		**384**	**3,229,668**	**28.22 (24.46, 32.00)**	
Bachelor's degree	**50**	**331,712**	**16.69 (11.87, 21.51)**		**216**	**2,261,102**	**19.76 (16.24, 23.28)**	
Master's/Professional/Doctoral degree	**23**	**193,788**	**9.75 (5.18, 14.32)**		**168**	**1,641,835**	**14.35 (11.27, 17.43)**	

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Household Income								
$50,000 or below	96	670,150	36.19 (30.20, 42.17)	0.3897	**453**	**5,000,914**	**47.38 (43.08, 51.69)**	**<.0001**
Above $50,000	208	1,181,828	63.81 (57.83, 69.80)		**802**	**5,553,350**	**52.62 (48.31, 56.92)**	
Acculturation								
Duration in the U.S.								
10 years or less	93	575,539	28.69 (21.43, 35.96)	0.3181	355	2,702,022	23.54 (19.63, 27.46)	0.9712
11-20 years	120	613,237	30.57 (24.80, 36.35)		489	3,604,679	31.41 (27.83, 34.99)	
20 years or more	112	816,953	40.73 (32.63, 48.83)		500	5,170,598	45.05 (40.51, 49.59)	
Age at Migration								
Before age 18	**202**	**1,043,450**	**52.60 (45.73, 59.46)**	**<.0001**	**716**	**4,816,830**	**42.16 (38.37, 45.95)**	**<.0001**
At age 18 and After	**118**	**940,365**	**47.40 (40.54, 54.27)**		**617**	**6,608,510**	**57.84 (54.05, 61.63)**	
Language Spoken at Home								
English	88	475,941	23.73 (18.82, 28.64)	0.4312	**337**	**319,1369**	**27.86 (23.58, 32.14)**	**0.0006**
Non-English (Other language)	237	1,529,787	76.27 (71.36, 81.18)		**1,004**	**8,263,601**	**72.14 (67.86, 76.42)**	

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
English Proficiency								
Proficient in English	262	1,412,203	70.41 (62.44, 78.39)	0.0543[2]	**1,050**	**8,700,415**	**75.81 (72.39, 79.22)**	**<.0001**
Limited in English	63	593,525	29.59 (21.61, 37.57)		**294**	**2,776,884**	**24.19 (20.78, 27.61)**	
Harm Perceptions								
Harmfulness of ATPs to health								
Not at all harmful or Somewhat harmful	**117**	**719,577**	**35.88 (30.10, 41.65)**	**<.0001**	**338**	**2,451,072**	**21.36 (18.59, 24.12)**	**0.0137**
Very or Extremely harmful	**208**	**1,286,152**	**64.12 (58.35, 69.90)**		**1006**	**9,026,227**	**78.64 (75.88, 81.41)**	
Harmfulness of ATPs for some day use								
No, a little or some harm	**194**	**1,186,094**	**62.64 (55.70, 69.57)**	**<.0001**	**717**	**5,659,853**	**52.01 (48.01, 56.01)**	**0.0005**
A lot of harm	**111**	**707,548**	**37.36 (30.43, 44.30)**		**553**	**5,222,594**	**47.99 (43.99, 51.99)**	
Harmfulness of APTs compared to cigarette								
Less Harmful	**24**	**164,750**	**8.21 (4.64, 11.78)**	**0.0045**	68	592,461	5.17 (3.10, 7.23)	0.1227
About the same or more harmful	**301**	**1,840,978**	**91.79 (88.22, 95.36)**		1,276	10,884,838	94.84 (92.77, 96.90)	

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Peer/Family Influence (Yes/No)								
Had important people in their lives who used or smoked any ATPs	**151**	**936,668**	**47.02 (39.98,54.07)**	**<.0001**	**627**	**4,982,725**	**43.78 (39.63, 47.93)**	**<.0001**
Cigarette smoking status (Yes/No)								
Ever smoked cigarettes								
Wave 3	**278**	**1,711,457**	**85.39 (79.43, 91.36)**	**<.0001**	**1,128**	**9,785,709**	**85.49 (82.82, 88.16)**	**<.0001**
Wave 4	**287**	**1,748,854**	**87.26 (81.55, 92.97)**	**<.0001**	**1,145**	**9,893,209**	**86.46 (83.96, 88.96)**	**<.0001**

1. Only complete cases were used for analyses. Sum of unweighted sample size in each variables may not be equal to the total sample size of each group due to different number of missing cases in each variables.

2. Borderline significance

†Significant percentages ($p<0.05$) are presented in boldface.

Table 1.3. *Adjusted Odds Ratio of Acculturation Predicting Harm Perceptions Among Foreign-Born Residents*

	Harm Perceptions					
	Harmfulness of ATPs to health (N=2,507)		*Harmfulness of ATPs for some day use* (N= 2,507)		*Harmfulness of ATPs compared to cigarettes* (N= 2,507)	
	AOR[1] (95% CI)	**P-Value**	**AOR[1] (95% CI)**	**P-Value**	**AOR[1] (95% CI)**	**P-Value**
Acculturation						
Age at Migration						
Before Age 18			ref[2]			
At Age 18 and After	**1.33 (1.05, 1.68)**	**0.0166**	1.15 (0.95, 1.37)	0.1502	1.25 (0.76, 2.70)	0.3818
Language Spoken at Home						
English			ref			
Non-English (Other language)	1.27 (1.03, 1.56)	0.0232	0.95 (0.77, 1.17)	0.5943	1.08 (0.61, 1.91)	0.8006
English Proficiency						
Proficient in English			ref			
Limited in English	**1.44 (1.02, 2.03)**	**0.0369**	1.05 (0.82, 1.36)	0.6647	1.48 (0.79, 2.74)	0.2164

1. Adjusted with sex, age, marital status, educational attainment, household income and W3 and W4 cigarette smoking status
2. ref = reference group

†Significant AORs ($p<0.05$) are presented in boldface.

Table 1.4. *Adjusted Odds Ratio of Acculturation, Harm perceptions, and Peer/Family Influence, Predicting ATP Use Among Foreign-Born Residents*

	Wave 4			
	Current ATP Use (N=325)		**Ever ATP Use (N=1,344)**	
Wave 3	AOR[1] (95% CI)	P-value	AOR[2] (95% CI)	P-value
Acculturation				
Age at Migration				
Before age 18		ref[3]		
At age 18 and after	**0.60 (0.42, 0.86)**	**0.0066**	**0.45 (0.33, 0.63)**	**<.0001**
Language Spoken at Home				
English			ref	
Non-English (Other languages)	NA[4]	NA	0.71 (0.47, 1.05)	0.0878
English Proficiency				
Proficient in English		ref		
Limited in English	0.94 (0.56, 1.60)	0.8261	**0.43 (0.30, 0.61)**	**<.0001**
Harm Perceptions				
Harmfulness of ATPs to health				
Very or extremely harmful		ref		
Not at all harmful or Somewhat harmful	**2.66 (1.93, 3.67)**	**<.0001**	1.29 (0.92, 1.79)	0.1358
Harmfulness of ATPs for some day use				
A lot of harm		ref		
No, a little or some harm	**1.69 (1.19, 2.40)**	**0.0041**	1.09 (0.82, 1.44)	0.5633
Harmfulness of APTs compared to cigarette				
About the same or more harmful	ref			
Less Harmful	**2.34 (1.24, 4.42)**	**0.0093**	NA	NA
Peer/Family Influence				
Had important people in their lives who used or smoked any ATPs				
No		ref		
Yes	**1.83 (1.27, 2.64)**	**0.0015**	**1.65 (1.22, 2.24)**	**0.0014**

1. Adjusted with sex, age, marital status, educational attainment and W3 and W4 cigarette smoking status

2. Adjusted with sex, age, marital status, educational attainment, household income and W3 and W4 cigarette smoking status

3. ref = reference group

4. Adjusted odds ratio was examined only if significant differences exist between predictor and outcome variables.

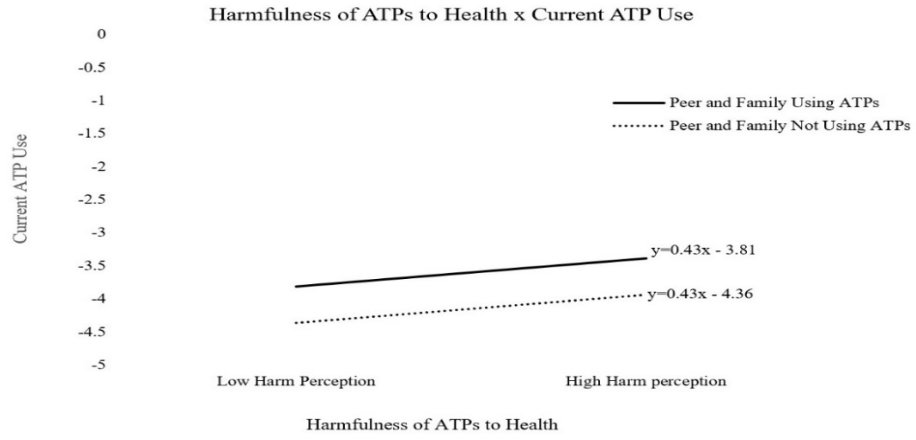
5. Significant AORs ($p<0.05$) are presented in boldface.

Table 1.5. *Moderation Analyses on Current ATP Use Among Foreign-Born Residents (Harm Perceptions to Health* X *Peer/ Family Use of ATPs)*

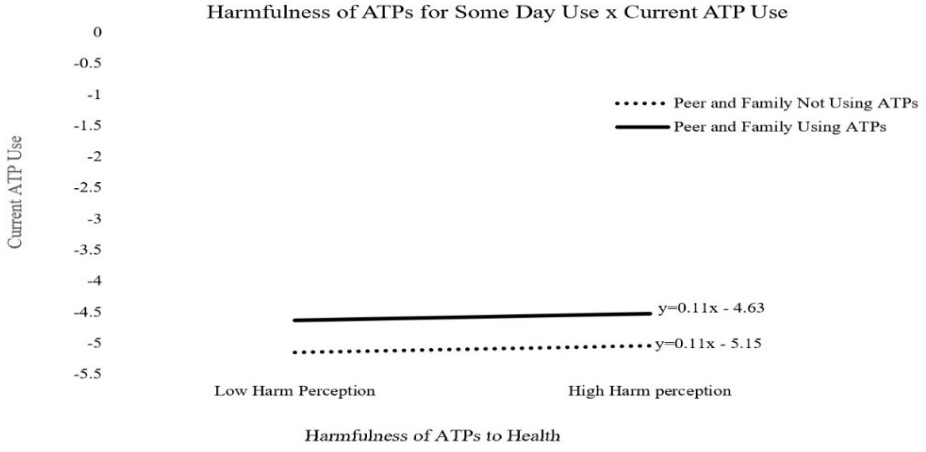
Independent Variables:	Estimate (*b*)	Test of Interaction Term		
		Standard Error (SE)	t-value (t)	P-value
*Harm Perceptions to Health * Peer/ Family Use of ATPs*				
Constant	-4.36	0.52	-8.36	<.0001
Harm perceptions to health	0.43	0.11	3.90	0.0002
Peer and Family use of ATPs	0.55	0.18	3.00	0.0034
Interaction term	0.070	0.18	0.40	0.6910
*Harm perceptions for some day ATP use * Peer/ Family Use of ATPs*				
Constant	-5.15	0.51	-10.08	<.0001
Harm perceptions for some day ATP use	0.11	0.14	0.84	0.4043
Peer and Family use of ATPs	0.52	0.19	2.66	0.0093
Interaction term	0.25	0.17	1.51	0.1348
*Harm perceptions Compared to Cigarettes * Peer and Family Use of ATPs*				
Constant	-5.06	0.54	-9.43	<.0001
Harm perceptions compared to cigarettes	0.16	0.25	0.65	0.5176
Peer and Family use of ATPs	0.85	0.30	2.89	0.0047
Interaction term	0.31	0.31	1.02	0.3096

Note. All logistic regression models were adjusted for sex, age, marital status, educational attainment, lifetime cigarette smoking status at Waves 3 and 4

(a)



(b)



(c)

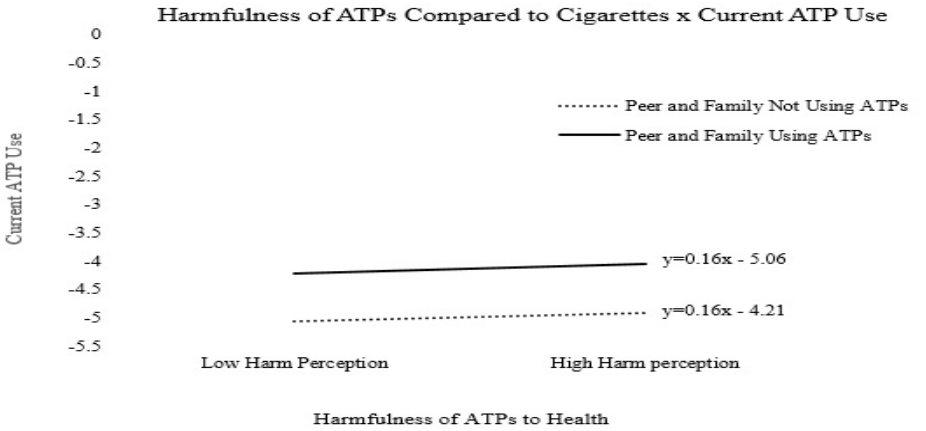
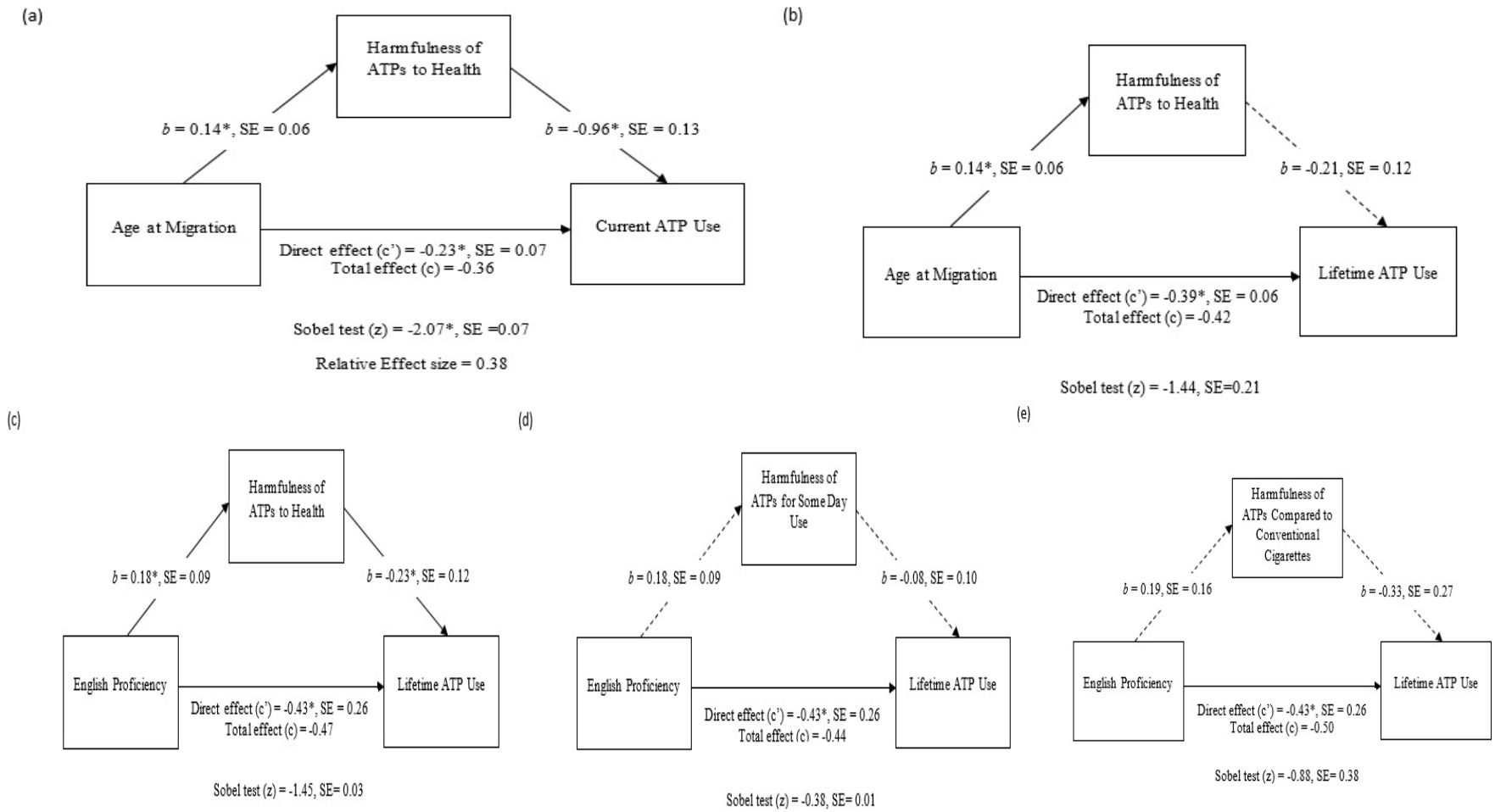


Figure 1.1. *Moderating Effect of Peer/ Family Use of ATPs on Harm Perceptions and Current ATP Use Among Foreign-Born Residents*



* $p<0.05$
b = Estimates
SE = Standard error
Note. All logistic regression models were adjusted for sex, age, marital status, educational attainment, lifetime cigarette smoking status at Waves 3 and 4

Figure 1.2. *Tests of Mediation Models with Acculturation as the Independent Variable and Harm Perceptions as the Mediator*

Chapter 4: Study 2 - The Influence of Acculturation, Peer Tobacco Product Use and Marketing Exposure on Alternative Tobacco Product Use among U.S. Foreign-born Residents

4.1 Introduction

Tobacco marketing has expanded from conventional cigarettes to other tobacco products. For example, e-cigarette advertising and promotion by domestic e-cigarette manufacturers has increased more than threefold between 2015 and 2018, from $197.8 million to $643.6 million, according to the Federal Trade Commission (FTC) E-cigarette Report (U.S. Federal Trade Commission, 2022). The same report also found that domestic e-cigarette manufactures' spending on sampling and the distribution of free and deeply discounted e-cigarette products has more than doubled over three years between 2015 and 2018, from $23.0 million to $58.2 million (U.S. Federal Trade Commission, 2022). Moreover, U.S. smokeless tobacco companies have a long history of promoting their tobacco products to young adults (Mantey et al., 2019; Qian et al., 2021). Currently, alternative tobacco products (ATPs) have no or fewer marketing restrictions. Therefore, tobacco companies use different tactics, such as sponsoring sporting, musical or cultural events, opening pop-up shops, sending coupons or flash event alert via e-mail and creating social media pages and websites to expand marketing and promotion of non-cigarette products (Truth Initiative, 2018).

Additionally, tobacco companies have a long history of targeting certain ethnic and minority groups (Carroll et al., 2020; Fellows & Rubin, 2006; Iglesias-Rios & Parascandola, 2013; Moran et al., 2019). These tobacco companies have used culture- and ethnic-specific targeted marketing strategies to attract different racial and ethnic groups. For example, the

tobacco company promoted certain conventional cigarette brands to Hispanic and American Indians/Alaska Natives (U.S. Department of Health and Human Services, 2014). Tobacco companies have targeted African-Americans by providing price promotion, such as sweepstakes, free samples, price discounts and coupons for menthol cigarette and cigar products (Moran et al., 2019; Ribisl et al., 2017). Tobacco companies also have marketed tobacco products to Asian Americans by emphasizing collective identities and providing financial support to the Asian communities, such as financial contributions to Asian community organizations, sponsorship of cultural and business events, and supporting for Asian American business associations (Fellows & Rubin, 2006; U.S. Department of Health and Human Services, 2014).

Evidence from past studies is strong that tobacco product marketing contributes to tobacco product use among adolescents and adults (Chen-Sankey et al., 2019; Cruz et al., 2019; Lienemann et al., 2019; Mantey et al., 2019). For example, a study suggested that exposure to e-cigarette marketing was associated with subsequent e-cigarette experimentation (Chen-Sankey et al., 2019). Exposure to marketing of e-cigarettes, hookahs, cigars, smokeless tobacco, and pipes in stores was associated with use initiation of those products (Cruz et al., 2019). Another study suggested that exposure to coupons, sweepstakes and free samples played an important role in African Americans' tobacco product use (Moran et al., 2019).

Tobacco product use behaviors are complex. Many factors, such as individual harm perceptions, attitudes, beliefs, social and community environment, culture, and policy, contribute to tobacco use behaviors. Although many past studies examined the relationship between tobacco marketing exposure and subsequent tobacco product use, very little information is known about the impact of ATP marketing on ATP use among foreign-born adult residents. Investigating how acculturation, social factors, and ATP marketing strategies influence this

population may help reducing tobacco-related health disparities. The purpose of study two is to examine the influence of acculturation, peer and family use of ATPs, ATP advertisement, marketing, and promotion exposure on ATP use (i.e., e-cigarettes, hookah, smokeless tobacco, pipe, and cigars including traditional cigars, little cigars, and cigarillos) among U.S. foreign-born residents who are 18 years and older (n=2,507) using de-identified, restricted-use data from Waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study. The specific objectives of this study were to (1) examine the relationship between acculturation, peer and family use of ATPs, and ATP use among U.S. foreign-born residents, (2) examine the relationship between acculturation, ATP advertisement, marketing and promotion exposure, and ATP use among U.S. foreign-born residents, and (3) identify whether peer and family use of tobacco products moderates the association between ATP advertisement, marketing and promotion exposure, and ATP use among U.S. foreign-born residents.

4.2 Methods

4.2.1. Study Population

This study was conducted using PATH Study Wave 3 (2015-2016) and Wave 4 (2016-2018) adult data. Individuals who responded as being a "U.S. citizen by naturalization" and "Not a [U.S.] Citizen" to the citizenship question were selected. As a result, the final analysis included 2,507 foreign-born adult residents with 1,144 naturalized U.S. citizens and 1,357 U.S. residents but not U.S. citizens. Sub-samples of currently use ATPs (N=325) and ever used ATPs (N=1,344) at Wave 4 were used for analyses. The replenishment sample respondents at Wave 4 were not included in this study.

4.2.2. Sampling Procedure

The sampling procedure for this study is the same as the sampling procedure for study one since both study one and study two use the same dataset (refer to section 3.2.3.). The sampling procedures for the PATH Study are described in the PATH Study Restricted Files User Guide from the National Addiction & HIV Data Archive Program (NAHDAP) website (https://www.icpsr.umich.edu/files/NAHDAP/documentation/ug36231-all_REST.pdf). The PATH Study sample was selected using a four-stage, stratified probability sample design. Data from Wave 3 of the PATH Study were collected between October 19, 2015 and October 13, 2016. At Wave 3, respondents from wave 1 were selected and interviewed. All respondents from Wave 1 were eligible for the Wave 3 interview as long as they were still residents of the U.S. and were not incarcerated. Data from Wave 4 of the PATH Study were collected between December 1, 2016 and January 3, 2018. At Wave 4, participants were selected using a probability sample at Wave 1 and a probability replenishment sample at the time of wave 4. In this study, only the adult samples who were 18 years and older at both Waves 3 and 4 were included in the study.

4.2.3. Validity and Reliability of Measures

The procedure for validation and reliability of questionnaires used in this study is the same as in study one (refer to section 3.2.4.). Items in the PATH Study were adapted from well-established existing national surveys, such as the Tobacco Use Supplement to the Current Population Survey (TUS-CPS), the National Epidemiological Survey on Alcohol and Related Conditions Survey, the National Health and Nutrition Examination Survey (NHANES), the Global Appraisal of Individual Needs (GAIN), and the Patient Reported Outcomes Measurement Information System (PROMIS) (Hyland et al., 2017). Some items were adapted from

international, state, and privately funded tobacco surveillance surveys, such as the ITC Project, the Visual Media Influences on Adolescent and Young Adult Smoking Behaviour surveys, and the Minnesota Adult Tobacco Survey (Hyland et al., 2017). Researchers at Westat conducted a series of cognitive tests, with more than 500 respondents from the PATH Study over two weeks, to validate responses for the survey instrument (Westat, 2019).

4.2.4. Measures

Acculturation (Wave 3)

Acculturation was assessed using the four items, including duration in the U.S., age at migration, language spoken at home and English proficiency at Wave 3. Each item was assessed separately.

Duration in the U.S.

Duration in the U.S. was assessed using the question: "About how many years have you lived in the United States?" Initial responses were continuous responses with the number of years lived in the U.S. This variable was re-coded and categorized as *10 years or less*=1, *11-20 years*=2 and *20 years and more*=3 after the examination of the sample distribution.

Age at migration

Age at migration was derived from two existing variables. It was calculated by subtracting duration in the U.S. from age at the time of the interview. Then, this derived variable was re-coded into binary categories (*before age 18* vs. *at age 18 and after*).

Language spoken at home

Language spoken at home was assessed using a question: "Do you speak a language other than English at home?" The initial responses were binary (*yes* and *no*). The variable was re-coded into *English* and *other Languages* with those who responded *yes* categorized into *other languages*, and those who responded *no* categorized into *English*.

English proficiency

English proficiency was assessed using three questions: "How well do you speak English?", "How well do you read English?", and "How well do you write English?" Initial responses were 4-level responses (*very well*=1/*well*=2/*not well*=3/*not at all*=4). The new variable was created by calculating the mean score of these three items, then responses with a mean less than 3 were re-coded into *proficient in English*, and responses with a mean above 3 or equal to 3 were re-coded into *limited in English*.

Peer and Family Influence (Wave 3)

Peer and family influence was assessed using one item at Wave 3, "Think about people who are important to you, do any of them use any of the following products?" Respondents marked each tobacco product used. Then, the new variable for responses were re-coded into binary responses (*yes* vs. *no*). If respondents marked any ATPs in the response, they were categorized into *yes*. If they did not mark anything, they were categorized into *no*.

Marketing Exposure (Wave 3)

Marketing exposure was assessed using three items related to marketing exposure at Wave 3, "In the past 30 days, have you noticed [types of ATPs] being advertised in any of the following places?", "In the past 12 months, have you seen [types of ATPs: e-cigarettes, cigars/cigarillos/little cigars, hookah, snus, and smokeless tobacco] advertisements in stores where tobacco is sold?", and "Have you received coupons for the following tobacco products: [types of tobacco products]?" The new variables were created to collapse sub-questions of each ATP for each item related to marketing exposure. Respondents who responded *yes* to each sub-questions were coded into *yes* in newly created variables, and respondents who responded *no* to each sub-question were coded into *no* in newly created variables.

ATP Use (Wave 4)

Two variables in the study included self-reported current and ever use of ATPs.

Current ATP use

Current ATP use was assessed based on derived variables for adults who used each ATP within the past 30 day at wave 4. Seven variables for each ATP were collapsed into a single variable because sample size of some ATPs were too small and estimates of each ATP use were not statistically reliable. Initial responses were binary (*yes* vs. *no*). Respondents who had smoked or used any ATPs within the past 30 days were categorized into *yes* in the combined variable, and respondents who had not smoked or used ATPs within the past 30 days were categorized into *no*.

Lifetime ATP use (Wave 4)

Lifetime ATP use was assessed using derived variables for adults who ever used each tobacco product at Wave 4. Seven variables for each tobacco product were collapsed into a single variable because sample size of some ATPs were too small and estimates of each ATP use were not statistically reliable. Responses were binary (*yes* vs. *no*). Respondents who had ever smoked or used any ATPs were categorized into *yes* in the combined variable, and respondents who had not ever smoked or used ATPs were categorized into *no*.

Control variables

Key socioeconomic covariates of this study included sex, age, marital status, race, educational attainment, household income, and past 12-month cigarette smoking status at Waves 3 and 4. Selection of these measures was based on covariates tested in a past study investigating tobacco product use among U.S. adults (Creamer et al., 2019; Fong et al., 2019). Sex was coded into the binary response (Male vs. Female). Age was recoded into a 5-category response (*18-29*=1, *30-39*=2, *40-49*=3, *50-59*=4, and *60+*=5). Marital status was re-coded into 3-level responses (*never*

married=1, *married*=2, and *widowed/divorced/separated*=3). Race was coded into 4-level responses (*White race alone*=1, *Black race alone*=2, *Asian race alone*=3, and *other race, including multi-racial*=4). Educational attainment was re-coded into 5-level responses (*less than high school*=1, *high school equivalent*=2, *associate degree or some college*=3, *bachelor's degree*=4, and *master's/professional/doctoral degree*=5). Cigarette smoking status at Waves 3 and 4 were re-coded into the binary response (*yes* vs. *no*).

4.2.5. Study Procedure

The study procedure for this study is the same as in study one (refer to section 3.2.6.). Waves 3 and 4 of the PATH restricted-use files were requested from NAHDAP. All analyses were done within the Virtual Data Enclave (VDE) system. The VDE allows researchers to launch a virtual machine on their own desktop but operates from a server at the Inter-university Consortium for Political and Social Research (ICPSR). Data files and software remain on the ICPSR server. In the VDE, Waves 3 and 4 data were combined. The combined data were cleaned and re-coded into new response categories, and new variables were created as necessary (Appendix A). After the data cleaning procedure, data analyses were completed. The principal investigator (PI) submitted a request to obtain generated outputs within the VDE for the final review of output to be used in the study. Upon review by NAHDAP staff, the approved output was sent to the PI. The results of the analyses in this study are presented with tables and graphs.

4.2.6. Data Analyses

Data from Waves 3 and 4 of the PATH Study were combined into one data file. Distribution of samples and characteristics among all adult samples at Wave 3 were examined according to the U.S. citizenship status groups at Wave 3 and ATP use status groups (ATP

current use and ATP ever use) at Wave 4. The bivariate analyses using chi-square tests were then performed to determine statistical significance between Wave 3 predictors (acculturation, peer and family influence, and ATP marketing exposure) and Wave 4 ATP use status groups (current ATP use and lifetime ATP use). Then, multivariate logistic regression analyses were conducted to examine the association between acculturation at Wave 3 and ATP use at Wave 4, between peer and family use at Wave 3 and ATP use at Wave 4, and between ATP marketing exposure and ATP use. All estimates were weighted to represent the U.S. adult population. The full-sample weight (Wave 4 adult all-wave weights) of the sample and sample design stratification variables (PSU, strata) were included in all models. Covariates, including gender, age, race, education, household income and cigarette smoking status at Waves 3 and 4, were examined to determine if any of these variables had a relationship with current and lifetime ATP use. Those variables that had significant relationships with current and lifetime ATP use were controlled in each final logistic regression model.

Next, we conducted moderation analysis to determine if peer and family use of tobacco products moderates the relationship between ATP advertisement, marketing and promotion exposure, and lifetime ATP use. Lifetime ATP use was significantly related to ATP discount or coupon exposure, thus this logistic regression model was selected for moderation analysis. In the moderation analysis, peer and family use of tobacco product variable at Wave 3 and the interaction term were included in a logistic regression model predicting lifetime ATP use at Wave 4 from ATP discount or coupon exposure at Wave 3. The new logistic regression model with the interaction terms was tested and checked for a significant R^2 change and a significant effect by the new interaction term.

Lastly, we conducted several mediation analyses to test if peer and family tobacco use mediates the relationship between acculturation and ATP use and if ATP marketing exposure mediates the relationship between acculturation and ATP use. ATP use measures that were significantly related to acculturation measures were selected for mediation analyses. The study used a modified Sobel's test approach adopted from previous studies (Baron & Kenny, 1986; MacKinnon et al., 2007; Pham et al., 2021; Rijnhart et al., 2019; VanderWeele & Vansteelandt, 2010). In the first step, the estimated effect of independent variables (age at migration, language spoken at home, or English proficiency) on ATP use (current and lifetime ATP use) were examined. Next, the effect of the independent variables on the mediator (peer and family using ATPs and receiving discounts or coupons) were examined. Acculturation measures that were significantly related to the mediator were selected for the next step. In the third step, the estimated effect of the independent variable and the mediator on the dependent variable was examined. In the next step, indirect effect and total effect were calculated. Then Sobel's test statistic was computed, and the significance of the test was evaluated. Lastly, the relative effect size (the proportion of total mediated effect) was calculated. Using Bootstrapping with 100 repetition, correct standard errors were obtained for all logistic models (Bleser et al., 2016; Buis, 2010; Morera & Castro, 2013; Preacher & Hayes, 2004; SAS Institute Inc., 2013). All statistical data analyses for the study were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC). *Proc surveyfreq* were used for bivariate analyses and *proc surveylogistic* procedures were used for logistic regressions. The full-sample weight and 100 replicate weights were used directly in the *proc surveylogistic* procedure when fitting the model to adjust for the complex sample design and nonresponse. Respondents with missing data were interpreted as missing completely at random (MCAR), thus, the analyses included samples with complete data only. The Wave 4

replenishment sample respondents were not included in this study because these respondents were not included in data at Wave 3. As a result, 378 missing cases were identified and excluded from the initial 2,885 foreign-born residents.

4.3 Results

4.3.1. Descriptive Characteristics

Table 2.1 shows the characteristics of U.S.-born and foreign-born residents. Compared to the U.S. born counterpart (63.41%), foreign-born residents (48.92%) were less exposed to tobacco product advertisements in the past 30 days. About 42.81% of U.S.-born residents had seen tobacco product advertisement at the stores where tobacco is sold, and about 34.20% of foreign-born residents had seen tobacco product advertisement at the stores where tobacco is sold. About 6.00% of foreign-born residents received discounts or coupons for any of ATPs in the past 12 months before the interview, and 16.90% of U.S.-born received discounts or coupons for any of ATPs ($p<0.05$). Table 2.2 shows the probabilities and the results of chi-square tests of ATP advertisement, marketing, and promotion exposure on current ATP use and lifetime ATP use among foreign-born residents. Of 325 individuals who currently used ATPs at Wave 4, about 57.37% had seen ATP advertisements in the past 30 days, about 42.55% of them had seen ATP advertisement at the stores where tobacco is sold, and 9.98% received discounts or coupons for any of ATPs at Wave 3. Of 1,344 individuals who had ever used ATPs at Wave 4, about 55.38% had seen ATP advertisements in the past 30 days, about 41.28% had seen ATP advertisement at the stores where tobacco is sold, and about 10.46% received discounts or coupons for any of the ATPs at Wave 3. Highlights of other sample characteristics are described in study one (Section 3.3.1.).

4.3.2. Results of Multivariate Logistic Regression Analyses

Table 2.3 describes the association between acculturation measures and peer and family influence and between acculturation measures and ATP advertisement, marketing, and promotion exposure. Foreign-born residents who migrated to the U.S. at age 18 and after had lower adjusted odds of having peer and family who used or smoked any ATPs (AOR=0.77, 95% CI=0.61, 0.97) than foreign-born residents who migrated before age 18. Foreign-born residents who were limited in English had lower adjusted odds of having peer and family in their lives who used or smoked any ATPs (AOR=0.66, 95% CI=0.53, 0.83) than foreign-born residents who were proficient in English. Foreign-born residents who spoke other languages at home other than English had lower adjusted odds of receiving discounts or coupons (AOR=0.64, 95% CI=0.45, 0.90) than those who spoke English at home. Foreign-born residents who were limited in English had lower adjusted odds of receiving discounts or coupons (AOR=0.46, 95% CI=0.32, 0.67) than foreign-born residents who were proficient in English. All logistic regression models were adjusted with covariates.

Table 2.4 describes the association between peer and family influence and ATP use and the association between ATP advertisement, marketing, and promotion exposure and ATP use. After controlling for covariates, foreign-born residents who had important people in their lives who used or smoked any ATPs had higher adjusted odds of currently using ATPs (AOR=1.83, 95% CI=1.27, 2.64) than foreign-born residents who had important people in their lives who did not use or smoke ATPs. Foreign-born residents who had important people in their lives who used or smoked any ATPs had higher adjusted odds of ever using ATPs (AOR=1.61, 95% CI=1.19, 2.18, $p<0.05$) than foreign-born residents who had important people in their lives who did not use or smoke any ATPs. Foreign-born samples who received discounts or coupons had higher

adjusted odds of ever using ATPs (AOR=2.16, 95% CI=1.28, 3.63, p<0.05) than foreign-born residents who did not receive discounts or coupons. Additionally, the results of the association between acculturation and ATP use are reported in results section of the study one (section 3.3.3.).

4.3.3. Moderation Effects of Peer and Family Use of ATPs

Results of the logistic regression model between received discounts or coupons and lifetime ATP use showed significant association. We examined the logistic regression model between received discounts or coupons and lifetime ATP use to test the hypothesis that peer and family use of ATPs moderates the relationship between ATP marketing exposure and ATP use. (Table 2.5). Interaction plots for this logistic regression model were also examined (Figure 1.1).

In the first step, two variables, including received discounts or coupons and peer and family influence, were included in a logistic regression model. Received discounts or coupons (*b*= -0.32, SE= 0.14, t= -2.26, p= 0.026) negatively predicted current ATP use. Individuals who had important people in their lives who used or smoked any ATPs also positively predicted lifetime ATP use in the logistic regression model (*b*= 0.45, SE= 0.16, t= 2.8, p= 0.006). Next, the interaction term between harm perceptions and peer and family influence was added to the logistic regression model. Overall, the results revealed no significant moderating role of peer and family use of ATPs on the relationship between harm perceptions and ATP current use (*b*= 0.45, SE= 0.28, t= 1.69, p= 0.094). Examination of the interaction plots in Figure 1.1 showed the parallel and negative gradient for peer and family using ATPs (Yes) and peer and family not using ATPs (No).

4.3.4. Mediation Effect of Peer and Family Use of ATPs

Figure 2.2 shows the results of the mediating effect of peer and family use of ATPs on acculturation and ATP use. The logistic regression model with ATP use measures that were significantly related to acculturation measures were selected for the mediation analysis. All logistic regression models were adjusted with covariates. In the first mediation analysis, the estimated effect of age at migration on current ATP use, ignoring the mediator (harm perceptions), was statistically significant (b= -0.26, t= -3.95, p= 0.0001). The estimated effect of age at migration on peer and family use of ATPs was also statistically significant (b= -0.15, t= -2.80, p= 0.006). The estimated effect of age at migration on current ATP use in the presence of peer and family use of ATPs was statistically significant with a reduction in significance level (b= -0.25, t= -3.79, p= 0.0003). Conducting Sobel's test, we found that the test statistic was also statistically significant (z= -2.38, $p<0.05$). Results revealed the partial mediating role of harmfulness of ATPs to health on the relationship between age at migration at Wave 3 and current ATP use at Wave 4. The relative effect size was 0.26. In the second mediation testing, the mediating effect of peer and family use of ATPs on age at migration and lifetime ATP use was tested. The estimated effect of age at migration on lifetime ATP use without peer and family use of ATPs was statistically significant (b= -0.40, t= -6.77, $p<0.0001$), and the estimated effect of age at migration on peer and family use of ATPs was statistically significant (b = -0.14, t= -2.51, p= 0.014). The estimated effect of age at migration on lifetime ATP use in the presence of peer and family use of ATPs was statistically significant (b= -0.76, t= -6.21, $p<0.0001$). Sobel's test statistic was statistically significant (z= -2.11, p= 0.035). Therefore, peer and family use of ATPs partially mediates the relationship between age at migration and lifetime ATP use. The relative effect size was 0.04. In the third mediation analysis, the mediating effect of peer and family use of ATPs on language spoken at home and lifetime ATP use was tested. The estimated

effect of language spoken at home on lifetime ATP use without harmfulness of ATPs to health was statistically significant (*b*= -0.17, t= -2.36, p= 0.020). The estimated effect of language spoken at home on peer and family use of ATPs was not statistically significant (*b*= -0.10, t= -1.61, p= 0.111). The estimated effect of language spoken at home on lifetime ATP use in the presence of peer and family use of ATPs was significant (*b*= -0.17, t= -2.22, p=0.029). Therefore, peer and family use of ATPs does not mediate the relationship between language spoken at home and lifetime ATP use. In the fourth mediation analysis, the mediating effect of peer and family use of ATPs on the relationship between English proficiency and lifetime ATP use was tested. The estimated effect of English proficiency on lifetime ATP use without peer and family use of ATPs was statistically significant. The estimated effect of English proficiency on peer and family use of ATPs was statistically significant (*b*= -0.21, t= -3.74, p=0.0003). The estimated effect of peer and family use of ATPs on lifetime ATP use in the presence of English proficiency was statistically significant (*b*= -0.42, t= -6.23, p<0.0001). Sobel's test statistic was statistically significant (z= -3.28, p= 0.001). Therefore, peer and family use of ATPs partially mediates the relationship between English proficiency and lifetime ATP use. The relative effect size was 0.26.

4.3.5. Mediation Effect of ATP Marketing Exposure

Figure 2.3 shows the results of the mediating effect of ATP advertisements, marketing, and promotion exposure on the relationship between acculturation and ATP use. In the first mediation analysis, the mediating effect of receiving discounts or coupons on the relationship between age at migration and current ATP use was tested. The estimated effect of age at migration on the current ATP use without the mediator, receiving discounts or coupons, was statistically significant. However, the estimated effect of age at migration on receiving discounts

or coupons, was not statistically significant (b = -0.18, t= -1.98, p= 0.050). The estimated effect of receiving discounts or coupons on current ATP use in the presence of age at migration was statistically significant (b= -0.26, t= -4.03, p=0.0001). Sobel's test statistic was not statistically significant (z= -0.44, p= 0.660). Thus, receiving discounts or coupons does not mediate the relationship between age at migration and current ATP use. In the second mediation analysis, the mediating effect of receiving discounts or coupons on the relationship between age at migration and lifetime ATP use was tested. The estimated effect of age at migration on lifetime ATP use without the mediator was statistically significant (b= -0.40, t= -6.77, p<0.0001). However, the estimated effect of age at migration on receiving discounts or coupons was not statistically significant (b= -0.18, t= -1.98, p= 0.050). The estimated effect of receiving discounts or coupons on lifetime ATP use in the presence of age at migration was statistically significant (b= -0.39, t= -6.72, p<0.0001). Sobel's test statistic was not statistically significant (z= -1.80, p= 0.072). Thus, receiving discounts or coupons does not mediate the relationship between age at migration and lifetime ATP use. In the third analysis, the mediating effect of receiving discounts or coupons on the relationship between language spoken at home and lifetime ATP use was tested. The estimated effect of language spoken at home on lifetime ATP use without receiving discounts or coupons was statistically significant (b= -0.17, t= -2.36, p= 0.020). The estimated effect of language spoken at home on receiving discounts or coupons was statistically significant (b= -0.22, t= -2.63, p= 0.010). The estimated effect of language spoken at home on lifetime ATP use in the presence of receiving discounts or coupons was statistically significant with the reduction in the significant level (b= -0.16, t= -2.19, p= 0.031). Then, we conducted Sobel's test and found that the test statistic was statistically significant (z= -2.24, p= 0.025). Results revealed the partial mediating role of receiving discounts or coupons on the relationship between language spoken at

home at Wave 3 and lifetime ATP use at Wave 4. The relative effect size was 0.50. In the fourth mediation analysis, the mediating effect of receiving discounts or coupons on the relationship between English proficiency and lifetime ATP use was examined. The estimated effect of English proficiency on lifetime ATP use without the mediator was statistically significant (b= -0.43, t= -6.47, p<0.0001). The estimated effect of English proficiency on receiving discounts or coupons was also statistically significant (b= -0.39, t= -4.06, p<0.0001). The estimated effect of English proficiency on lifetime ATP use in the presence of receiving discounts or coupons was statistically significant (b= -0.42, t= -6.28, p<0.0001). Then, we conducted Sobel's test and found that the test statistic was statistically significant (z= -2.81, p= 0.005). Results revealed that receiving discounts or coupons partially mediates the relationship between English proficiency and lifetime ATP use. The relative effect size was 0.39.

4.4 Discussion

4.4.1. Interpretation of results

The results of the study showed that almost half of foreign-born residents who currently or ever used ATP at Wave 4 had had important people in their lives who used or smoked any ATPs at Wave 3. Consistent with the results of bivariate analyses, the results of multivariate logistic regression also showed that individuals who had important people in their lives who used or smoked any ATPs at Wave 3 were more likely to currently and ever use ATPs at Wave 4 than those who had important people who did not use or smoke any ATPs. Consistent with past studies (Nicksic et al., 2019; Patel et al., 2016; Patel et al., 2019; Vu et al., 2018; Vitória et al., 2020), these results suggested that others use of ATPs may influence ATP use behaviors among U.S. foreign-born adults. Previous literature suggested that ATP use by others was likely to influence ATP use initiation during adolescence and young adulthood (Patel et al., 2016; Vitória

et al., 2020; Vu et al., 2018). Moreover, a study suggested that others' use of e-cigarette was the most popular reason for e-cigarette use among U.S. adults (Nicksic et al., 2019). The influence of other social factors, such as social support, social events, peer pressure, and others' perception toward ATPs, on individual tobacco use behaviors still needs to be investigated further to better understand the social influence on ATP use and to accurately interpret the results in the current study.

Findings in the current study indicated that foreign-born residents who spoke languages other than English at home and those who were limited in English were less likely to receive tobacco product discounts or coupons. English language barriers seem to protect them from ATP marketing exposure. One explanation for these findings is that these individuals might have difficulty navigating American media, social media, and websites written or spoken in English. Even if they were able to understand some English, they might not be culturally attracted to the contents or messages in tobacco advertisements, marketing, and promotions written or spoken in English.

The findings in the current study showed that more than half of foreign-born residents who currently or ever used ATPs were exposed to ATP advertisements at some places, including gas stations, convenience or other retail stores, on billboards, in newspapers or magazines, on radio, on television, at events, at nightclubs, in bars or at music concerts, or on websites and social media sites. Moreover, more than 40% of individuals who currently or ever used ATPs reported that they had seen tobacco product advertisements at the stores where tobacco is sold. About 10% of individuals who currently or ever using ATPs also reported that they received discounts or coupons. We found that having received discounts, or coupons was significantly associated with ever ATP use after adjusting for covariates. Prior studies suggest that exposure to

price promotions, such as coupons and discounts influenced tobacco product use behaviors among some racial minority groups (Carroll et al., 2020; Moran et al., 2019; Soneji et al., 2019). The results of the current study provide some evidence that price promotions may play a role in ATP use behaviors among racial and ethnic minority groups. One study suggested that receiving tobacco product coupons and more exposure to online tobacco marketing were associated with subsequent current ATP use among U.S. youth populations (Choi et al., 2020). It is possible that, like youths, U.S. foreign-born adults who use ATPs may also be price sensitive, although further investigations are needed to better understand this phenomenon.

Findings suggested that peer and family use of ATPs did not moderate the relationship between exposure to discounts or coupons and current and lifetime ATP use. However, peer and family use of ATPs partially mediated the association between age at migration and current ATP use and the association between age at migration and lifetime ATP use. As mentioned in study one, only one measure of peer and family influence was examined in the study. Further investigation is needed in order to better understand these results. Additionally, findings in the current study suggest that exposure to discounts or coupons partially mediates the association between language spoken at home and lifetime ATP use and the association between English proficiency and lifetime ATP use. It is possible that individuals who spoke other languages at home were less likely to be exposed to discounts or coupons due to limitations within English and cultural gaps, and in turn, were less likely to know about ATPs promotions and less likely to experiment or use ATP.

4.4.2. Strengths

This study is the first study to examine how peer and family influence, ATP marketing, and acculturation jointly influence ATP use among U.S. foreign-born adults using nationally

representative samples. The PATH Study is a longitudinal cohort study, thus, it is more reliable than cross-sectional data in measuring the relationship between risk factors and subsequent tobacco use behaviors. Previous studies have focused mostly on youth because marketing exposure is suggested to be a strong predictor of tobacco initiation among youth. The impacts of marketing exposure among adult populations are not well unknown. The current study provides some evidence of the impact of marketing exposure among adults, particularly U.S. foreign-born adults who previously have not been studied as thoroughly.

4.4.3. Limitations

The current study has limitations. First, when testing the mediated effect, we assumed that Sobel's test follow the standard normal distribution, however, this assumption might be violated in practice. Second, due to the observational nature of the data, results inform scientists regarding population-wide characteristic and behaviors. Thus, causal inferences cannot be made. Third, the study tested only one item for peer and family influence. Others' view of using any ATPs, social support, and social engagement could also influence individual ATP use behaviors. Further investigation of this factor is needed. Third, the study did not examine the product-specific associations because sample sizes of both ATP marketing exposure and the use of each specific tobacco product use were low. Third, measures were self-reported and subject to recall bias. Lastly, attrition can introduce bias in the associations that were estimated due to the longitudinal nature of the study. However, the procedures used in the weighting process account for nonresponse and minimize such bias.

4.5 Conclusions

The current study examined the influence of peer and family use of ATPs and ATP advertisement, marketing, and promotion exposure on ATP use among foreign-born residents who participated in the PATH Study. Less acculturated foreign-born residents were less likely to have had important people in their lives who used or smoked any ATPs and to be exposed to ATP marketing. Those who had more peer and family use of ATPs were more likely to currently use ATPS. Those who were reported receiving fewer discounts or coupons were less likely to use ATPs in their lifetime. Others use of ATPs and ATP marketing exposure to discounts or coupons seems to be strong correlates to ATP use among U.S. foreign-born residents. Future research studies should further examine the influence of different social factors on ATP use and how ATP advertisements, marketing, and promotions influence tobacco product purchasing behavior among this population.

Table 2.1. *Population Characteristics of U.S.-Born and Foreign-Born Residents of the Population Assessment of Tobacco and Health (PATH) Study Waves 3 and 4*

	U.S. Born or Natives (N=21,760)			**Foreign-born** (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N**[1]	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Gender *(Wave 3)*							
Female	1,1270	103,763,488	51.61 (50.59, 52.62)	1,313	19,050,490	54.23 (51.16, 57.29)	0.1071
Male	10,474	97,305,550	48.39 (47.38, 49.41)	1,188	16080747	45.77 (42.71, 48.84)	
Age *(Wave 3)*							
18-29	**9,231**	**44,645,529**	**22.19 (21.28, 23.11)**	**835**	**5,525,697**	**15.66 (13.89, 17.43)**	**<0.0001**
30-39	**3,393**	**32,021,993**	**15.92 (15.13, 16.70)**	**524**	**8,247,543**	**23.38 (21.02, 25.74)**	
40-49	**2,758**	**30,231,755**	**15.03 (14.27, 15.79)**	**470**	**8,177,986**	**23.18 (20.97, 25.39)**	
50-59	**3,071**	**37,590,727**	**18.69 (17.85, 19.52)**	**342**	**5,834,585**	**16.54 (14.21, 18.87)**	
60+	**3,305**	**56675,637**	**28.17 (27.20, 29.15)**	**336**	**7,488,912**	**21.23 (18.71, 23.75)**	
Marital Status *(Wave 3)*							
Never Married	**9,692**	**55,326,293**	**27.92 (26.78, 29.07)**	**828**	**6,450,897**	**18.61 (16.73, 20.50)**	**<0.0001**
Married	**7,871**	**100,708,510**	**50.82 (49.24, 52.40)**	**1,265**	**22,129,269**	**63.85 (61.22, 66.48)**	
Widowed/Divorced/Separated	**3,898**	**42,118,391**	**21.26 (20.21, 22.30)**	**384**	**6,075,918**	**17.53 (14.97, 20.09)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N**[1]	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Race *(Wave 3)*							
White race alone	**15,710**	**160,816,332**	**81.08 (78.77, 83.38)**	**1,432**	**18,572,871**	**56.61 (51.79, 61.43)**	**<0.0001**
Black race alone	**3,642**	**25,619,637**	**12.91 (10.84, 14.99)**	**269**	**3,358,392**	**10.24 (8.33, 12.15)**	
Asian race alone	**273**	**3,654,937**	**1.84 (1.35, 2.34)**	**382**	**8,979,659**	**27.37 (23.08, 31.66)**	
Other race, including multi-racial	**1,671**	**8,262,548**	**4.17 (3.70, 4.63)**	**195**	**1,896,090**	**5.78 (4.43, 7.13)**	
Educational Attainment *(Wave 3)*							
Less than high school	**787**	**5,801,154**	**2.89 (2.55, 3.24)**	**272**	**4,176,263**	**11.87 (9.84, 13.90)**	**<0.0001**
High school equivalent	**8,322**	**68,935,960**	**34.37 (32.75, 35.99)**	**986**	**13,201,332**	**37.53 (34.83, 40.22)**	
Associate degree or some college	**7,854**	**67,359,538**	**33.59 (32.39, 34.78)**	**618**	**7,716,108**	**21.93 (19.53, 24.34)**	
Bachelor's degree	**3,133**	**37,944,015**	**18.92 (17.72, 20.12)**	**342**	**5,440,747**	**15.47 (13.37, 17.56)**	
Master's/Professional/Doctoral Degree	**1,581**	**20,519,862**	**10.23 (9.34, 11.13)**	**279**	**4,643,679**	**13.20 (10.88, 15.52)**	
Household Income *(Wave 3)*							
$50,000 or Below	**7,841**	**89,413,044**	**51.93 (50.10, 53.76)**	**725**	**1,275,524**	**38.92 (35.66, 42.19)**	**<0.0001**
Above $50,000	**12,464**	**96,586,722**	**48.07 (46.24, 49.90)**	**1,558**	**19,104,249**	**61.08 (57.81, 64.34)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Peer/Family Influence (Yes/No) (*Wave 3*)							
Had important people in their lives who used or smoked any ATPs	**13,290**	**115,416,407**	**57.59 (56.03, 59.15)**	**945**	**11,449,746**	**32.72 (30.28, 35.15)**	**<0.0001**
ATP Advertisement/Marketing/Promotion Exposure (Yes/No) *(Wave 3)*							
Has seen ATP ads in past 30 days	**13,818**	**126,014,095**	**63.41 (62.26, 64.56)**	**1,280**	**17,027,112**	**48.92 (45.77, 52.07)**	**<0.0001**
Has seen ads at the stores where tobacco is sold	**9,977**	**86,026,322**	**42.81 (41.65, 43.96)**	**930**	**12,016,318**	**34.20 (31.21, 37.18)**	**<0.0001**
Received discounts or coupons	**4,826**	**33,936,782**	**16.90 (16.05, 17.75)**	**213**	**2,105,981**	**6.00 (4.69, 7.31)**	**<0.0001**
Cigarette smoking status (Yes/No) *Ever smoked cigarettes*							
Wave 3	**18,310**	**143,110,748**	**70.31 (68.80, 71.83)**	**1,743**	**17,849,404**	**50.23 (47.52, 52.94)**	**<0.0001**
Wave 4	**16,565**	**142,050,223**	**70.64 (69.13, 72.15)**	**1,596**	**18,170,953**	**51.80 (49.07, 54.54)**	**<0.0001**
Current ATP Use[2] (Yes/No)							
Wave 3	**6,182**	**33,757,575**	**16.78 (16.09, 17.47)**	**356**	**2,425,821**	**6.88 (5.82, 7.94)**	**<0.0001**
Wave 4	**5,590**	**29,922,044**	**14.87 (14.24, 15.50)**	**325**	**2,005,728**	**5.69 (4.72, 6.65)**	**<0.0001**

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Ever ATP Use[3] (Yes/No)							
Wave 3	**16,286**	**118,427,462**	**58.87 (57.33, 60.41)**	**1,302**	**11,007,469**	**31.21 (29.06, 33.35)**	**<0.0001**
Wave 4	**16,549**	**119,917,974**	**59.61 (58.07, 61.14)**	**1,344**	**11,477,299**	**32.54 (30.37, 34.70)**	**<0.0001**
Current ATP Use (by Product Type)							
Wave 3							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**
E-cigarettes	**2,995**	**15,236,799**	**7.57 (7.17, 7.98)**	**174**	**1,080,726**	**3.06 (2.43, 3.69)**	
Cigars/Cigarillos/Filtered Cigars	**1,985**	**11,151,172**	**5.54 (5.17, 5.91)**	**103**	**776,919**	**2.20 (1.56, 2.85)**	
Hookahs	**315**	**1,448,455**	**0.72 (0.59, 0.85)**	**48**	**338,303**	**0.96 (0.61, 1.31)**	
Pipe	**117**	**707,146**	**0.35 (0.26, 0.44)**	**8**	**48,306**	**0.14 (0.04, 0.24)**	
Snus	**143**	**1,008,007**	**0.50 (0.38, 0.62)**	**4**	**26,819**	**0.08 (0.00, 0.16)**	
Other Smokeless Tobacco Products	**627**	**4,205,996**	**2.09 (1.85, 2.33)**	**19**	**154,749**	**0.44 (0.15, 0.73)**	
Wave 4							
No ATP Use	**16,170**	**171,281,997**	**85.13 (84.50, 85.76)**	**2,182**	**33,268,995**	**94.31 (93.35, 95.28)**	**<0.0001**
E-cigarettes	**2,486**	**12,492,830**	**6.21 (5.85, 6.57)**	**138**	**781,844**	**2.22 (1.73, 2.70)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Cigars/Cigarillos/Filtered Cigars	**1,971**	**10,612,990**	**5.27 (4.91, 5.64)**	**117**	**679,886**	**1.93 (1.42, 2.44)**	
Hookahs	**279**	**1,273,680**	**0.63 (0.53, 0.74)**	**43**	**303,642**	**0.86 (0.52, 1.20)**	
Pipe	**88**	**561,830**	**0.28 (0.20, 0.36)**	**4**	**40,375**	**0.11 (0.00, 0.26)**	
Snus	**176**	**1,186,044**	**0.59 (0.48, 0.70)**	**10**	**113,539**	**0.32 (0.10, 0.55)**	
Other Smokeless Tobacco Products	**590**	**3,794,670**	**1.89 (1.67, 2.10)**	**13**	**86,443**	**0.25 (0.08, 0.41)**	
Current ATP Use (by Multiple Product Use)							
Wave 3							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**
Single Product Use	**4,429**	**25,433,682**	**12.64 (12.06, 13.22)**	**262**	**1,926,985**	**5.46 (4.46, 6.46)**	
Two or More Product Use	**1,753**	**8,323,893**	**4.14 (3.91, 4.36)**	**94**	**498,836**	**1.41 (1.00, 1.83)**	
Wave 4							
No ATP Use	**15,577**	**167,436,762**	**83.22 (82.53, 83.91)**	**2,151**	**32,848,902**	**93.12 (92.06, 94.18)**	**<.0001**
Single Product Use	**4,131**	**22,714,400**	**11.29 (10.79, 11.78)**	**240**	**1,517,302**	**4.30 (3.41, 5.19)**	
Two or More Product Use	**1,459**	**7,207,644**	**3.58 (3.34, 3.83)**	**85**	**488,427**	**1.38 (0.10, 1.77)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Lifetime ATP Use[3] (Yes/No)							
Wave 3	**16,286**	**118,427,462**	**58.87 (57.33, 60.41)**	**1,302**	**11,007,469**	**31.21 (29.06, 33.35)**	**<0.0001**
Wave 4	**16,549**	**119,917,974**	**59.61 (58.07, 61.14)**	**1,344**	**11,477,299**	**32.54 (30.37, 34.70)**	**<0.0001**
Lifetime ATP Use (by Product Type)							
Wave 3							
No ATP Use	**5,473**	**82,755,890**	**41.13 (39.60, 42.67)**	**1,205**	**24,267,255**	**68.80 (66.65, 70.94)**	**<0.0001**
E-cigarettes	**10,640**	**56,466,040**	**28.07 (26.96, 29.17)**	**748**	**4,759,527**	**13.49 (12.24, 14.74)**	
Cigars/Cigarillos/Filtered Cigars	**4,438**	**50,364,765**	**25.03 (23.94, 26.13)**	**348**	**4,427,766**	**12.55 (10.66, 14.44)**	
Hookahs	**703**	**3,963,337**	**2.23 (1.90, 2.57)**	**168**	**1,231,984**	**3.49 (2.73, 4.25)**	
Pipe	**244**	**4,493,228**	**1.97 (1.77, 2.17)**	**17**	**202,925**	**0.58 (0.18, 0.97)**	
Snus	**67**	**622,014**	**0.31 (0.22, 0.40)**	**3**	**31,765**	**0.09 (0.00, 0.23)**	
Other Smokeless Tobacco Products	**194**	**2,518,079**	**1.25 (1.00, 1.51)**	**18**	**353,501**	**1.00 (0.34, 1.67)**	
Wave 4							
No ATP Use	**5,210**	**81,265,378**	**40.39 (38.86, 41.93)**	**1163**	**23,797,424**	**67.46 (65.30, 69.63)**	**<0.0001**
E-cigarettes	**11,004**	**58,504,861**	**29.08 (27.94, 30.22)**	**795**	**5,060,857**	**14.35 (13.05, 15.65)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N[1]**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Cigars/Cigarillos/Filtered Cigars	**4,370**	**49,976,140**	**24.84 (23.73, 25.95)**	**345**	**4,478,558**	**12.70 (10.83, 14.57)**	
Hookahs	**684**	**3,868,817**	**2.22 (1.89, 2.55)**	**166**	**1,298,988**	**3.68 (2.89, 4.48)**	
Pipe	**239**	**4466,011**	**1.92 (1.73, 2.12)**	**17**	**204,679**	**0.58 (0.19, 0.97)**	
Snus	**73**	**686,878**	**0.34 (0.25, 0.43)**	**4**	**83,119**	**0.24 (0.00, 0.50)**	
Other Smokeless Tobacco Products	**179**	**2,415,267**	**1.20 (0.95, 1.46)**	**17**	**351,098**	**1.00 (0.33, 1.66)**	
Lifetime ATP Use (by Multiple Product Use)							
Wave 3							
No ATP Use	**5,473**	**82,755,890**	**41.13 (39.60, 42.67)**	**1205**	**24,267,255**	**68.80 (66.65, 70.94)**	**<0.0001**
Single Product Use	**4,025**	**37,283,012**	**18.53 (17.72, 19.35)**	**503**	**5,121,814**	**14.52 (12.76, 16.28)**	
Two or More Product Use	**12,261**	**81,144,450**	**40.33 (39.02, 41.65)**	**799**	**5,885,655**	**16.69 (14.93, 18.44)**	
Wave 4							
No ATP Use	**5,210**	**81,265,378**	**40.39 (38.86, 41.93)**	**1163**	**23,797,424**	**67.46 (65.30, 69.63)**	**<0.0001**
Single Product Use	**3,939**	**36,913,530**	**18.35 (17.34, 19.16)**	**495**	**5,347,755**	**15.16 (13.41, 16.91)**	
Two or More Product Use	**12,610**	**83,004,444**	**41.26 (39.92, 42.60)**	**849**	**6,129,544**	**17.38 (15.60, 19.16)**	

	U.S. Born or Natives (N=21,760)			Foreign-born (N=2,507)			
N, Weighted	201,204,041			35,274,723			
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**Unweighted N**[1]	**Weighted N**	**Weighted % (95% CI)**	**P-value**

1. Sum of unweighted samples for each variable may not equal to the total sample size for each group (U.S. born and Foreign-born) due to different number of missing cases for each variable.

2. Adult respondents who used any ATPs (e-cigarettes, cigars, cigarillos, filtered cigars, pipe, hookah, snus and other smokeless tobacco products) within past 30 days. Those who use multiple products were counted as one case.

3. Adult respondents who ever used any ATPs. Those who use multiple products were counted as one case.

†Significant percentages ($p<0.05$) are presented in boldface.

Table 2.2 *Population Characteristics of U.S. Foreign-Born Residents by ATP Use Status: Waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) Study*

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Wave 3								
Gender								
Female	**125**	**633,921**	**31.61 (23.94, 39.27)**	**<.0001**	**582**	**4,264,297**	**37.15 (33.59,40.72)**	**<.0001**
Male	**200**	**1,371,807**	**68.39 (60.7, 76.06)**		**762**	**7,213,003**	**62.85 (59.29,66.41)**	
Age								
18-29	**173**	**791,242**	**39.45 (31.19, 47.71)**	**<.0001**	**536**	**2,739,036**	**23.86 (20.83,26.90)**	**<.0001**
30-39	**56**	**393,790**	**19.63 (14.02, 25.25)**		**302**	**2,998,002**	**26.12 (22.90,29.34)**	
40-49	**40**	**378,461**	**18.87 (11.39, 26.35)**		**225**	**2,570,969**	**22.40 (18.91,25.89)**	
50-59	**27**	**191,313**	**9.54 (6.50, 12.58)**		**149**	**1,630,411**	**14.21 (11.27,17.14)**	
60+	**29**	**250,923**	**12.51 (6.57, 18.46)**		**132**	**1,538,881**	**13.41 (10.07,16.75)**	
Marital Status								
Never married	**176**	**893,182**	**45.84 (38.40, 53.29)**	**<.0001**	**531**	**3,128,888**	**27.76 (24.56, 30.96)**	**<.0001**
Married	**96**	**784,411**	**40.26 (32.80, 47.72)**		**597**	**6,359,287**	**56.42 (52.78,60.05)**	

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Widowed/Divorced/Separated	**46**	**270,714**	**13.89 (9.70, 18.09)**		**197**	**1,783,435**	**15.82 (12.49, 19.16)**	
Race								
White race alone	184	1,115,822	60.34 (52.19, 68.48)	0.4734	781	6,333,446	60.32 (55.39, 65.25)	0.1165
Black race alone	43	215,824	11.67 (8.08, 15.26)		126	945,194	9.00 (6.86, 11.14)	
Asian race alone	39	420,125	22.72 (15.62, 29.82)		196	2,556,984	24.35 (19.85, 28.86)	
Other race, including multi-racial	31	97,547	5.27 (2.96, 7.59)		114	664,820	6.33 (4.64, 8.02)	
Education Level								
Less than high school	**16**	**89,394**	**4.50 (1.59, 7.4)**	**0.0013**	**88**	**746,201**	**6.52 (4.60, 8.44)**	**<.0001**
High school equivalent	**134**	**751,169**	**37.79 (31.27, 44.30)**		**482**	**35,643,30**	**31.15 (27.26, 35.04)**	
Associate degree or some college	**99**	**621,744**	**31.28 (23.44, 39.11)**		**384**	**3,229,668**	**28.22 (24.46, 32.00)**	
Bachelor's degree	**50**	**331,712**	**16.69 (11.87, 21.51)**		**216**	**2,261,102**	**19.76 (16.24, 23.28)**	
Master's/Professional/Doctoral degree	**23**	**193,788**	**9.75 (5.18, 14.32)**		**168**	**1,641,835**	**14.35 (11.27, 17.43)**	
Household Income								
$50,000 or below	96	670,150	36.19 (30.20, 42.17)	0.3897	**453**	**5,000,914**	**47.38 (43.08, 51.69)**	**<.0001**

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Above $50,000	208	1,181,828	63.81 (57.83, 69.80)		**802**	**5,553,350**	**52.62 (48.31, 56.92)**	
Acculturation								
Duration in the U.S.								
10 years or less	93	575,539	28.69 (21.43, 35.96)	0.3181	355	2,702,022	23.54 (19.63, 27.46)	0.9712
11-20 years	120	613,237	30.57 (24.80, 36.35)		489	3,604,679	31.41 (27.83, 34.99)	
20 years or more	112	816,953	40.73 (32.63, 48.83)		500	5,170,598	45.05 (40.51, 49.59)	
Age at Migration								
Before age 18	**202**	**1,043,450**	**52.60 (45.73, 59.46)**	**<.0001**	**716**	**4,816,830**	**42.16 (38.37, 45.95)**	**<.0001**
At age 18 and after	**118**	**940,365**	**47.40 (40.54, 54.27)**		**617**	**6,608,510**	**57.84 (54.05, 61.63)**	
Language Spoken at Home								
English	88	475,941	23.73 (18.82, 28.64)	0.4312	**337**	**3,191,369**	**27.86 (23.58, 32.14)**	**0.0006**
Non-English (Other language)	237	1,529,787	76.27 (71.36, 81.18)		**1,004**	**8,263,601**	**72.14 (67.86, 76.42)**	
English Proficiency								
Proficient in English	262	1,412,203	70.41 (62.44, 78.39)	0.0543[2]	**1,050**	**8,700,415**	**75.81 (72.39, 79.22)**	**<.0001**

	Wave 4							
	Current ATP Use (N=325)				**Ever ATP Use** (N=1,344)			
N, Weighted								
	Unweighted N	**Weighted N**	**Weighted % (95% CI)**	**P-value**	**Unweighted N**	**Weighted N**	**Weighted % (95% CI)**	**P-value**
Limited in English	63	593,525	29.59 (21.61, 37.57)		**294**	**2,776,884**	**24.19 (20.78, 27.61)**	
Peer/ Family Influence (Yes/No)								
Had important people in their lives who used or smoked any ATPs	**151**	**936,668**	**47.02 (39.98,54.07)**	**<.0001**	**627**	**4,982,725**	**43.78 (39.63, 47.93)**	**<.0001**
ATP Advertisement/Marketing/Promotion Exposure (Yes/No)								
Has seen ATP ads in past 30 days	**193**	**1,110,202**	**57.37 (50.40, 64.35)**	**0.0157**	**739**	**6,237,882**	**55.38 (51.38, 59.38)**	**0.0007**
Has seen ads at the stores where tobacco is sold	**136**	**853,407**	**42.55 (36.37, 48.72)**	**0.0101**	**540**	**4,711,272**	**41.28 (37.79, 44.77)**	**<.0001**
Received discounts or coupons	**36**	**196,753**	**9.98 (5.52, 14.44)**	**0.0249**	**160**	**1,190,652**	**10.46 (8.04, 12.88)**	**<.0001**
Cigarette smoking status (Yes/No)								
Ever smoked cigarettes								
Wave 3	**278**	**1,711,457**	**85.39 (79.43, 91.36)**	**<.0001**	**1,128**	**9,785,709**	**85.49 (82.82, 88.16)**	**<.0001**
Wave 4	**287**	**1,748,854**	**87.26 (81.55, 92.97)**	**<.0001**	**1,145**	**9,893,209**	**86.46 (83.96, 88.96)**	**<.0001**

1. Sum of unweighted samples for each variable may not equal to the total sample size for each group (U.S. born and Foreign-born) due to different number of missing cases for each variable.
2. Borderline significance
†Significant percentages ($p<0.05$) are presented in boldface.

Table 2.3 *Adjusted Odds Ratio of Acculturation Predicting Peer/Family Use of ATPs, and ATP Advertisement/Marketing/Promotion Exposure Among Foreign-Born Residents*

	Had important people in their lives who used or smoked any ATPs (N= 2,507)		**ATP Advertisement/Marketing/ Promotion Exposure: Received discount or coupons (N=2,507)**	
	AOR[1] (95% CI)	**P-Value**	**AOR[1] (95% CI)**	**P-Value**
Acculturation				
Age at Migration				
Before age 18	ref[2]		ref	
At age 18 and after	**0.77 (0.61, 0.97)**	**0.0237**	0.77 (0.53, 1.11)	0.1566
Language Spoken at Home				
English	ref		ref	
Non-English (Other language)	0.81 (0.64, 1.03)	0.0876	**0.64 (0.45, 0.90)**	**0.0099**
English Proficiency				
Proficient in English	ref		ref	
Limited in English	**0.66 (0.53, 0.83)**	**0.0004**	**0.46 (0.32, 0.67)**	**<.0001**

1. Adjusted with sex, age, marital status, educational attainment, household income and W3 and W4 cigarette smoking status

2. ref = reference group

3. Significant AORs ($p<0.05$) are presented in boldface.

Table 2.4 *Adjusted Odds Ratio of Peer/Family Use of APTs and ATP Advertisement/Marketing/Promotion Exposure Predicting ATP Use Among Foreign-Born Residents*

	Wave 4			
	Current ATP Use (N=325)		**Lifetime ATP Use (N=1,344)**	
Wave 3	AOR[1] (95% CI)	P-value	AOR[2] (95% CI)	P-value
Peer/Family Influence				
Had important people in their lives who used or smoked any ATPs				
No		ref[3]		
Yes	**1.83 (1.27, 2.64)**	**0.0015**	**1.65 (1.22, 2.24)**	**0.0014**
ATP Advertisement/Marketing/Promotion Exposure				
Has seen ATP ads in past 30 days				
No		ref		
Yes	1.26 (0.89, 1.77)	0.1904	1.26 (0.97, 1.65)	0.0870
Has seen ads at the stores where tobacco is sold				
No		ref		
Yes	1.1 (0.89, 1.61)	0.2346	1.19 (0.92, 1.53)	0.1878
Received discounts or coupons				
No		ref		
Yes	0.82 (0.47, 1.42)	0.4829	**2.14 (1.27, 3.60)**	**0.004**

1. Adjusted with sex, age, marital status, educational attainment and W3 and W4 cigarette smoking status
2. Adjusted with sex, age, marital status, educational attainment, household income and W3 and W4 cigarette smoking status
3. ref = reference group
4. Significant AORs ($p<0.05$) are presented in boldface.

Table 2.5. *Moderation Analyses on Lifetime ATP Use Among Foreign-Born Residents (ATP Advertisement/Marketing/Promotion Exposure X Peer/Family Use of ATPs)*

Independent Variables:	Estimate (*b*)	Test of Interaction Term		
		Standard Error (SE)	t-value (t)	P-value
*Received Discount or Coupons * Peer/ Family Use of ATPs*				
Constant	-2.53	0.45	-5.59	<.0001
Received Discount or Coupons	-0.60	0.23	-2.60	0.0107
Peer and Family use of ATPs	0.07	0.28	0.24	0.8136
Interaction term	0.45	0.27	1.69	0.0941

Note. All logistic regression models were adjusted for sex, age, marital status, educational attainment, household income, lifetime cigarette smoking status at Waves 3 and 4

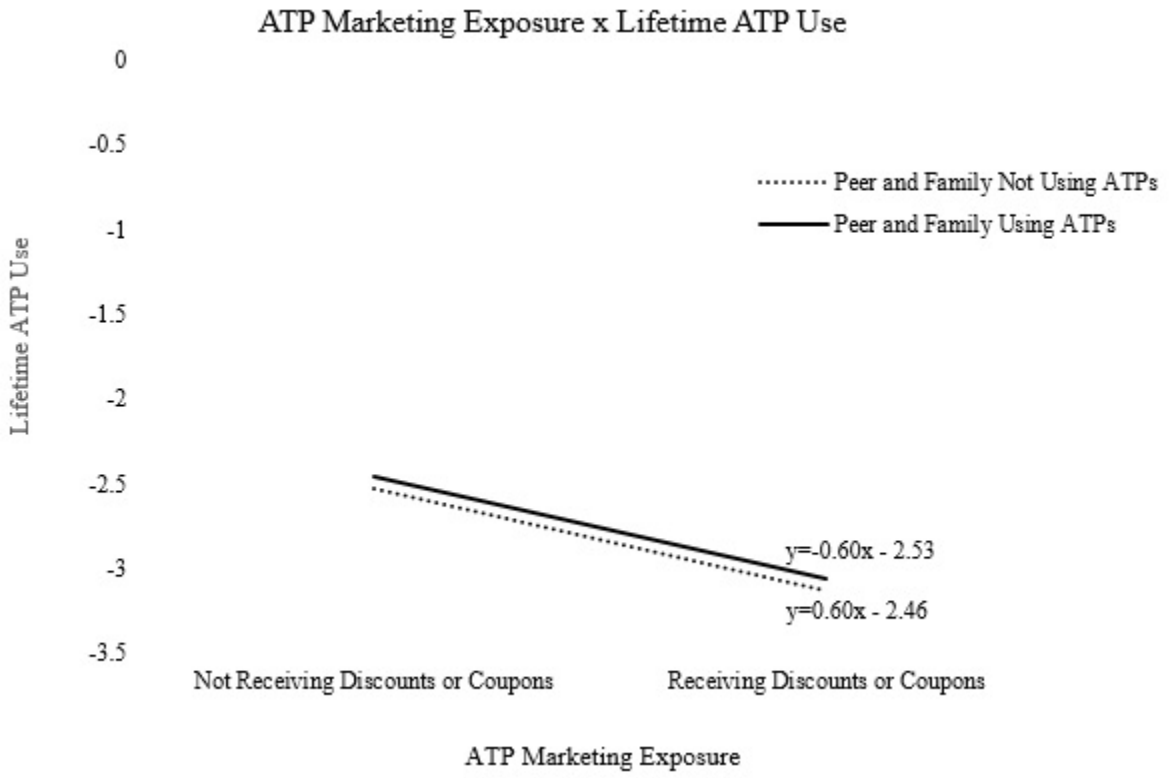
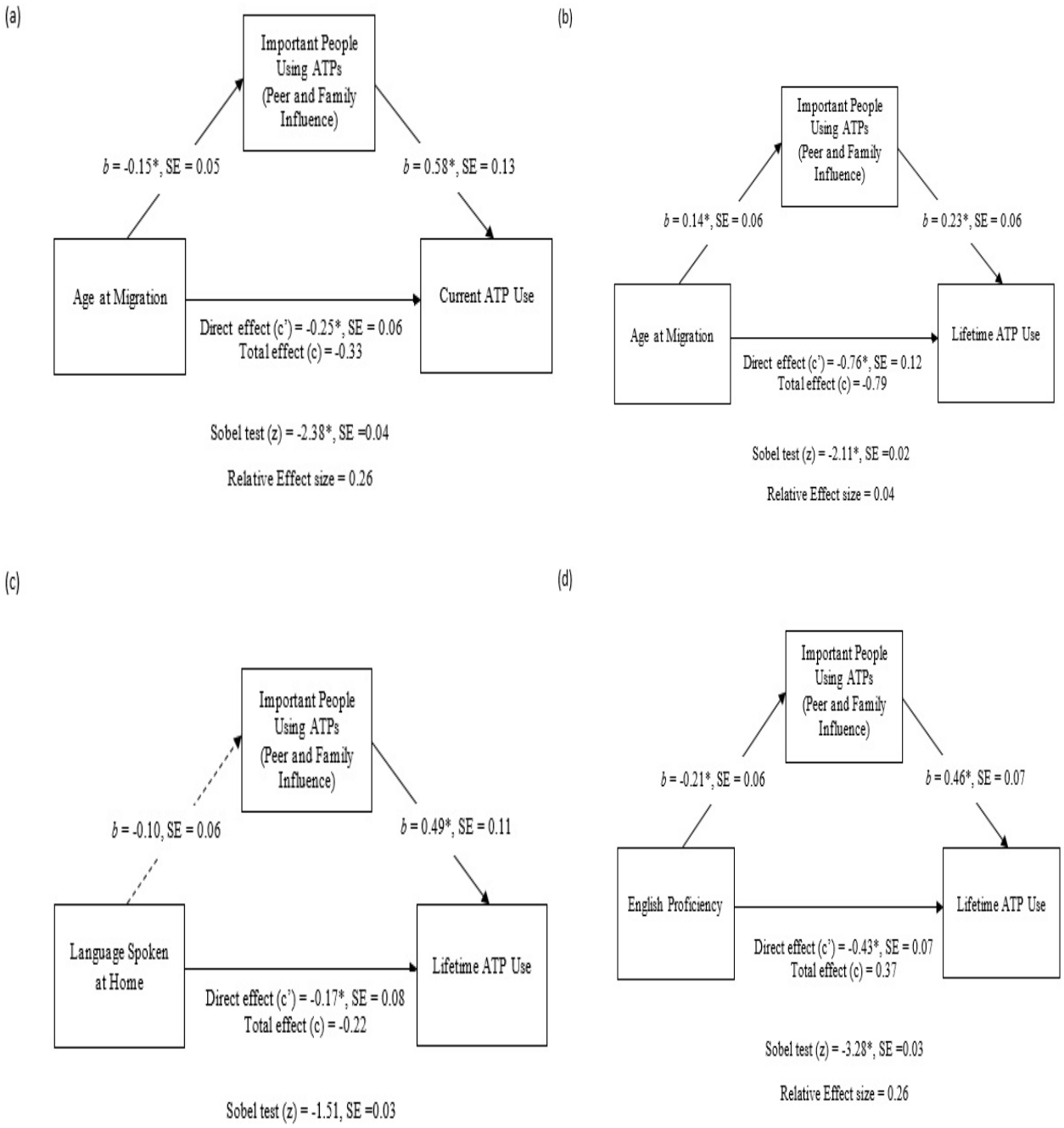
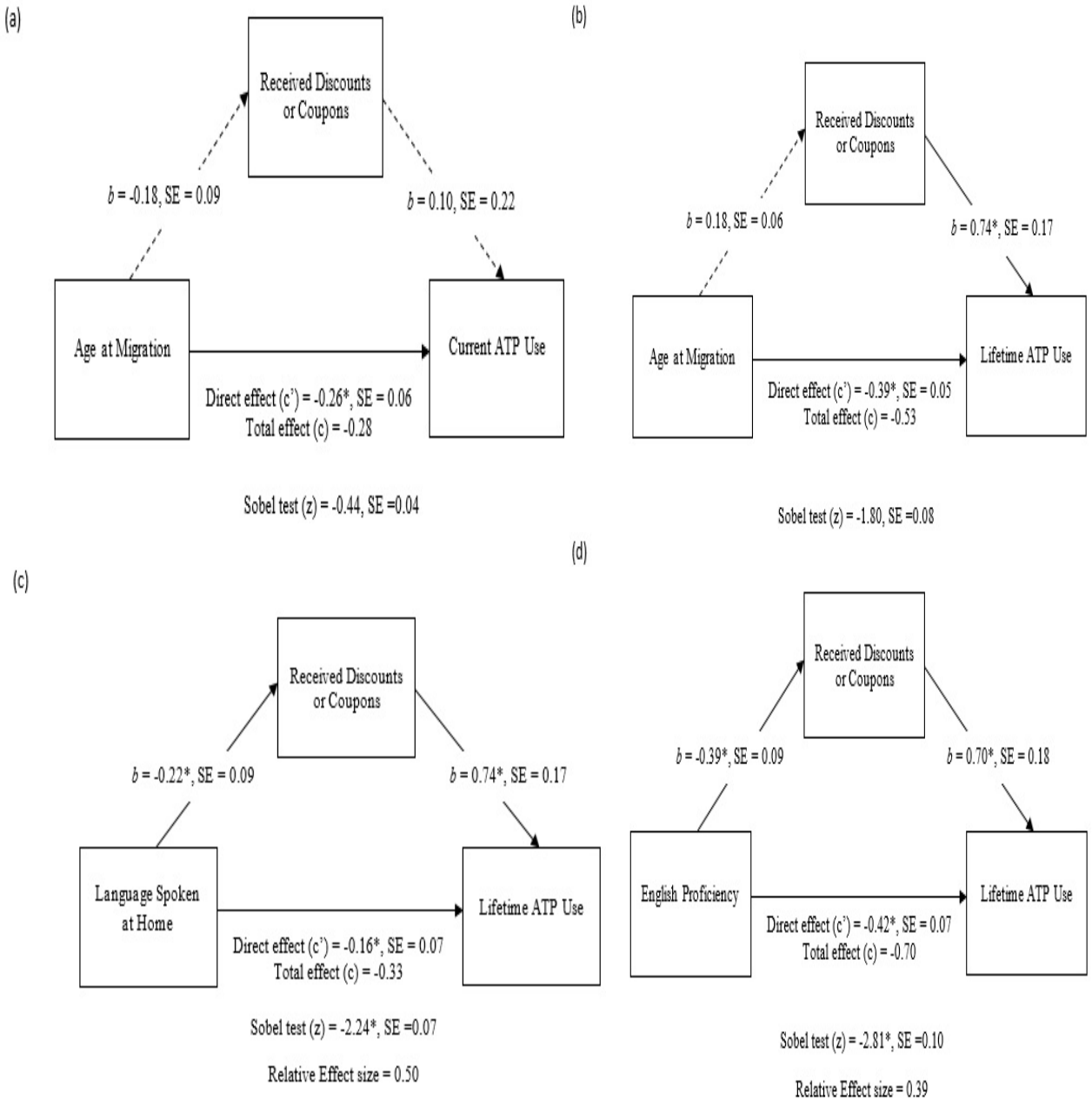


Figure 2.1. *Moderating Effect of Peer/Family Use of ATPs on Moderating Effect of Peer/Family Use of ATPs on ATP Advertisement/Marketing/ Promotion Exposure and Lifetime ATP Use and Lifetime ATP Use Among Foreign-Born Residents*



* $p<0.05$
b = Estimates
SE = Standard error
Note. All logistic regression models were adjusted for sex, age, marital status, educational attainment, lifetime cigarette smoking status at waves 3 and 4

Figure 2.2. *Tests of Mediation Models with Acculturation as the Independent Variable and Peer/Family Use of ATPs as the Mediator*



* $p<0.05$
b = Estimates
SE = Standard error
Note. All logistic regression models were adjusted for sex, age, marital status, educational attainment, lifetime cigarette smoking status at waves 3 and 4

Figure 2.3. *Tests of Mediation Models with Acculturation as the Independent Variable and ATP Advertisement/Marketing/Promotion Exposure as the Mediator*

Chapter 5: Study 3 - Multilevel Factors Influence on Tobacco Product Use among Korean Residents in DC, MD and VA

5.1 Introduction

In 2019, 25.3% of the U.S. adult population aged 25 to 44 years used tobacco products such as cigarettes, e-cigarettes, hookah, cigars and smokeless tobacco (Cornelius, 2020). This was the highest prevalence rate among all age groups. In the same study, e-cigarette use was highest among adults aged 18-24 years (9.3%). Among these individuals who used e-cigarettes, 50.6% were individuals who never smoked before (Cornelius, 2020). In addition, a study (Roh et al., 2022) found that more than half of adults who had ever used e-cigarettes and currently used e-cigarettes every day or some days were between 18 and 39 years old. Growing evidence suggests a progression towards a later age of tobacco use initiation from adolescence to young adulthood (Bandi et al., 2021; Barrington-Trimis et al., 2020; Chen-Sankey et al., 2019; Huh et al., 2013). This phenomenon may be due to increased risk-taking behavior during young adulthood leading to life-long tobacco use trajectories (Schwartz & Petrova, 2019).

Historically, Korean Americans have had the highest prevalence of conventional cigarette use among all Asian Americans (Martell, 2016). But Koreans living in the U.S. are often still viewed as a low-priority group in tobacco control, as Asian American data in most national surveys are aggregated into a homogenous group. This creates barriers to addressing tobacco product use among this population (Caraballo et al., 2008; Martell, 2016). Overcoming this barrier is important because according to some studies (Caraballo et al., 2008; Kim et al., 2007; Sa et al., 2013) Korean American men were more likely to be current cigarette smokers than the general U.S. population. Furthermore, when compared to other Asian sub-groups, Koreans in the

U.S. had the highest prevalence of past 30-day e-cigarette use and lifetime cigar use (Nguyen, 2019).

The information on tobacco product use among Koreans living in District of Columbia (DC), Maryland (MD), and Virginia (VA) has been relatively unknown to researchers despite the fact that tobacco use is identified as an important issue in Asian American communities in the area (Lee et al., 2011). According to the American Community Survey, approximately 101,000 Koreans resided in DC, MD and VA as of 2019, and a majority of Koreans in this region were born outside of the U.S. (U.S. Census Bureau, 2019). Many foreign-born Korean residents bring their smoking habits from their home country (Lee et al., 2011). Therefore, understanding tobacco product use behaviors among foreign-born Korean residents in this region marks an important step in reducing tobacco-related disparities among Asian immigrants.

Different racial and ethnic groups display different cultural values, norms, expectancies, and attitudes toward tobacco use. Moreover, acculturation, social, community, and organizational factors also influence these groups differently. In the case of U.S. Korean residents, some regional studies found that sociocultural factors affect tobacco product use behaviors among Korean American young adults (Cerrada et al., 2016; Huh et al., 2013, 2016; Huh & Leventhal, 2016). Among U.S. Koreans, more acculturated men and less acculturated women were less likely to use tobacco products (Cerrada et al., 2016; Kim et al., 2007). Currently, no information on multi-level factors influencing ATP use behaviors among Koreans living in the U.S. is available. Given the limited information, there is a need to deeply explore, through qualitative research method, how cultural values and the immigration experience may influence tobacco use behavior among this Asian sub-ethnic group.

The purpose of the current study is to explore factors that shape alternative tobacco product (ATP) use and understand tobacco product use patterns among non-U.S. citizen Korean residents in the DC, MD, and VA using qualitative methodology. In this study, the principal investigator (PI) conducted twenty-one semi-structured, in-depth interviews to enhance understand of how acculturation, harm perceptions regarding ATP use, peer and family influence, and ATP marketing and promotion exposure affect ATP use among this population.

5.2 Methods

5.2.1. Study Population

The sample in the study is non-U.S. citizen Korean residents in DC, MD and VA. Among a population of 75,409 Korean population in the area, about 68.6% were born outside of the United States, and about 74.0% of them speak a language other than English at home (U.S. Census Bureau, 2019a). Of the 51,695 foreign-born residents, about 72.68% were naturalized U.S. citizen and about 27.32% were not U.S. citizens (U.S. Census Bureau, 2019a). A prior study suggested that smoking was identified as an important health concern among Asian Americans in the Washington D.C. Metropolitan area (Lee et al., 2011). The same study reported that many college-aged Asian Americans in the area were identified as a group that smoked and developed smoking habits easily if their parents smoked (Lee et al., 2011). Moreover, some studies suggested the importance of exploring the culture, social norms and smoking experiences of Korean immigrants (Cerrada et al., 2016; Huh et al., 2013, 2016). However, previous literature addressing tobacco product use behaviors among this population are limited because these studies were conducted regionally, mostly in California (Cerrada et al., 2016; Huh et al., 2013, 2016; Huh & Leventhal, 2016). Additionally, the current state and national surveys, including

the PATH Study, were limited in the collection of ethnic sub-group data and underestimated each ethnic sub-group's smoking behaviors (Holland & Palaniappan, 2012; Schwartz et al., 2010). To date, details on tobacco product use behavior among foreign-born Korean residents in DC, VA and MD region is unknown. As a result, the PI conducted in-depths interviews with twenty-one non-U.S. citizen Korean residents to understand their tobacco product use behavior and work to fill gaps in the current research.

5.2.2. Recruitment

Recruitment Process

Recruitment of participants began in August 2020. Convenience sampling and snowball purposive sampling were used to gain wider access to foreign-born Korean residents in the area (Collins et al., 2007). The number of participants was determined by thematic saturation based on the recommendations for the ideal number of interviews of meaning saturation from previous studies, with a minimum of 16 interviews and a maximum of 24 interviews (Hennink et al., 2017; Morse, 2015). Thematic saturation was reached after interviewing twenty-one participants; thus the PI stopped recruiting new study participants at that point.

Recruitment advertisements were distributed on social media, such as KakaoTalk, Missy USA, and Korean community Facebook groups, as well as the UMD student and faculty listserv. Recruitment advertisements were also distributed to a staff at a local Korean community non-profit organization called, MyLife Foundation, in Catonsville, MD. Staff at MyLife Foundation helped distribute recruitment advertisements to their program participants, partners, and networks. The recruitment advertisement is included in Appendix B. The recruitment announcement was written in English and Korean. Participants were selected if they met all eligibility criteria: 1) be 18 to 39 years old, 2) be born in South Korea and of South Korean

heritage, 3) reside in the District of Columbia (DC), Virginia, or Maryland, 4) not be a U.S. citizen, 5) have experience using any tobacco products (formerly and currently using any tobacco product), and 6) be able to read, listen, and speak either English or Korean. Participants were excluded from the study if they were unable to provide informed consent due to mental and cognitive disability. Individuals who were interested in participating in the study were screened for eligibility via a phone call (Appendix C). A diagram in Figure 3.1 depicts the screening process. Participants who elected to provide consent were scheduled for a one-hour in-depth interview. A copy of the consent form was sent by email to potential participants to read before the interview. The PI reviewed the informed consent on the day of the interview and received verbal consent before the interview began. Participants received $40 cash at the end of the interview using electronic money transfer systems, such as Zelle, Venmo and PayPal.

Characteristics of Participants

Table 3.1 shows the characteristics of participants. Participants' mean age was 26.5 years old. About 66.7% of participants were male. About 57.1% of participants resided in VA, 38.1% were in MD and 4.8% were in DC. More than half of participants had a Bachelor's degree or higher. About 76.1% of participant had a household income less than $49,999. About 42.9% of participants had student visas, and 38.1% were permanent residents at the time of the interview. About 38.1% of participants had lived in the U.S. for less than 5 years, 42.9% for 5 to 10 years, and about 19.0% for more than 10 years. A majority of participants said that their English proficiency was either very good or good.

5.2.3. Interview question development

This study focused on a subset of questions where participants were asked about their immigration experiences, their harm perceptions of ATP, how the acculturation process changed

their harm perceptions of ATP and their smoking habits, how peer and family influence their smoking habits, and how tobacco product marketing exposure influences their ATP use or potential ATP use. The interview questions were prepared in both English and Korean. The interview protocol was first prepared in English, then was translated into Korean by the first researcher (PI) and reviewed by the second trained researcher who is bilingual in English and Korean. The interview questions were pilot-tested with three foreign-born Korean residents. The pilot test was conducted as a part of a course project in the Qualitative Method in Family and Health Research course at UMD. The interview questions were updated based on the inputs from the Committee Chair and the experiences from the pilot interviews.

5.2.4. Study Procedure

Sixty minutes, face-to-face interviews were conducted using Zoom videoconference due to the COVID-19 pandemic circumstances. During the interview, the PI asked a series of open-ended questions about their acculturation experience, harm perceptions, peer and family influence of ATP use, and exposure to ATP marketing and promotions to participants (Appendix D). When asked, all participants preferred to speak Korean during the interview, thus, all interviews were conducted in Korean. All interviews were video-recorded and transcribed verbatim for analysis. All collected interview data were first transcribed using Vrew software (VoyagerX, Inc., Seoul, South Korea). Then, the PI and a research staff (transcriber) transcribed all interviews verbatim and created transcripts. The PI reviewed all transcripts to assure quality and accuracy. Then, the PI and the second trained researcher (a graduate student) who is bilingual in English and Korean and trained in public health separately reviewed the transcripts for analysis. The research team agreed to analyze transcripts in the original language in order to preserve originality and culture. Quotes in original transcripts that are used in the Results section

were translated from Korean to English by the PI. All translations were reviewed by the second trained researcher for accuracy and quality of translations.

5.2.5. Data Analysis

All analyses were conducted in NVivo 12 (QSR International, Burlington, MA) and followed qualitative data analysis strategies established in qualitative research manuals (Creswell & Poth, 2018; Huberman & Miles, 1994; Saldana, 2015). In this study, thematic analysis was conducted. First, interview transcripts were uploaded into NVivo 12, which stores the database and files together in a single file and enables the researchers to use multiple languages (Creswell & Poth, 2018). Next, transcripts were reviewed separately by the PI and the second researcher multiple times to get a sense of the interviews as a whole. Third, initial codes were created based on topics discussed during the interview (open coding), and an initial codebook was developed. Fourth, all transcripts were coded with initial codes by two researchers. Fifth, initial codes were compared and reviewed for consistency among two researchers, and the codebook was revised with inductive codes after a series of discussions. Sixth, once coding was complete, the codes were defined and clustered into bigger themes (axial coding). A codebook with final codes and definitions of each code are included in Appendix E. Interrater reliability was excellent with a Kappa of 0.95. Seventh, themes across different interviews were compared and interpreted to find possible and plausible explanations of the findings. Finally, each theme and the corresponding texts were detailed in a thematic map (Figure 3.2).

5.2.6. Positionality Statement

The study represented a shared perspective and shaped by both the researcher and participants. Therefore, my identity as a U.S. foreign-born resident, a Korean descendant, a

public health researcher, and a non-smoker may have impacted the researcher process and shaped my interpretation in the study. When I began engaging with participants, I acknowledged that I brought my own world views, ideas, beliefs, and perspectives in the process of understanding their acculturation and tobacco product use experience. As a researcher and the Principal Investigator in the study, it is important to share the context of my positionality in order to accurately and honestly capture the research process.

As a foreign-born Korean resident who immigrated to the U.S. at age 16, I had my own migration and acculturation experiences. My parents sacrificed their comfortable lives in South Korea to provide better education and living situation for me and my younger brother. The adjustment to the U.S. culture and society was not easy. When I first moved to the U.S., I was very limited in English and did not know much about American culture and society. I was always told by my parents that I needed to be a good citizen and completely assimilate to the American society. As I tried to assimilate, I had observed and experienced inequity, disparities, and structural racial discrimination against Asians. Stereotypes about Asian as "a model minority" sometimes resulted in unequal opportunities for me and brought me a lot of pressures to be successful in every aspect of my life. On the other hands, at or around my home and Korean community, I still had to position myself as a Korean and meet expectations from my own community that I should keep Korean culture and identity. Moreover, as a person in the household who were more fluent in English and had formal U.S. education, I always had to help my parents who were very limited in English and could not navigate complex U.S. health systems, when they seek medical treatments and other social services. I was, is, and will be always their translator and personal secretary. From these experiences, I had noticed structural racial inequity and disparities that exist in American society. My personal experiences shaped

my perspectives on health behaviors, inequity, and disparities among U.S. foreign-born residents. Furthermore, as a member of the Korean community in the DC, MD, and VA, I have empathy toward my people and want to bring voice of my own community to this world by sharing their unique experiences in tobacco use behaviors that are, often times, not studied well and are not seen as an important ethnic-group to focus in the field of tobacco and health researches. As I conducted interviews with participants, I connected my personal experiences to participants to make them feel more comfortable. At the same time, I was aware of my bias and tried to minimize those bias so that they did not interfere with the process of observing participants' experiences. Rather, my position as a foreign-born Korean immigrant provided opportunities that opened up the conversations more freely and deeply. It also made me to understand their perspectives better. During the analyses, I and the second researcher who was also a foreign-born Korean resident acknowledged our position. We tried to preserve cultural aspects and meanings but avoid the invisible bias or subjectivity by being rooted in science and confirming our findings and discussion via literature.

I also acknowledge that my social position as a tobacco researcher who promotes the protection of the public health, a non-smoker, and a person who pursues doctoral degree could interfere the process of observation in the study. I was aware of that my own beliefs, perspectives and experiences on tobacco use behaviors that I obtained through my education and research career. My position as a tobacco researcher could provide unbalanced position between me and participants. I had to be mindful of my invisible bias toward people who smoke. I tried my best not to judge but respect their choices. At the same time, I felt obligation to provide correct health information and protect their health as well. During the interviews, I used probing strategies to clarify meanings and reiterate discussion topics when participants were out of focus in responses.

However, I tried my best to avoid judgmental questions or comments while they shared their experiences. Moreover, at the end of every interview, I provided the correct health information and tobacco cessation resources to participants who currently smoked but thought about quitting. Finally, acknowledging my positionality inside this study helped to clarify my theoretical lens, a guiding perspective that influences my perception of tobacco use behaviors and its influencing factors among foreign-born residents.

5.3 Results

5.3.1. Tobacco Product Use Behaviors and Reason for ATP Use

The PI asked about participants' tobacco product use behaviors. Most participants mentioned that they had experience with conventional cigarettes. Some participants said that they use multiple tobacco products, and some participants were former cigarette smokers who switched to ATPs. Some participants used more than one ATP, particularly combinations of e-cigarettes, hookahs and heated tobacco products (HTP). While conventional cigarettes were the dominant tobacco product used by participants, the majority of participants mentioned that they also had experiences with or currently used e-cigarettes, hookahs, traditional cigars or HTPs (specifically IQOS). Among these four ATPs, e-cigarettes were the most popular with participants, followed by hookahs and HTP (Figure 3.3). The most popular e-cigarette device type was pod mods, and JUUL was the most frequently mentioned brand by participants. A couple of participants said that they had tried traditional cigars. Only one participant said that he had tried all the ATPs.

The PI asked participants at what age they first initiated smoking. Most participants initiated smoking at or after 15 years old. More than half of participants said they initiated conventional cigarettes or ATPs after they graduated from high school, mostly during the first

few years in college or in their early 20s. When the PI asked them which tobacco product(s) they had initiated with, the majority of participants said that they smoked conventional cigarettes first before initiating with any ATPs. All participants reported that they initiated their use of any tobacco products out of curiosity. Participants shared their different ATP use behaviors and reasons for using each ATPs which are described below.

E-cigarettes

The majority of participants either currently or formerly used e-cigarettes. Some of them had used marijuana with e-cigarette device. Participants who had experience with e-cigarettes mentioned that e-cigarettes are convenient. For example, most participants who used e-cigarettes said that they like vaping e-cigarettes because they can vape them anytime and anywhere, including their bedrooms, cars and even workplaces where cigarette smoking is not permitted. P9, a 34-year-old male participant shared his reasons for using e-cigarettes,

> …E-cigarette is more convenient…for instance, you can't really smoke cigarettes indoors, but you can vape e-cigarettes anywhere…so I have been using it everywhere, and I feel that I have become more bold, like vaping inside the car, in my lab. Then I started vaping e-cigarettes more frequently than before…I used to smoke a pack of cigarettes per day, but now, I think I vape 2.5 times more than I used to smoke cigarettes.

Similarly, some participants mentioned the benefits of portability—e-cigarettes fit easily inside of their pockets—and that recharging them is easy.

Many participants who had experience with e-cigarettes also expressed that e-cigarettes do not leave a smell on the body like conventional cigarettes and are more acceptable to non-smokers than smoking conventional cigarettes. P10, a 30-year-old male participant shared his opinions about e-cigarettes:

> I feel that non-smokers are less repulsed by vaping e-cigarettes than they are by smoking regular cigarettes…I always complained about cigarette smokers when I was not a smoker, but when I met with people who used JUUL, it did not bother me. I think people around me feel the same way like I felt.

Some participants expressed that e-cigarettes were "tastier" than conventional cigarettes due to added flavors in vapes, such as fruit, mint and menthol. Some of them felt refreshed after they vaped menthol or mint flavored e-cigarettes. All participants who used e-cigarettes reported that they liked to use fruit flavors before most flavored vaping products were no longer available on the market. Participants reported that they switched to mint, menthol and tobacco flavors following the ban.

Some participants who formerly used conventional cigarettes reported that they switched to e-cigarettes because they wanted to quit smoking, and they believed that using e-cigarettes might help them quit. Among those who tried to quit cigarette smoking, some became dual users of e-cigarettes and conventional cigarettes because using e-cigarettes alone did not reduce their cravings. Others reported that they switched back to conventional cigarettes because they did not feel the same "kick" with e-cigarettes and did not feel like smoking when using e-cigarettes. Some participants reported that they completely switched to e-cigarettes because e-cigarettes, particularly JUUL, have a better "kick" and are "tastier" than conventional cigarettes. Participant also reported that e-cigarettes are convenient and portable and do not smell compared to conventional cigarettes. Participants also felt less pain in their throats when they vaped e-liquid compared to smoking conventional cigarettes.

Hookahs

While hookahs were one of common ATPs among participants, most participants who had experience with hookahs in the study reported that they did not use a hookah regularly. Some participants reported that they used a hookah once or twice a week, usually on the weekend. Some other participants reported that they used it once or twice a month, or just a couple of times in the past year. They did not use hookahs as often as e-cigarettes or conventional cigarettes since they only use hookahs when socializing with their friends. P21, a 31 year-old male participant said, "…It is not about how often I vape hookahs. Rather, whenever I meet up with my friends, we vape hookahs, and sometimes, we were too lazy to meet and do it. So maybe, I've done it just once or twice?" The main reasons for using a hookah among participants were social gathering and recreation. P20, 32-year-old female participant, recalled and shared her experience smoking a hookah and expressed her thoughts about hookah lounge:

> Well, not very frequent, but probably, I used hookah five or six times in a year. Hookah lounge is a place where you can just casually hang out with friends. Whenever I hang out with my friends here in the U.S., well, not very often, but it is a place where I can socialize with friends and have fun occasionally. That's my thought about hookah lounge.

Participants also shared their flavor experience with smoking hookahs.

Many participants mentioned that they used flavors like mango, green apple, watermelon, grape and mint flavors. Most participants did not think of a hookah as a tobacco product, but perceived it as a device with "just water with added flavors". They believed that a hookah does not contain nicotine. Additionally, participants shared different hookah lounge settings in Korea and the U.S. Participants reported that in Korea, they usually meet friends at restaurants where foods and hookahs are sold together in Korea. They also reported that some restaurants offer hookahs for free if they order food. On the other hands, they mentioned that hookah lounges in

the U.S. tend to sell hookahs without food. Most participants had more positive experiences with hookah lounges in Korea than in the U.S. Most participants expressed that hookah lounges in Korea are more "fancy" and "modernized" than hookah lounges in the U.S. They also expressed that hookah lounges in Korea offered more flavor options than hookah lounges in the U.S. Moreover, they thought that hookah lounges in Korea were more convenient than hookah lounges in the U.S. because they could stay longer hours and hang out with friends at the same place. P14, a 27-year-old female participant, shared her thoughts:

> I think hookah bars are better in Korea…overall, the stores look nicer…I think the owner was Asian Indian. Anyway…it was in *Itaewon*. The owner explained the history of hookah in detail and had more flavor options, but here, many places are in old neighborhoods. Only small hookah bars here…

Traditional cigars

A couple of participants had cigar experience. Most participants who had smoked a cigar did not have a positive experience with this tobacco product, so they discontinued it after a couple of trials. They shared some reasons why they did not like cigars. Some cigar smokers in the study felt a very strong tobacco taste and experienced some throat pain after smoking. They also expressed that smoking a cigar was inconvenient because the time to burn one cigar took so long, and cigars are too big and thick for their mouths. For example, P7, a 27-year-old male, participant said,

> It was very strong at first. I did not know at first that you are not supposed to inhale the smoke. So after I had a sip, it was too strong, and I felt the burning sensation in my eyes. After I got used to it and learned how to smoke, I understood why people smoke cigars, but I still did not want to continue smoking it. It was too strong, leaving some stuffy

> feeling inside of mouth. I got the immediate buzz from smoking it, so maybe, people smoke it for that sensation…Taste was not that bad after I got used it…but overall it was inconvenient to smoke cigars. When I smoke a cigarette, I can hold it in my mouth but a cigar is thick…so I had to open my mouth wider and felt a bit stupid….

Additionally, some participants expressed that smoking cigars require extra leisure time and money if they want to fully enjoy it. Moreover, many participants in the study had misconceptions about cigars. For example, they noted that cigars were for certain racial groups like Blacks or Hispanics, old people, and people who are rich and have more money and leisure time.

IQOS (Heated Tobacco Product, HTP)

Some participants in the study shared their experiences using heated tobacco product (HTP), particularly IQOS, an HTP created by Philip Morris International. This tobacco product was not included in the list of ATPs that the PI planned to explore before the study began, but some interviewees mentioned this new ATP. Participants who had experience with IQOS reported that IQOS is popular among young adult smokers in Korea and smokers who want to quit conventional cigarettes. Participants who used IQOS had mixed experiences with this tobacco product. Some of them switched to IQOS from conventional cigarettes while some participants used both IQOS and e-cigarettes. Some participants tried IQOS a couple of times but eventually discontinued. Participants who discontinued IQOS switched back to either conventional cigarettes or e-cigarettes. IQOS users in the study described the unique smell and taste of this product. P18, a 31-year-old male participant, said, "It has a unique smell...something like smell of *tteum* [a type of acupuncture therapy procedure]…or sort of boiled rice smell and taste…" Another participant also described its taste as "steamed sweet potato." Some IQOS users

in the study did not like the smell and taste. They did not feel the same sensation as when they smoked a cigarette. As a result, these participants discontinued IQOS after a couple of trials. Some participants also thought that IQOS is inconvenient and too expensive to use. Other participants who had experience with IQOS reported that the tobacco "stick" or "pencil" used in the IQOS does not last long, therefore, they needed to recharge the product after heating a single cigarette. They also reported that they could not use IQOS indoors like e-cigarettes, making it inconvenient. On the other hand, positive reasons for using IQOS included smoking cessation, reduced smell, and the benefits of having an alternative product to use if e-cigarettes are not available. Additionally, we found some misclassification around IQOS by participants. Some participants thought that IQOS was an e-cigarette product. Most participants who had experience with IQOS in the study were not sure if IQOS is classified as an e-cigarette or a conventional cigarette.

5.3.2. Dual Smoking Culture Influence (Korean and U.S. Smoking Culture)

Notably, many participants in the study regularly visit Korea to reunite with their families and friends. Some participants reported that they tend to smoke more conventional cigarettes when they visit Korea because they have more social gatherings, drink more alcohol and have more friends or peers who smoke conventional cigarettes. Some participants reported that not many people around them smoked in the U.S. Here are quotes from some participants:

> I think friends in Korea…are more lenient about cigarettes or other tobacco products. (P1, 21-year-old female)
>
> In Korea, there is a culture of smoking together when people around me smoke a cigarette. But here, not many people around me smoke. (P11, 21 year-old male)

> Oh, yes…I definitely smoke more when I visit Korea. I have thought about why that might be. I think maybe it's because I usually drink more alcohol in Korea, and when I drink, I end up smoking more cigarettes. I tend to spend more time outside there, too. I think that is why I smoke more cigarettes there... (P16, 21-year-old male)

Furthermore, some participants mentioned that because tobacco product prices are generally lower in Korea compared to the U.S., they tend to use tobacco products, such as conventional cigarettes, e-cigarettes, or hookahs more while in Korea.

On the other hand, other participants expressed that they liked American smoking culture and used more tobacco products in the U.S. For example, these participants expressed that they did not feel pressure to smoke or not to smoke when they are around smokers or non-smokers in the U.S. They said that people in the U.S. respect individual choice and rights, but in Korea, they felt more pressure to smoke or not to smoke around smokers or non-smokers. Additionally, some participants reported that outdoor smoking restrictions in the U.S. were less strict than outdoor smoking restrictions in Korea, which caused them to smoke more outside in the U.S. P9, a 34-year-old male participant, recalled his experiences in both countries:

> …First of all, I began smoking more cigarettes when I came to the U.S. because I could smoke more freely (outside). In Korea, there are many designed smoke-free zones on the streets…uh…something like that, but here, there was no smoke-free zone on the streets, at least when I first came to the U.S.

Korean and U.S. smoking culture also influence participants' use of e-cigarettes and hookahs. Participants had various opinions about the use of these products in both countries. Some reported that they went to hookah lounges more often when they visited Korea because

they spent more time outside with friends. P5, a 27-year-old female participant, shared her hookah lounge experiences from both countries:

> In Korea, many hookah lounges sell food items and hookahs together but here (in the U.S.)...no food items… The concept of hookah lounge in Korea is more like you sell hookah at restaurants and cafe. But here, hookah lounge offers only hookah…Sometimes, I would go to hookah lounge to have a meal. In such cases, I would meet my friends there to have a meal and vape hookah together at the same time. But here, I would not want to pay just for hookah…I feel more convenient going to hookah lounges in Korea because I can kill two birds at the same time.

Another participant discussed the availability of flavor options at hookah lounges from both countries:

> In Korea, vaping hookah is like a recreational activity, so people can add alcohols to their orders and choose more exotic flavors. On the other hand, in the U.S., vaping hookah is more ordinary, so if people want to drink alcohol at a hookah bar, they order it on their own. Not many hookah bars have this option. Also, hookah bars in the U.S. usually only have about 10 flavors, but in Korea, there are so many flavors you can choose from.

On the other hand, some participants reported that they used a hookah more in the U.S. because they socialize more with international friends who owned hookahs at their houses.

Participants expressed that e-cigarettes are popular among young adults in Korea these days due to strict indoor and outdoor smoke-free policies, health concerns and stereotypes about cigarette smokers. Participants who used e-cigarettes in the study reported that they could only use menthol and mint flavors in the U.S. due to a flavor ban, however, they used more flavors when they visited Korea. Additionally, most participants who used JUUL in the study also

reported that JUUL sold in the U.S. has a stronger "kick" and higher nicotine concentration. Thus, they liked to use JUUL in the U.S. Furthermore, participants reported that certain e-cigarette and conventional cigarette brands are sold only in Korea or only in the U.S. As a result, some participants who want to use Korean tobacco products order from small Korean retailers that do international trading and shipping. Alternately, they buy multiple boxes of country-specific cigarettes or e-cigarette brands from duty free shops at the airport for a cheaper price.

Additionally, some participants reported that HTPs are popular in Korea, particularly IQOS. Those who had experience with IQOS reported that they learned about IQOS and tried out it in Korea. However, they mentioned that IQOS is not popular in the U.S. As a result, they did not use IQOS while in the U.S.

Lastly, participants who were more acculturated and assimilated to U.S. culture, regardless of gender, were exposed to variety of ATPs. Participants who were more acculturated to Korean culture smoked more conventional cigarettes. For example, participants who had families and close friends in Korea and contacted them regularly reported that they traveled back and forth between the U.S. and Korea regularly. As a result, they were more exposed to Korean smoking culture and changed their smoking behaviors accordingly. Further, participants who socialized with Koreans in the U.S. were influenced more by Korean smoking culture. Many participants also mentioned that few Koreans in the U.S. smoke or use ATPs compared to Koreans in Korea. On the other hand, participants who had more diverse social circles, were more acculturated to the U.S. and were more fluent in English had more experiences with various ATPs and had tried more new tobacco products. All participants expressed that acculturation factors, such as food preference, media preference, years of residency, age at migration and primary language at home did not influence their tobacco product use behaviors.

Notably, some participants expressed that they wanted to use e-cigarettes more when they experienced acculturative stress involving cultural and social adjustment after dealing with migration, language and visa issues.

5.3.3. Tobacco Product Harm Perceptions

While participants regarded all tobacco products as harmful to health, they regarded e-cigarettes and hookahs as less harmful than conventional cigarettes. For e-cigarettes, participants believed that nicotine and other chemicals like carcinogens in e-cigarettes were definitely risks to health. However, most participants who used e-cigarettes in the study thought that the added flavors, lack of smell and smoke and vaporizing liquid in e-cigarettes made them less harmful than conventional cigarettes. Some participants believed that e-cigarettes are less harmful if used without nicotine or with less e-liquid. Most participants who perceived e-cigarettes as less harmful thought that water vapor from e-cigarettes was not as harmful as smoke produced by conventional cigarettes. Some participants perceived that water vapor was not harmful at all. They believed that this water vapor might be less harmful to people around them than conventional cigarettes. P15, a 19-year-old female participant, shared her opinions:

> There are pros and cons for each tobacco product. But overall, I think e-cigarette is better…first, it does not leave bad smell, and it does not produce harmful smoke. To me, it seems healthier than regular cigarettes…yeah, because of these reasons…and it is tastier…

Moreover, a 31-year-old male participant shared his harm perceptions about JUUL:

> First of all, compared to when I smoked cigarettes, I feel that my respiratory system is much better now. Regular cigarettes contain nicotine, tar and other harmful substances like carcinogens. But I think JUUL is simply a nicotine delivery device. To

me, it is the same as a nicotine patch. I consider JUUL as the same line as a nicotine patch or a gum that only delivers nicotine. Maybe JUUL produces other harmful substances when it vaporizes in high temperature…But I am not so sure about that part.

Most participants who used hookahs in the study thought that hookahs were not harmful to health or, at least, were less harmful than conventional cigarettes. Some hookah users did not regard a hookah as a tobacco product. They believed that the liquid inside of a hookah was made out of water and artificial flavors. They reported that they did not use hookahs regularly like cigarettes. They used them occasionally for recreation or entertainment purposes, therefore, overall, they perceived hookahs as less harmful than cigarettes. P7, a 26- year-old male participant, expressed:

> To my knowledge, based on one time usage…hookah…I heard from my friend that vaping hookah is much more harmful than smoking a cigarette. But hookah is not addictive, so if I smoke it only once in a while, then overall, hookah is less harmful to health than regular cigarette…

On the other hand, a couple of participants believed that hookahs could be more dangerous to health because people inhale water vapor directly into their lungs without any filter.

For cigars, some participants believed that cigars are bad for one's health and regarded them as more harmful than conventional cigarettes. A male participant said that he questioned which substances were contained in cigars. Another male participant believed that cigars are not good for the lungs and teeth. On the other hands, some participants regarded cigars as less harmful to health because smokers do not inhale the smoke directly to the lungs, but only hold the smoke inside the mouth and smell the scent. Other participants expressed that they were not sure if cigars are less harmful than cigarettes.

5.3.4. Peer and family influence on Tobacco Product Use Behaviors

We found that smoking initiation was influenced mainly by peers who smoke. While all participants initiated any tobacco products out of curiosity, they were exposed to tobacco products by peers who smoke cigarettes or use ATPs. They also learned about new tobacco products from peers and began to try it out in that way. Participants mentioned that their peers did not force or pressure them to use tobacco products. However, they became curious about tobacco products when their friends offered tobacco products, particularly during social gatherings. They were curious about taste or how it feels to smoke or use the new tobacco products. P1, a 21 year- old female, participant recalled:

> I started using e-cigarette when I was 16 years old. Hum…I started it when I spend time together with my friends. They were smokers. They asked me, "Do you want one?", so I said, "yes"…that's how I started… It was not peer pressure. just…just out of curiosity? Pretty much…my mind is saying, 'Should I try it out?'…

Some participants thought that their friends looked "cool," and they wanted to look cool like their friends. While smoking initiation was mainly influenced by peers, most participants reported that their peers did not influence their continuous use of tobacco products. Once they were addicted to tobacco products or became regular smokers, peer influence diminished. For example, P18, a 31-year-old male participant, recalled:

> Yes, it was curiosity plus peer pressure, then something like wanting to show off. I thought it was cool, so I started…Most of my friends were smokers, so smoking became a daily routine, eventually becoming hard to quit…

We also found that many participants did not want their family, particularly their parents, to know about their smoking status. Most participants reported that they hid their smoking status

from their parents. They thought that their parents would not be happy if they found out their son or daughter was a smoker. Some participants reported that their parents were strongly against smoking any tobacco products, so they wanted to avoid unpleasant situations at home. However, when the PI asked participants how their parents' opinions about using tobacco products influenced their smoking behaviors, many participants reported that their parents' opinions did not influence their smoking behaviors. They expressed that they would continue smoking regardless of their parents' opinion. Some e-cigarette users reported that their parents did not know what e-cigarettes look like. They also reported that they even used e-cigarettes at home because e-cigarettes do not smell or produce smoke, and therefore, their parents would not find out if they vape. Some other participants reported that their parents did not take it seriously when they found out about their smoking or use of tobacco products. Additionally, most participants said that they know smoking is bad for one's health and that they had worried about addiction during childhood when they observed their father or other family members smoking. Moreover, their childhood memories and experiences of secondhand smoking made them think they would never smoke in the future. However, when they became older, they could not resist curiosity.

Many participants expressed that they would quit smoking for their families. For example, most male participants who were married expressed that they would consider quitting smoking in the future because their spouses wanted them to quit smoking. Or participants did not want their smoking behaviors influencing their children because they were concerned about their children's health and wellbeing. Furthermore, some reported that they tried to quit smoking for a couple of years when their children were very young or their spouses were pregnant. Some other participants expressed that they wanted to please their parents and did not want to disappoint them, and that, eventually, they would try to quit.

5.3.5. Price Influences Tobacco Product Use Behaviors

When the PI asked participants if they had ever been exposed to tobacco product marketing, promotion and advertisement, most participants automatically thought about direct advertisements or anti-smoking campaign, before saying. They did not recall if they had ever seen any tobacco product advertisements. When the PI probed further, some participants recalled that they encountered cigarette and e-cigarette marketing and promotion on radio, at gas stations, convenience stores, smoke shops, newspapers, social media and online. Since most participants in the study were bilingual and travelled frequently back and forth between the U.S. and Korea, they were exposed to tobacco product marketing and learned about new tobacco products from various sources in both countries.

Participants reported that they saw JUUL or other cigarette brand sales posters at convenience stores, smoke shops and gas stations in the U.S. Some participants reported that they saw IQOS advertisements at convenience stores, from newspaper and tobacco companies' websites in Korea. Most participants said that they learned about new products at convenience stores and gas stations, but they did not really pay attention to sales posters most times. They expressed that tobacco product advertisement exposure from these sources did not influence their smoking behaviors.

Some participants reported that they saw advertisements for JUUL devices and accessories from social media, such as YouTube, Facebook and Instagram. Some participants also reported that they saw online banner marketing from social media. For example, P16, a 21-year-old male participant, recalled his exposure to social media marketing:

> I saw JUUL advertisements in Social Media…like in Facebook, Instagram, some advertisements in Google…uh…I cannot remember if I have seen an advertisement on

> websites… hum…the advertisement is like…When you scroll down through the Newsfeed page on social media, sometimes, you see "Sponsored" ads pop up…I think…my guess is that they (JUUL) paid Instagram to do it for them…ads popped up. I think 1-2 years ago, JUUL ads were a common sight in social media…In the pop-up advertisement, I saw the picture of JUUL products in the white background page and sales message saying they are selling JUUL.

Some current e-cigarette users mentioned that online advertisements, promotions and marketing sometimes influenced their tobacco product purchasing behavior.

Although tobacco product marketing did not directly influence participants' smoking behaviors, we found that price plays an important role in tobacco product purchasing behaviors, and in turn, influences tobacco use behaviors. For example, participants considered buying more packages when they saw sales discounts or received coupons via email for their favorite brands. P17, a 34-year-old male, participant described his tobacco advertisement exposure:

> Uh…Usually, I do not pay attention to tobacco advertisement. But I saw sales posters at cash register or when I enter the convenient store. And I have no brand preference, so I usually buy a pack of cigarette with sales tag on the pack, something like…today's sale price, this product has x % discount…I bought those when I saw these tags.

Some study participants who currently used e-cigarettes reported that they usually purchased tobacco products directly from the tobacco company's website. After the first purchase, they would receive coupons and promotions from the tobacco company via emails. Some participants mentioned that tobacco companies sometimes provide promotions online such a special sales events. For example, a male participant said that he had to enter some information on the website

every month so that the tobacco company would send him some free tobacco products. P18, 31-year-old male participant, shared:

> I buy JUUL online…yes, from their official website…when you buy JUUL online, it is cheaper than buying it at a convenient store…Maybe two times is an exaggeration, but it feels like half the price. It feels like the price is 1-1.5 times cheaper in their official website…Yes, I ordered it using auto shipping, so they send me refills regularly by mail.

These participants expressed that they were likely to buy multi-packs even if they did not need them at the moment in order to save them for future use. Some of them searched discount or special offers from various blogs, social media and online and were able to access to imported tobacco products from Korea. For example, P4, a 21-year-old male participant, shared:

> Uh…Koreans living in the U.S. cannot smoke Korean tobacco products. So I found a website that sold imported tobacco products from Korea. At that time, I was smoking cigarettes, so I purchased Korean brand products there with my friend. On that website, there was 'E-cigarette' menu…found so many Korean brand e-cigarettes there…So, I learned about them after I saw advertisements through that website.

Additionally, some participants reported that tobacco prices are higher in the U.S. than in South Korea. As a result, some thought seriously about quitting smoking or quit smoking for a period of time after they moved to the U.S.

Other participants also mentioned that they were exposed to tobacco product promotions at smoke shops in the U.S. While narrating their experiences, they described that some of the smoke shops required customers to create a new account and enter their personal information. Only then would the shops provide reward points to customers by email that could be used for future purchases. Those who preferred to buy tobacco products from smoke shops expressed that

they liked receiving reward points so they could buy more products in the future. They believed that using reward points was their way to bargain and to continually receive tobacco products at a good price.

5.4 Discussion

5.4.1. Interpretation of Results

Findings in the current study showed that e-cigarettes were the most commonly used ATPs among Korean young adults in the U.S., followed by hookahs, HTP (specifically IQOS) and cigars. Findings related to reasons for using e-cigarettes were consistent with findings from a previous study that conducted focus group interviews with college students (Pokhrel et al., 2014). Conventional cigarette use was still high among participants in the study. The current study found some relationship between conventional cigarettes smoking and e-cigarette use. The relationship between e-cigarette use and conventional cigarette smoking among Asian Americans suggested in previous studies are similar to findings in the current study (Her, 2020; Roh et al., 2022). Findings in the current study also suggest that conventional cigarette use may still be high among Korean young adults in the U.S. despite conventional cigarette use in the U.S. declining in recent years (Bandi et al., 2021). Moreover, the current study suggests that e-cigarettes use may be prevalent among Korean youth and young adults in the U.S.

Our findings suggest that hookahs and IQOS seem to be most popular tobacco products among young adults in South Korea. Korean young adults in the U.S. who travel frequently to South Korea seem to access hookahs and IQOS more easily due to different tobacco regulation in South Korea and the U.S. Regarding hookahs, more diverse flavored hookahs and convenient food package options are available in Korea to attract customers. More flavor options and fancy and “cool” looking restaurants in Korea seem to increase curiosity and interest and reduce harm

perceptions regarding these products, which in turn leads to tobacco product initiation and continued use among Korean young adults.

Regarding IQOS, IQOS is one brand of HTPs and includes “the electronic IQOS device that generates a nicotine-containing aerosol by heating tobacco-filled sticks wrapped in paper” (U.S. Food and Drug Administration, 2020). The product was introduced in 2014 in the U.S. and in 2017 in South Korea (Truth Initiative, 2020). In the U.S., the U.S. Food and Drug Administration (FDA) authorized marketing of IQOS in April 2019 via the premarket tobacco application (PMTA), then in 2020, FDA further authorized the marketing of this product as modified risk tobacco products (U.S. Food and Drug Administration, 2019; U.S. Food and Drug Administration, 2020). However, due to a patent lawsuit case between two rival tobacco companies, the import of IQOS was banned in the U.S. as of September 2021 (Lucas, 2021; U.S. Food and Drug Administration, 2019). Thus, IQOS is not currently available in the U.S. market. Since the introduction of IOQS in Korean market, the market share has grown rapidly to become one of the hottest IQOS market in the world (J. Kim et al., 2018). Prior studies suggest that IQOS is more popular among Korean young adults and has not gained much popularity among U.S. young adults (Kim et al., 2018; Nyman et al., 2018; Truth Initiative, 2020). Consistent with previous studies, participants in the study reported that IQOS is more popular in South Korea than in the U.S., and they tended to have greater exposure to IQOS and use it more during their visits to South Korea. Philip Morris International has received authorization to market IQOS as a modified risk tobacco products in the U.S because the company submitted data to FDA demonstrating that switching from cigarettes to the use of IQOS reduces exposure to potentially harmful chemicals and that use of IQOS may help adult smokers transition away from cigarettes (U.S. Food and Drug Administration, 2020). However, due to lack of data, long-term health risks

of HTPs, including IOQS, are still unknown. More research is needed to understand the short- and long-term effect of HTPs. Regardless of whether these tobacco products reduces exposure to harmful toxins or carcinogens, they contain nicotine that is highly addictive. The use of these tobacco products is harmful, especially for youth, young adults, as well as adults who do not currently use any tobacco products because nicotine can harm the brain that keeps developing until about age 25 (U.S. Department of Health and Human Services, 2016). Therefore, tobacco control professionals should continue monitoring the use of these tobacco products among Korean young adults in the U.S. to reduce tobacco-related health disparities.

Korean young adults in the study initiated smoking during late adolescence and early young adulthood. Many participants in the current study initiated smoking with a conventional cigarette or an e-cigarette, then smoked regularly after their first smoking initiation. A prior study found that the proportion of people who initiate their first smoking or start to smoke regularly in early adulthood increased substantially over the period of 2002 to 2018 (Barrington-Trimis et al., 2020). Later age of cigarette smoking initiation is strongly associated with lower risk of becoming a regular smoker, developing nicotine dependence and having adverse smoking-related health effects (U.S. Department of Health and Human Services, 2014). Findings in the current study suggest that overall adverse smoking-related health effects during one's life course may be lessened among Korean young adults. Yet, most participants in the study became regular smokers after their first smoking initiation. This phenomenon is concerning from a public health standpoint. A prior study found that onset of regular smoking initiation between age 18 to 20 was associated with higher odds of nicotine dependence and lower odds of attempting and intending to quit (Ali et al., 2020). Thus, prevention efforts in the young adult population are needed to protect their health.

Findings in the current study showed that many participants used two or more tobacco products, particularly combinations of conventional cigarettes and e-cigarettes, conventional cigarettes and hookahs, e-cigarettes and hookahs, HTP and e-cigarettes. Multiple tobacco product use has been common among smokers in recent years (Cornelius, 2020; Kasza et al., 2017). Prior studies suggested that multiple tobacco product use results in greater nicotine exposure and dependence, increased exposure to harmful constituents and greater risk of tobacco related disease (Choi et al., 2017, 2022; National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2012; Owusu et al., 2019). Findings in the current study suggest that Korean young adults may be at higher risk of increased exposure to tobacco harm and nicotine dependence if dual or multiple tobacco product use behaviors become a long-term behavior. More research on multiple tobacco product use behaviors among Korean young adults in the U.S., including those who were born outside of the U.S., is needed. Continued prevention efforts to reduce use of any tobacco products among this vulnerable population are also recommended.

While all participants in the current study believed that all tobacco products were not good for health, many participants regarded ATPs, such as e-cigarettes, cigars, hookahs and HTP, as less harmful than cigarettes, or expressed ambivalent opinions. They underestimated the health risks of these tobacco products. Many participants had incorrect health risk information about these tobacco products and were not sure if they had correct health risk knowledge on these products. At the same time, Korean young adults had less social stigma when using these tobacco products. Findings in the current study suggest that flavors, convenience, lack of smell, incorrect health risk information, less social stigma and young adult-targeted marketing may contribute to lower harm perceptions on these ATPs among Korean young adults. Lower harm

perceptions seems to raise curiosity and interest about these tobacco products, and in turn, this causes Korean young adults to try out these ATPs. Prior studies suggested that lower harm perceptions of e-cigarettes and hookahs are associated with e-cigarette and hookah use, particularly among younger generations (Chen et al., 2018; Heinz et al., 2013; Mumford et al., 2017). Thus, lower harm perceptions may be related to e-cigarette, hookah and HTP use among Korean young adults. The current study provides a narrative understanding of harm perceptions and ATP use among Korean young adults, and further research is needed to test the associations between harm perceptions and ATP use among Korean young adults with a larger sample. Further, ethnic-focused tobacco prevention effort with correct health risk information about these ATPs will be helpful.

Findings in the current study suggest that peers' smoking status influenced tobacco product initiation in Korean young adults. Many participants shared that they initiated smoking when their peers smoked or used ATPs. Although a majority of participants mentioned that their peers did not pressure them to smoke a conventional cigarette or use ATPs, the frequent observation of peers who use ATPs raises curiosity and is a risk factor for smoking initiation among Korean young adults. However, findings in the current study suggest that the peer influence on tobacco use behaviors diminished over time. Once these Korean young adults became regular smokers, their tobacco product use behavior was not influenced by peers but rather, by nicotine dependence. Additionally, the study found that Korean young adults tend to use more tobacco products during social gatherings, especially when socializing with Korean friends, and while using alcohol. Consistent with previous studies, the presence of others using tobacco products and alcohol might increase levels of momentary craving among Korean young adults, and socializing with Korean friends who use any tobacco products might contribute to a

"culturally-specific salient smoking cue" (Cerrada et al., 2016; Huh et al., 2016). Thus, researchers who develop culturally targeted smoking prevention intervention for Korean young adults may consider including components that can reduce negative peer influence. Further, smoking cessation programs targeting Korean young adult smokers should consider providing nicotine replacement therapy and resources for alternative activities to reduce nicotine dependence symptoms.

Additionally, findings in the current study suggest that family members influence tobacco product use behaviors among participants. For example, a majority of participants reported that their father was either a current or former cigarette smokers. Participants thought that seeing their father smoking during childhood may have affected their smoking behaviors in later years, they thought to themselves during childhood that they would never smoke and even when their father has quit smoking many years ago. Moreover, most parents and family members were not so resistant when parents found out that their son or daughter smoked. It seems that parents and family members told participants to quit smoking but showed passive support for quitting smoking. Interestingly, individuals who currently and formerly used ATPs in the study mentioned that family was the main reason that they would quit after all. Family values seem to influence their decision to quit smoking. These Korean young adult smokers need more resources and interventions that help to reduce tobacco product use and nicotine dependence symptoms. With that said, culturally targeted smoking cessation that emphasizes family values and provides nicotine replacement therapy (NRT) may be more effective for this population (Mahabee-Gittens et al., 2012; Nierkens et al., 2013).

We found that individual smoking behaviors were influenced by Korean and American smoking culture, and that participants modified their smoking behaviors accordingly between the

two cultures. Findings in the current study suggest that some acculturation factors, such as proficiency in English and preference of social circle (Koreans vs. international friends) and country-specific smoking culture influence tobacco product use among Korean young adults in the U.S. However, other acculturation factors, such as food preference, media preference, age at migration and the number of years living in the U.S., do not seem to influence tobacco product use behaviors. Notably, many foreign-born young adult Koreans in the U.S. seem to be influenced by dual smoking culture. For example, individuals who were more assimilated to Korean culture seem to smoke more frequently, be more influenced by peers and others around them and use more conventional cigarettes and HTPs. Those who were more assimilated to U.S. culture seem to learn about new ATPs more and do not have many peers who smoke or use tobacco products regularly. Further, those who were assimilated to both cultures (those who had about equal percentages of involvement in both culture, were bilingual in English and Korean and had more connections to Korea regardless of the number of years in the U.S.) were able to access various new tobacco products from both countries. Findings in the study suggest that culture, by itself, does not determine tobacco use behaviors among these young adults. Rather, the relationships of influencing factors are very complex. To be sure, cultural factors should be considered when researchers investigate tobacco product use behaviors among foreign-born Korean young adults. Findings in the study suggest that culture seems to be jointly influenced by individual, interpersonal and policy factors, such as harm perceptions, nicotine dependence symptoms, peers, family, different tobacco regulations in both countries and social, economic, and environmental stressors. Further research is needed to examine how these multiple factors jointly influence ATP use behaviors among Korean young adults.

Price seems to strongly influence tobacco purchasing behaviors among Korean young adults. Findings in the current study suggest that Korean young adults were sensitive to tobacco product pricing. They demonstrated various price reducing strategies, such as reducing or stopping tobacco consumption, multi-pack buying or carton-buying, buying at duty-free shops and using coupons or rewards points. Studies suggested that price promotions increase tobacco product purchase quantity, which in turn, affect tobacco use (Doogan et al., 2018; Persoskie, Donaldson, et al., 2019). For example, consumers who buy a larger supply of a tobacco product may use or consume it more because consumers see multi-pack buying or carton-buying as "value-for-money" and perceive the unit cost to be lower because of an increased supply (Chaloupka & Warner, 2000; Doogan et al., 2018; Wansink, 1996). A study found that multi-pack purchases increased among U.S. smokers between 2002 and 2011 (Cornelius et al., 2015). Moreover, tobacco companies use tobacco price promotions, such as discount coupons and reduced price multi-pack buys, to motivate consumers to switch their brand and continued use of their products among those who currently smoke (Persoskie, Donaldson, et al., 2019). Therefore, finding a way to limit the price reducing strategies used by tobacco consumers and implementing stronger regulations on tobacco companies' price promotions, particularly through online and small vape shops, are important to reducing consumption.

Lastly, most participants in the study were not exposed to and not influenced greatly by tobacco product advertisement from most sources, such as TV, radio, convenient stores and gas stations. Regardless, it seems that Korean young adults are vulnerable to online and social media marketing. While the direct advertisement of tobacco product is prohibited in both South Korea and the U.S., tobacco companies have expanded marketing of various ATP products through many online channels such as websites, blogs and social media to target young populations.

Some participants in the study mentioned that they saw online and social media advertisements and promotions. The online advertisements did seem to influence purchasing behaviors of those who currently smoke. Studies suggested that exposure to marketing of tobacco products is associated with subsequent tobacco product initiation (Cruz et al., 2019; Lienemann et al., 2019). Protecting young adults from tobacco product marketing exposure is important in reducing tobacco product use among young adults. Continued monitoring of online or social media tobacco product marketing and stronger restrictions on online advertisements and tobacco marketing may reduce this population's risk of smoking initiation.

5.4.2. Strength

Findings in the current study make important additions to the current literature on tobacco-related disparities based on culture and ethnicity. While prior studies have limitations in presenting an ethnic Asian sub-groups' tobacco product use behaviors, the current study provides detailed information about tobacco product use behaviors among this group. To our knowledge, this is the first qualitative study to understand tobacco product use behaviors among foreign-born Korean young adults in the regions of DC, MD and VA which was important because their ATP use behaviors were previously unknown. The current study provides an understanding of the underlying reasons, opinions and motivations for tobacco use behaviors among Korean young adults.

5.4.3. Limitations

The study is not without limitations. The study interviewed non-U.S. citizen Koreans living in DC, MD and VA, and therefore, findings in the study cannot be generalized to a larger Korean or Korean American population. However, findings can be transferable to another

setting; thus, a future study can replicate the study with Korean young adults in other regions or conduct quantitative research with larger samples. Second, the researcher's presence during data collection, which is unavoidable in the study, might affect the participants' responses. Third, the association of influencing factors and tobacco use behaviors cannot be determined in the current study. Rather, the study provides narrative opinions of individuals in details and examines tobacco use behaviors and its risk factors in depth. The results of this study can provide potential plausible explanations. Thus, influencing factors that were identified in the study can be considered when a future study examines the associations.

5.5 Conclusions

In conclusion, the study provides insight into ATP use and associated risk factors among non-U.S. citizen Korean residents. Participants' ATP use are influenced by multiple factors, particularly peers and price. Participants were exposed to both Korean and U.S. smoking cultures. They modified their smoking behaviors accordingly and were influenced by both smoking cultures. Findings in the current study have implications for culturally targeted tobacco prevention and cessation programs. It is important to incorporate culturally sensitive methods of reducing nicotine dependence and peer influence, as well as increasing rewards and family values. Future quantitative research with larger representative samples of foreign-born Korean young adults that examines the association between these influencing factors and tobacco product use behaviors would be helpful. More ethnic-tailored research and anti-tobacco campaigns are warranted to address known and potential risks of ATP use among this population.

Table 3.1 *Characteristics of Participants in In-depth Interview*

Characteristics	Mean or Percentage
Age (mean, in years)	26.5
Sex	
Male	66.7%
Female	33.3%
States	
MD	38.1%
VA	57.1%
Washington DC	4.8%
Educational level	
Less than high school	4.8%
High school graduate or GED	23.8%
2 years college with Associate Degree or attended some years of college	4.8%
Bachelor's Degree	38.1%
Master's level Degree or higher	28.6%
Household income	
Less than $49,999	76.2%
$50,000 - $99,999	14.3%
More than $100,000	9.5%
Visa Status	
Student visa	42.9%
Work visa	9.5%
Permanent residency	38.1%
Undocumented	9.5%
Years in the U.S.	
<5 years	38.1%
5-10 years	42.9%
More than 10 years	19.0%
English Proficiency	
Very well	23.8%
Well	38.1%
Not well	14.3%
Not at all	0.0%

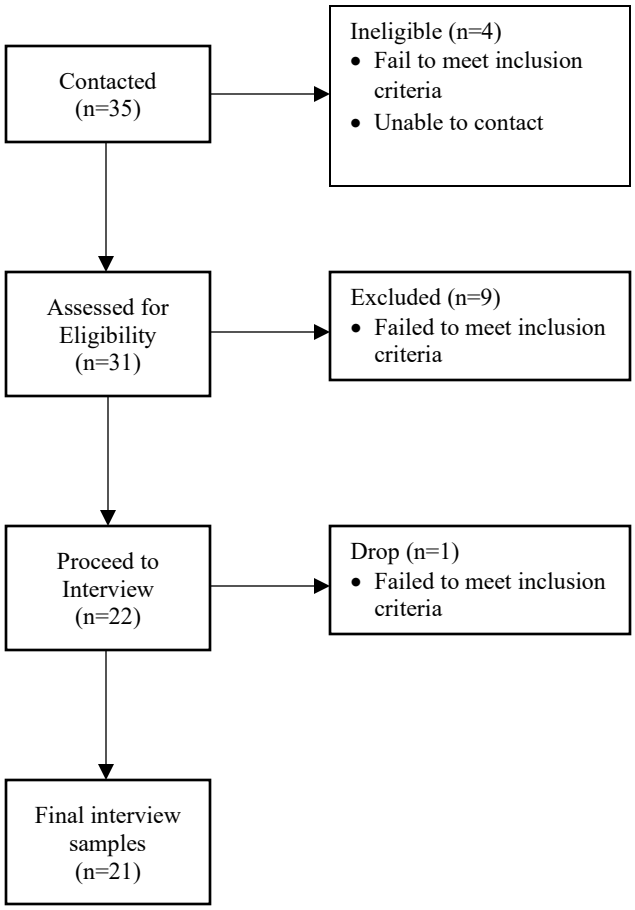


Figure 3.1. *Flow Diagram for Participant Selection*

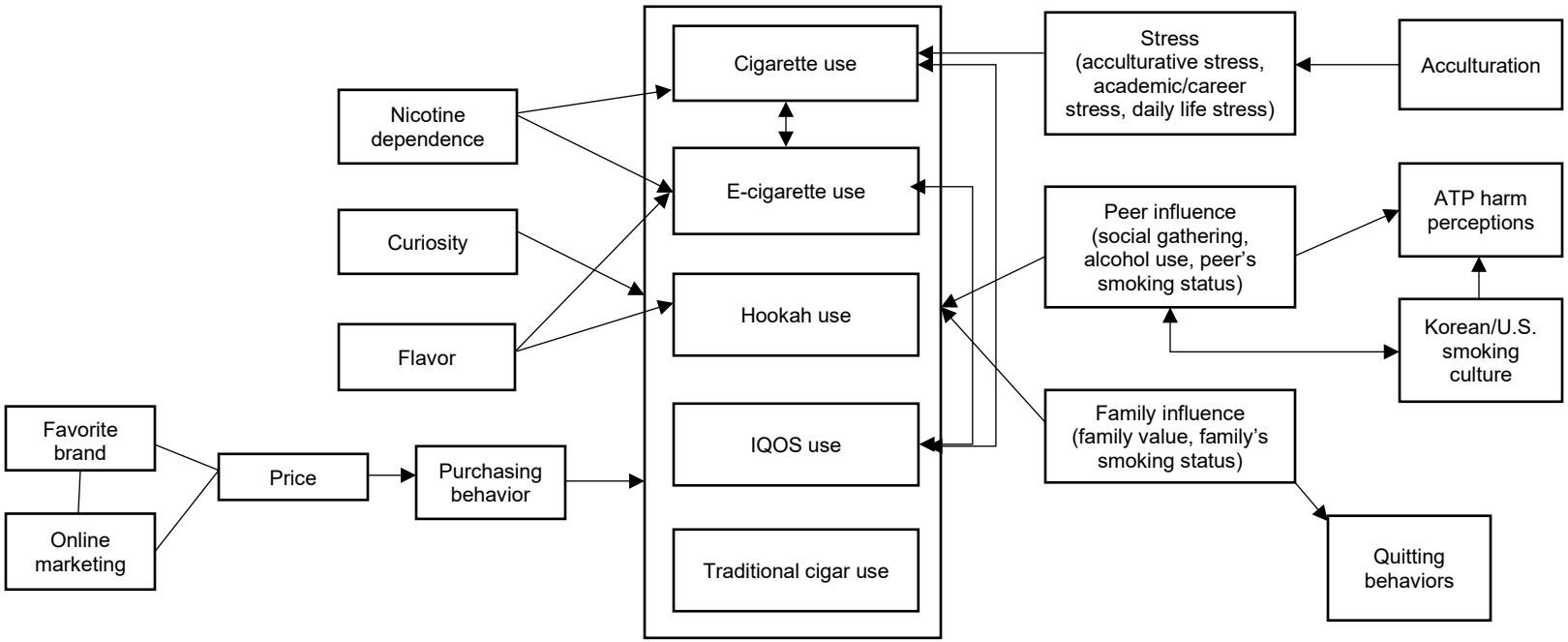


Figure 3.2. *Thematic Map*

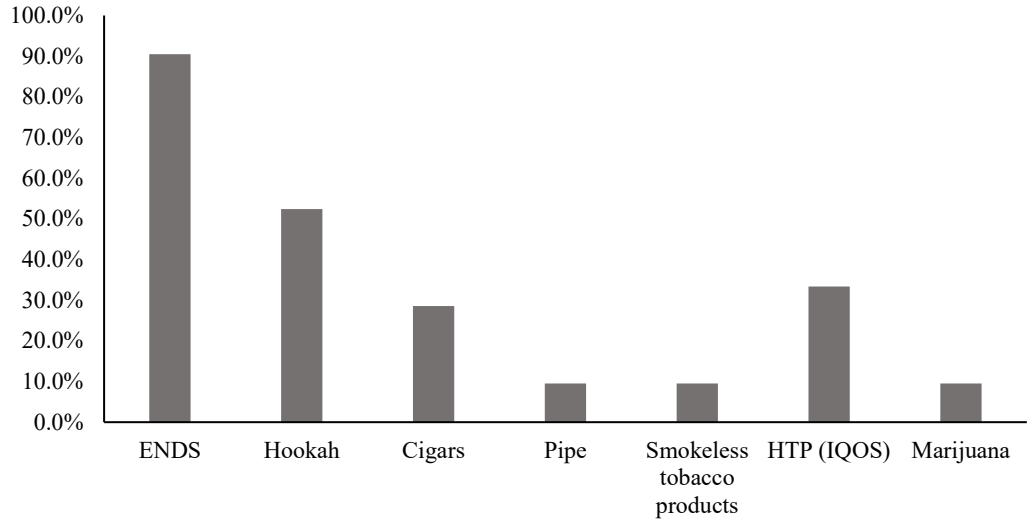


Figure 3.3. *Alternative Tobacco Produce Use among In-depth Interview Participants*

Chapter 6: Integrated Summary and Discussion

6.1 Overview

This dissertation examined the multilevel factor influence, addressed in the Social Ecological Model (SEM), on ATP use among U.S. foreign-born residents both quantitatively and qualitatively. Findings from this dissertation suggest that multiple factors at different determinant levels influence tobacco product use behaviors among U.S. foreign-born residents. Results of quantitative studies in this dissertation showed that foreign-born residents had lower prevalent estimates of ATP use and conventional cigarette use compared to the U.S. natives. Findings from all studies indicated that e-cigarettes, hookahs, and cigars are the most popular ATPs used among U.S. foreign-born residents. Results also suggest that conventional cigarette smoking is strongly related to ATP use. Additionally, dual or multiple tobacco product use was observed in the study samples.

Regarding acculturation, findings from studies one and two suggest that age at migration, language spoken at home, and English proficiency were predictors of harm perceptions, peer and family influence and ATP advertisement, marketing, and promotion exposure. Some acculturation factors were also predictors of ATP use. For example, less acculturated foreign-born residents were more likely to perceive ATPs as harmful, less likely to have peers or family members who use ATPs and less likely to receive tobacco product discounts or coupons than those who were more acculturated to the U.S. These acculturation factors were also predictors of current and lifetime ATP use among U.S. foreign-born residents. For example, less acculturated foreign-born residents were less likely to use ATPs compared to more acculturated individuals. Findings in study three suggest that smoking culture and social norms in the U.S. and South

Korea, as well as price, seem to influence ATP use behaviors among non-U.S.-citizen Korean samples. We also found that acculturation factors did not seem to influence directly ATP use behaviors among participants. However, participants reported that acculturative stress, as it relates to English language and visa status issues, and post-migration adjustment, causes them to smoke.

Regarding harm perceptions toward ATPs, foreign-born residents in all studies perceived all tobacco products as harmful to health. However, ethnic sub-group differences in harm perception toward each type of tobacco product may exist. For example, results from studies one and two indicated that foreign-born residents regarded ATPs as about the same or more harmful compared to cigarettes. On the other hand, results from study three indicated that non-U.S. citizen Koreans regarded some ATPs, such as e-cigarettes and hookahs, as less harmful than conventional cigarettes. Additionally, findings from all studies showed that those who regarded ATPs as less harmful were more likely to currently use ATPs than those who did not use ATPs.

Peers who smoke were identified as the most influencing factor of ATP use at different stages of smoking behavior among foreign-born residents. For example, findings from studies one and two suggest that peer and family use of ATPs was a strong predictor of individuals' ATP use behaviors. Moreover, results from study three suggest that peers greatly influenced ATP initiation while family seems to influence individuals' ATP initiation negatively and decision to quit smoking positively. Peer and family influence diminished when an individual became addicted to tobacco products. Nonetheless, peer and family influence do not necessarily have the same effect on smoking behavior across all U.S. foreign-born residents. The peer and family influence on ATP use may vary by different ethnic-sub groups. Moreover, different ethnic sub-groups may have different tobacco use experiences and smoking conditions in their original

countries. Further investigation on diverse ethnic sub-groups is needed to understand more about this phenomenon.

U.S. foreign-born residents may be sensitive to tobacco product price. For example, results in study two found that receiving discounts or coupons negatively predicted lifetime ATP use. In the study three, participants reported that they were likely to buy more of their favorite tobacco product brands if they were offered coupons or discounts. Interestingly, these foreign-born residents did not seem to be significantly influenced by direct ATP advertisements, marketing, and promotion of any kind even though they were exposed to ATP advertisements, marketing, and promotions. Results from study two indicate that those who were limited in English language were less likely to be exposed to ATP advertisements, marketing, and promotions. It is possible that U.S. foreign-born residents may not recognize tobacco product advertisements, marketing and promotions. Moreover, U.S. tobacco product advertisements may not linguistically and culturally attract this population.

In conclusion, ATP use behaviors among U.S. foreign-born residents is very complex. Findings in this dissertation suggest that multiple factors at different determinant levels influence ATP use in this population. Although this dissertation did not examine the country of origin, the home countries' smoking condition is a factor that can be included in future studies when examining the ATP use behavior patterns among this population. Additionally, dual and multiple tobacco product use was observed among samples in this dissertation even though the proportion was small. Lastly, different ethnic sub-group populations may display different ATP use patterns. Continued monitoring of ATP use behaviors among foreign-born residents is important to reduce tobacco-related health disparities among this population. Future research studies should

further investigate multiple product use behaviors and ethnic sub-group differences in ATP use behaviors.

6.2 Strength

A strength of this dissertation is that it is one of the very few studies to examine multi-level factor influences on ATP use among U.S. foreign-born residents, both quantitatively and qualitatively. Currently, little information is available about ATP use behaviors among this population. The dissertation provides some evidence to help understand ATP use behaviors among the U.S. foreign-born population, which are often understudied. In studies one and two of this dissertation, we examined U.S. nationally representative data from the large comprehensive longitudinal national tobacco study. We recognized the limitations in the national data, in which ethnic sub-group estimates were not available. The qualitative component of this dissertation acknowledged these limitations in the national data and further explored ATP use among non-U.S. citizen Korean residents. The qualitative study provided a deeper understanding of non-U.S. citizen Korean residents' ATP experiences as it relates to individual, interpersonal, cultural, and organizational factors.

6.3 Limitations

This dissertation is not without limitations. First, the study did not look at all levels in the SEM. For example, anti-tobacco policies, such as point-of-sale restrictions and tobacco tax policy and community factors, such as access to ATPs in retail stores and neighborhood conditions are important factors that have been known to influence smoking behavior. Second, the sample in study three were not drawn from the same samples in studies one and two. Third, in studies one and two, we did not include ethnicity (Hispanic vs. non-Hispanic) in our logistic

regression models. Hispanic is one of the largest ethnic sub-groups among foreign-born residents. Moreover, the PATH Study was conducted in both English and Spanish. We acknowledge that ethnicity can have effects on our analytic models. Rather, we controlled our logistic regression models with race. Fourth, the qualitative data from study three focused on one ethnic group. It does not provide the perspectives of diverse ethnic sub-groups among U.S. foreign-born residents who may display different ATP use patterns. Finally, differences in socialization process and its influence on ATP use may exist among foreign-born residents in this dissertation. The process of socialization begin during the childhood. Foreign-born residents in this dissertation might begin learning socially acceptable values, norms and tobacco use behaviors in their home countries during childhood and continued to learn as they grew. The study could not account for socialization because the study included foreign-born adult residents who are over 18 years old. Despite these limitations, this study improves our understanding ATP use among U.S. foreign-born residents, who are often understudied in tobacco research.

6.4 Implications for the Field/Future Research

6.4.1. Practice Implications

Findings from this dissertation have implications on prevention and cessation interventions. Study findings inform that development of culturally and linguistically tailored prevention programs for U.S. foreign-born residents who do not currently smoke or use tobacco products and culturally tailored cessation among U.S. foreign-born residents who currently smoke or use tobacco products would reduce tobacco-related health disparities. To enhance the efficacy of interventions and reduce health disparity gaps for immigrants, researchers have developed culturally tailored interventions. Culturally tailored interventions focus on including intervention components, such as ethnic and cultural experiences, norms, and values that meet

the unique needs of the specific ethnic sub-group. As mentioned earlier, different ethnic sub-groups have their own unique health needs. Sub-groups from different regions speak different languages and have different socioeconomic status, cultural values, and historic backgrounds. Moreover, the prevalence, initiation patterns and various factors influencing tobacco product use behaviors may vary across different racial and ethnic sub-groups. Thus, tobacco interventions aimed at foreign-born residents needed to be culturally tailored to meet the unique needs of these ethnic sub-groups.

In addition, information on culture specific value and culturally sensitive and committed support are also needed to sustain the effect of the interventions (Heo, 2014). A need for culturally tailored health interventions has increased in recent years (Ruiz et al., 2018). However, Kong et al. (2012) suggested that existing interventions did not take into account culture specific values and suggested to collect more cultural information in order to assess whether culturally tailoring would improve intervention effects (Kong, 2012). Another study also suggested that culturally and linguistically tailored interventions may not be enough but culturally sensitive and committed social support should be provided together to sustain the effect of the interventions (Heo, 2014). Culturally tailored prevention and cessation interventions and culturally sensitive support would provide the unique needs of these sub-groups emphasizing cultural experiences, norms, and values.

6.4.2. Policy Implications

Findings from this dissertation have policy implications. Most national surveys have limitations, in which sub-ethnic group estimates were not available. For example, most national surveys are conducted in English and Spanish, so they exclude a lot of foreign-born residents who speak other languages. Data on these ethnic sub-groups are often aggregated into broader

racial categories due to the lack of reliable and valid data. As a results, most national data underestimates tobacco use behaviors among this population. Therefore, there is a need for complementary studies enabling in-depth examination of sub-ethnic groups. For example, supporting researchers to conduct regional tobacco use surveys on different ethnic sub-group among foreign-born residents can supplement the limitations in national surveys. Moreover, when developing survey instruments, more diverse language translations of these instruments can also help collecting ethnic sub-group data and increase reliability and validity of data among immigrant ethnic sub-groups.

Our findings suggest that an effective tobacco education campaign targeting young immigrants should particularly pay attention to differences in diverse sub-groups, such as ethnic sub-groups and sub-groups by nativity. Tobacco education campaign targeting these young immigrant population should utilize ethnic-specific resources and build on existing cultural beliefs, norms and values about smoking. Such campaign may help prevent smoking initiation among younger foreign-born residents and reduce smoking prevalence among this population.

6.4.3. Research Implications

Findings from this dissertation have implications for future research. First, future research studies should investigate multiple tobacco use behaviors among U.S. foreign-born residents. Findings in this dissertation suggest that some foreign-born residents used dual or multiple tobacco products. Like mentioned earlier, studies suggested that multiple tobacco product use is associated with greater nicotine dependence and marijuana and other substance use (Gomez et al., 2020; Osibogun et al., 2018). Currently, much remains unknown about the patterns of multiple tobacco use among foreign-born residents. Thus, it is important to further investigate the multiple tobacco use among this population and to understand better on their ATP

use behaviors. Second, future research studies should also investigate the country of origin as one of predictors of ATP use behaviors among foreign-born residents. Studies suggested that many foreign-born residents were influenced by their home countries' smoking culture and conditions (Leung, 2014; Moore et al., 2012; Saint-Fort & Choi, 2019). If foreign-born immigrants who came from countries where smoking is more socially acceptable, then they may be more receptive to smoking than those who came from countries where smoking is less socially acceptable. Additionally, the prevalence of each ATP use across countries varies by differences in countries' socioeconomic status and tobacco control policies (Moore et al., 2012). Finally, future research may investigate the causal relationship between individual, social, and organizational determinants using different factors at each determinant level that were not used in this dissertation in order to better understand complex tobacco use behaviors.

APPENDICES

Appendix A: The PATH Study Wave 3 and Wave 4 Codebook with Re-coded Variables

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
Harm Perceptions						
E-cigarettes or other electronic nicotine products	How harmful do you think e-cigarettes or other electronic nicotine products are to health?	Wave 3	R03_AE9050	General Perception: Harmfulness of using e-cigarettes or other electronic nicotine products to health	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How much do you think people harm themselves when they use e-cigarettes or other electronic nicotine products on some days but not every day?	Wave 3	R03_AV1170	General perception: How much people harm themselves when they use e-cigarettes or other electronic nicotine products on some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is using e-cigarettes or other electronic nicotine products less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AE1099	General perception: Harmfulness of using e-cigarettes or other electronic nicotine products compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Cigars	How harmful do you think	Wave 3	R03_AG9050	General perception: Harmfulness of	1=Not at all harmful 2=Slightly harmful	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	traditional cigars are to health?			traditional cigars to health	3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	
	How much do you think people harm themselves when they smoke traditional cigars some days but not every day?	Wave 3	R03_AG9060	General perception: How much people harm themselves when they smoke traditional cigars some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is smoking traditional cigars less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AG1099	General perception: Harmfulness of smoking traditional cigars compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Cigarillos	How harmful do you think cigarillos are to health?	Wave 3	R03_AG9054	General perception: Harmfulness of cigarillos to health	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How much do you think people harm themselves when	Wave 3	R03_AG9061	General perception: How much people	1=No harm 2=A little harm 3=Some harm	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	they smoke cigarillos some days but not every day?			harm themselves when they smoke cigarillos some days but not every day	4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	
	Is smoking cigarillos less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AG1106	General perception: Harmfulness of smoking cigarillos compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused	All adult respondents
Filtered cigars	How harmful do you think filtered cigars are to health?	Wave 3	R03_AG9055	General perception: Harmfulness of filtered cigars to health	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How much do you think people harm themselves when they smoke filtered cigars some days but not every day?	Wave 3	R03_AG9062	General perception: How much people harm themselves when they smoke filtered cigars some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is smoking filtered cigars less harmful, about the same, or more harmful than	Wave 3	R03_AG1107	General perception: Harmfulness of smoking filtered cigars compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	smoking cigarettes?				-7=Refused -1=Inapplicable	
Pipe tobacco	How much do you think people harm themselves when they smoke pipe tobacco some days but not every day?	Wave 3	R03_AP1170	General perception: How much people harm themselves when they smoke pipe tobacco some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is smoking filtered cigars less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AP1099	General perception: Harmfulness of smoking pipes filled with tobacco compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Hookah	How harmful do you think shisha or hookah tobacco is to health?	Wave 3	R03_AH9050	General perception: Harmfulness of shisha or hookah tobacco to health	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How much do you think people harm themselves when they smoke hookah on some days but not every day?	Wave 3	R03_AH1170	General perception: How much people harm themselves when they smoke hookah on some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	Is smoking tobacco in a hookah less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AH1099	General perception: Harmfulness of smoking tobacco in a hookah compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Snus	How harmful do you think snus pouches are to health?	Wave 3	R03_AU9050	General perception: Harmfulness of snus pouches to health	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How much do you think people harm themselves when they use snus pouches on some days but not every day?	Wave 3	R03_AU1170	General perception: How much people harm themselves when they use snus pouches on some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is using snus pouches less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AU1105	General perception: Harmfulness of using snus pouches compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	
Smokeless tobacco	How harmful do you think other		R03_AS9050	General perception: Harmfulness of	1=Not at all harmful 2=Slightly harmful 3=Somewhat harmful	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	smokeless tobacco products (such as dip, spit or chew) are to health?			smokeless tobacco products to health	4=Very harmful 5=Extremely harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	
	How much do you think people harm themselves when they use other smokeless tobacco products (such as dip, spit or chew) on some days but not every day?	Wave 3	R03_AS1170	General perception: How much people harm themselves when they use other smokeless tobacco products on some days but not every day	1=No harm 2=A little harm 3=Some harm 4=A lot harm -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Is using smokeless tobacco (such as dip, spit or chew) less harmful, about the same, or more harmful than smoking cigarettes?	Wave 3	R03_AS1105	General perception: Harmfulness of using smokeless tobacco compared to smoking cigarettes	1=Less harmful 2=About the same 3=More harmful -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Re-coded variables		Wave 3	ATP_harm_hlth	Harm perceptions to health on all ATPs (re-coded harm perceptions median score)	1= Not at all harmful 2=Slightly harmful 3=Somewhat harmful 4=Very harmful 5=Extremely harmful	
		Wave 3	ATP_harm_someday	Harm perceptions for some day ATP use but not every day (re-coded harm perceptions median score)	1=No harm 2=A little harm 3=Some harm 4= Extremely harm	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
		Wave 3	ATP_harm_cigarette	Harm perceptions compared to health (re-coded harm perceptions median score)	1=Less harmful 2=About the same 3=More harmful	
		Wave 3	ATP_harm_hlth_median	Median harm perceptions score for e-cigarettes, cigars/cigarillos/little cigars, hookah, pipe, snus, other smokeless tobacco	Continuous (Range 1 to 5) .=missing	
		Wave 3	ATP_harm_someday_median	Median score for e-cigarettes, cigars/cigarillos/little cigars, hookah, pipe, snus, other smokeless tobacco	Continuous (Range 1 to 4) .=missing	
		Wave 3	ATP_harm_cigarette_median	Median score for e-cigarettes, cigars/cigarillos/little cigars, hookah, pipe, snus, other smokeless tobacco	Continuous (Range 1 to 3) .=missing	
		Wave 3	ATP_harm_hlth_bi	Harm perceptions of ATPs to health (binary)	0=Not harmful (Not at all or somewhat harmful) 1=Harmful (Very or Extremely harmful)	
		Wave 3	ATP_harm_someday_bi	Harm perceptions using ATPs someday (binary)	0=Not harmful (No or some harm) 1=Harmful (A lot of harm)	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
			ATP_harm_cig_bi	Harm perceptions of ATP compared to cigarettes (binary)	0=Less harmful 1=About the same or More harm	
Peer/Family Influence						
E-cigarettes or other electronic nicotine products	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_02	People who are important to you use the following products: E-cigarettes or other electronic nicotine products	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_ecig	Re-coded variable	1=Yes 0=No .=missing	
Cigars	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_03	People who are important to you use the following products: Traditional cigars	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_cigar	Re-coded variable	1=Yes 0=No .=missing	
Cigarillos	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_04	People who are important to you use the following products: Cigarillos	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
		Wave 3	R03_AX0741_cigarillos	Re-coded variable	1=Yes 0=No .=missing	
Filtered cigars	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_05	People who are important to you use the following products: Filtered cigars	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_fltcigar	Re-coded variable	1=Yes 0=No .=missing	
Pipe tobacco	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_06	People who are important to you use the following products: Pipe tobacco	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_pipe	Re-coded variable	1=Yes 0=No .=missing	
Hookah	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_07	People who are important to you use the following products: Shisha or hookah tobacco	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_hookah	Re-coded variable	1=Yes	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
					0=No .=missing	
Snus	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_08	People who are important to you use the following products: Snus pouches	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_snus	Re-coded variable	1=Yes 0=No .=missing	
Smokeless tobacco	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_09	People who are important to you use the following products: other types of smokeless tobacco	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
		Wave 3	R03_AX0741_smkl	Re-coded variable	1=Yes 0=No .=missing	
None	Thinking about the people who are important to you, do any of them use any of the following products?	Wave 3	R03_AX0741_10	People who are important to you use the following products: None of the above	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Re-coded variable		Wave 3	R03_AX0741_ATP	People who are important to you using any of ATPs	1=Yes 0=No .=missing	
Marketing Advertising and Promotion						

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
E-cigarettes or other nicotine products	In the past 30 days, have you noticed e-cigarettes or other electronic nicotine products being advertised in any of the following places? Choose all that apply.	Wave 3	R03_AX0203_01, R03_AX0203_02, R03_AX0203_03, R03_AX0203_04, R03_AX0203_05, R03_AX0203_06, R03_AX0203_07, R03_AX0203_08, R03_AX0203_09, R03_AX0203_10	In past 30 days, noticed e-cigarettes or other electronic nicotine products being advertised: Have not seen any advertisements (01), At gas stations, convenience stores, or other retail stores (02), on billboards (03), In newspapers or magazines (04), on radio (05), on television (06), at events like fairs, festivals, or sporting events (07), at nightclubs, bars, or music concerts (08), on websites or social media sites (09), somewhere else (10)	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Cigarettes or other tobacco products	In the past 30 days, have you noticed cigarettes or other tobacco products (not including e-cigarettes or electronic nicotine products) being advertised in any of the following	Wave 3	R03_AX0677_01, R03_AX0677_02, R03_AX0677_03, R03_AX0677_04, R03_AX0677_05, R03_AX0677_06, R03_AX0677_07, R03_AX0677_08, R03_AX0677_09, R03_AX0677_10	In past 30 days, noticed cigarettes or other tobacco products being advertised: Have not seen any advertisements (01), At gas stations, convenience stores, or other retail stores (02), on billboards	1=Marked 2=Not Marked -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
				(03), In newspapers or magazines (04), on radio (05), on television (06), at events like fairs, festivals, or sporting events (07), at nightclubs, bars, or music concerts (08), on websites or social media sites (09), somewhere else (10)		
Re-coded variables		Wave 3	R03_p30d_ads_pl	Re-coded: Past 30 days of ATP advertisement exposure (Place)	1=At gas stations, convenience stores, or other retail stores 2=On billboards 3=In newspaper or magazines 4=On radio 5=On television 6=At events like fairs, festivals, or sporting events 7=At nightclubs, bars, or music concerts 8=On websites or social media 9=Somewhere else	
		Wave 3	R03_p30d_ads	Has seen tobacco product advertisement in the past 30 days	1 = Yes 0 = No .=missing	
		Wave 3	R03_ATP_coupons (Original code: R03_AX0708_07	Received coupons for any tobacco products	1 = Yes 0 = No .=missing	
		Wave 3	R03_ATP_12mth_storeads	Has seen advertisements in stores where tobacco	1 = Yes 0 = No .=missing	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
				is sold in the past 12 months		
Acculturation						
Years of residency in the United States	About how many years have you lived in the United States?	Wave 3	R03R_A_AM0065	Number of years living the U.S.	Continuous	Adults respondents who were not born in the United States
		Wave 3	R03_yrsinUS_cat	The number of years living in the U.S. (re-coded categorical variable)	1=10 years or less 2=11-20 years 3= more than 20 years .= missing	
Proficiency in English	How well do you speak English?	Wave 3	R03_AM0066	How well you speak English	1=Very well 2=Well 3=Not well 4=Not at all -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How well do you read English	Wave 3	R03_AM0070	How well you read English	1=Very well 2=Well 3=Not well 4=Not at all -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	How well do you write English?	Wave 3	R03_AM0073	How well you write English	1=Very well 2=Well 3=Not well 4=Not at all -9=Missing	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
					-8=Don't know -7=Refused -1=Inapplicable	
	Re-coded variables	Wave 3	R03_ENG_Prof	Proficiency in English (Combined speaking, reading and writing)	1=Very well 2=Well 3=Not well 4=Not at all	
			R03_ENG_Prof_bi	Proficiency in English (binary)	1=Proficient in English 2=Limited in English	
Language speak at home	Do you speak a language other than English at home?	Wave 3	R03_AM0071	Speak a language other than English at home	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Re-coded variable	Wave 3	R03_home_Language	Speak a language other than English at home	1=Yes 0=No .=missing	
Age at migration	Derived variable	Wave 3	R03_agemigration	Age at migration	Age in numbers	All adult respondents
	Derived variable	Wave 3	R03_agemigration_cat	Age at migration (categorical variable)	1=Before age 18 2=At age 18 and after	
Alternative Tobacco Use						
E-cigarettes	In the past 30 days, have you used an electronic nicotine products, even one or two times? (Electronic nicotine products include e-cigarettes, vape pens, personal	Wave 4	R04_AV1004	In the past 30 days, used an electronic nicotine product, even one or two times	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	vaporizers and mods, e-cigars, e-pipes, e-hookahs and hookah pens.)					
	Ever E-cigarette use		R04R_A_EVR_EPRODS	DERIVED - Wave 4 Adult Ever Electronic Nicotine Product User	1=Yes 2=No	
Cigars	In the past 30 days, have you smoked a traditional cigar, even one or two puffs?	Wave 4	R04_AG9030	In past 30 days, smoked a traditional cigar, even one or two puffs	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Ever cigars use	Wave 4	R04R_A_EVR_CIGAR	DERIVED - Wave 4 Adult Ever Cigar Smoker	1=Yes 2=No	
Cigarillo or filtered cigar	In the past 30 days, have you smoked a cigarillo or filtered cigar, even one or two puffs?	Wave 4	R04_AG9031	In past 30 days, smoked a cigarillo or filtered cigar, even one or two puffs	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
Pipe tobacco	In the past 30 days, have you smoked a pipe filled with tobacco, even one or two puffs?	Wave 4	R04_AP1004	In past 30 days, smoked a regular pipe filled with tobacco, even one or two puffs	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Ever pipe use	Wave 4	R04R_A_EVR_PIPE	DERIVED - Wave 4 Adult Ever Pipe Smoker	1=Yes 2=No	
Hookah	In the past 30 days, have you smoked	Wave 4	R04_AH1004	In past 30 days, smoked hookah,	1=Yes 2=No	All adult respondents

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
	hookah, even one or two puffs?			even one or two puffs	-9=Missing -8=Don't know -7=Refused -1=Inapplicable	
	Ever hookah use	Wave 4	R04R_A_EVR_HOOK	DERIVED - Wave 4 Adult Ever Hookah Smoker	1=Yes 2=No	
Snus pouches	In the past 30 days, have you used snus pouches, even one or two times?	Wave 4	R04_AU1004	In the past 30 days, used snus pouches, even one or two times	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Ever snus pouches use	Wave 4	R04R_A_EVR_SNUS	DERIVED - Wave 4 Adult Ever Snus Pouch User	1=Yes 2=No	
Other smokeless Tobaccos	In the past 30 days, have you used other smokeless tobacco products, such as loose snus, moist snuff, dip, spit, or chewing tobacco, even one or two times?	Wave 4	R04_AS1004	In the past 30 days, used other smokeless tobacco products, even one or two times	1=Yes 2=No -9=Missing -8=Don't know -7=Refused -1=Inapplicable	All adult respondents
	Ever other smokeless tobacco use	Wave 4	R04R_A_EVR_SMKLS	DERIVED - Wave 4 Adult Ever Other Smokeless Tobacco User	1=Yes 2=No	
Re-coded variables		Wave 3	R03_P30D_ATP_all	Used following tobacco products in the past 30 days	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
					5=Snus pouches 6=Other Smokeless tobacco products 7=None of ATPs	
		Wave 4	R04_P30D_ATP_all	Used following tobacco products in the past 30 days	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=None of ATPs	
		Wave 3	R03_P30D_multi	Single, dual and poly categories of past 30 days use	0=None 1=Single product use 2=2 or more product use .=missing	
		Wave 4	R04_P30D_multi	Single, dual and poly categories of past 30 days use	0=None 1=Single product use 2=2 or more product use .=missing	
		Wave 3	R03_P30D_ATP	Used ATPs within the past 30 days	1= Yes 0=No .=missing	
		Wave 4	R04_P30D_ATP	Used ATPs within the past 30 days	1= Yes 0=No .=missing	
		Wave 3	R03_P30D_ATP_poly (ATP users only)	Used following tobacco products in the past 30 days	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
					6=Other Smokeless tobacco products 7=All other	
		Wave 4	R04_P30D_ATP_poly (ATP users only)	Used following tobacco products in the past 30 days	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=All other	
		Wave 3	R03_EVR_ATP_all	Ever used following tobacco products	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=None of ATPs	
		Wave 4	R04_EVR_ATP_all	Ever used following tobacco products	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=None of ATPs	
		Wave 3	R03_EVR_multi	Single, dual and poly categories of ever users	0= No ATP use 1= Single 2= 2 or more products	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
		Wave 4	R04_EVR_multi	Single, dual and poly categories of ever users	0= No ATP use 1= Single 2= 2 or more products	
		Wave 3	R03_EVR_ATP	Ever used ATPs	1= Yes 0=No .=missing	
		Wave 4	R04_EVR_ATP	Ever used ATPs	1= Yes 0=No .=missing	
		Wave 3	R03_EVR_ATP_poly (ATP users only)	Ever used following tobacco products	1=E-cigarettes 2=Cigars/cigarillos/filtered cigar 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=All other	
		Wave 4	R04_EVR_ATP_poly (ATP users only)	Ever used following tobacco products	1=E-cigarettes 2=Cigars/cigarillos/filtered cigars 3=Pipe 4=Hookah 5=Snus pouches 6=Other Smokeless tobacco products 7=All other	
Control Variables						
Cigarette smoking status		Wave 3	R03_evr_cigs	Ever smoked cigarette at wave 3	1=Yes 0=No .=missing	All adult respondents
		Wave 4	R04_evr_cigs	Ever smoked cigarette at wave 4	1=Yes 0=No .=missing	

	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
Education	What is the highest grade or level of school you completed?	Wave 3	R03R_A_AM0018	DRIVED – Recoded education level (6 levels)	1=Less than High school 2=GED 3=High school graduate 4=Some college (no degree) or associate degree 5=Bachelor's degree 6=Advanced degree	All adult respondents
		Wave 3	R03_edu		1=Less than high school 2=High school equivalent 3=Associate or Some College 4=Bachelor's degree 5=Masters/Professional school/Doctorate degree	All adult respondents
Household income	Which of the following categories best describes your total household income in the past 12 months?	Wave 3	R03R_A_AM0030	DERIVED - Recoded total household income in the past 12 months (5 levels)	1=Less than $10,000 2=$10,000 to $24,999 3=$25,000 to $49,999 4=$50,000 to $99,999 5=$100,000 or more	All adult respondents
			R03_hh_income	Re-coded household income (binary)	0= Above $50,000 1= Below $50,000	
Marital status	What is your marital status?	Wave 3	R03R_A_AT0047	DERIVED - Recoded marital status (3 levels)	1=Married 2=Widowed, divorced or separated 3=Never married	All adult respondents
		Wave 3	R03_marital_status		1=Married 2=Widowed/Divorced/Separated 3=Never married .= missing	
Sex	Wave 3 Adult gender from the interview	Wave 3	R03R_A_SEX	DERIVED - Wave 3 Adult Gender	1=Male 2=Female .=Missing	All adult respondents

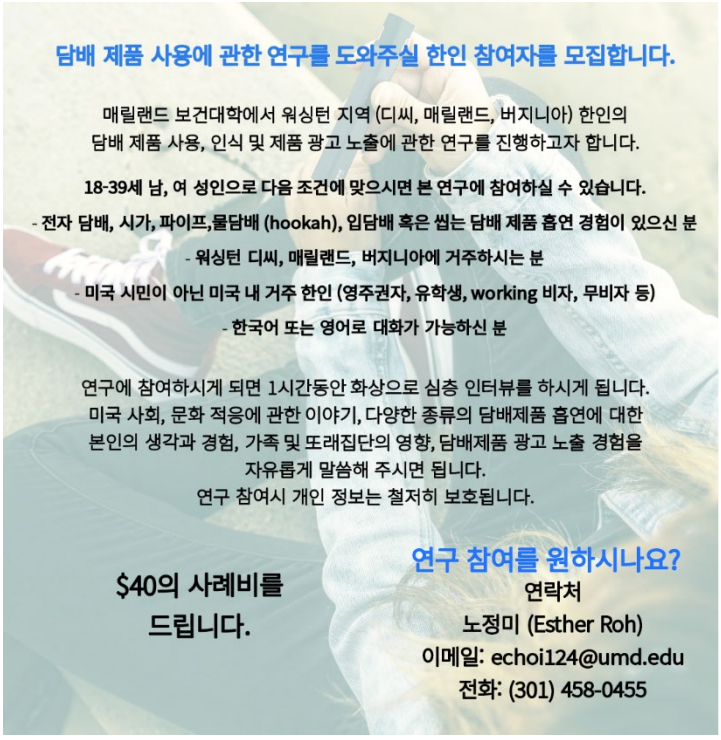
	Questions	Wave	Variable Name	Variable Label	Response Categories	Ask
Race	Race (4 levels)	Wave 3	R03_A_RACE	DERIVED - Recoded race (4 levels)	1=White race alone 2=Black race alone 3=Asian race alone 4=Other race, including multi-racial	All adult respondents

* The codebook was re-created for this dissertation study using the original PATH Study Restricted-Use Files codebook. Original codebook documents can be found in the NAHDAP website: http://www.icpsr.umich.edu/webNAHDAP/studies/36231/datadocumentation

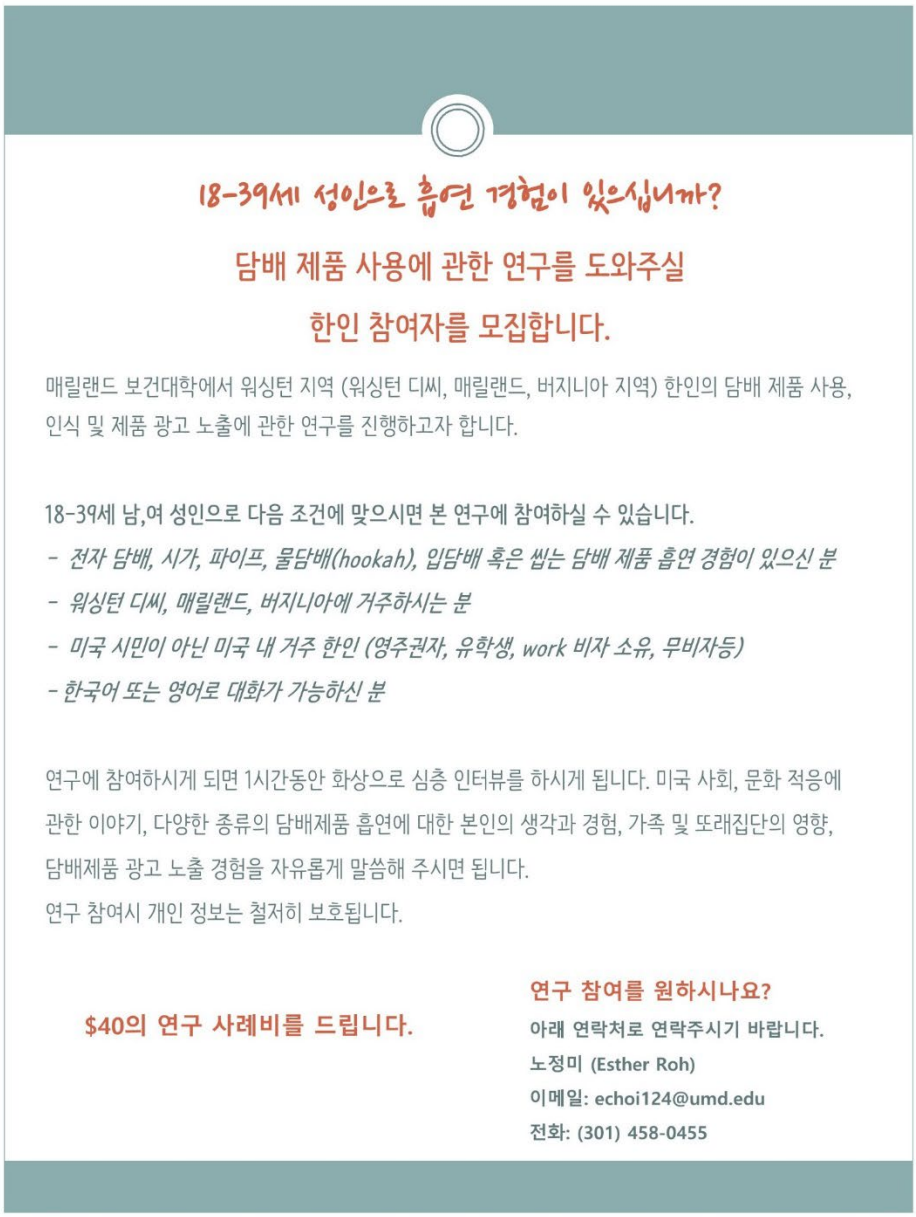
Appendix B: Recruitment Advertisement

1. Social media advertisement (English)

2. Social media advertisement (Korean)



3. Wall Flyers (Korean)



Appendix C: Participant Screening Form and Phone Script

Participant Eligibility Chart	
Date of Call:	
Are you a Korean descendant?	☐Yes ☐ No
Have you smoked or used any tobacco products? (formal and current smoker)	☐Yes ☐ No
Do you live in DC, VA or MD?	☐ Yes ☐ No *[If yes, note the state name.]*
Do you have U.S. citizenship?	☐Yes ☐ No
Can you speak English or Korean?	☐Yes ☐ No
Do you have problems with memory or any mental function?	☐Yes ☐ No
Do you have any serious mental health distress?	☐Yes ☐ No
Do you have autism, behavior disorders, brain injury, cerebral palsy, Down syndrome, fetal alcohol syndrome, intellectual disability or spina bifida?	☐Yes ☐ No
Eligible ☐ Ineligible ☐ (Reason:)	

If screened *no* for any questions: Unfortunately, you are not eligible to participate in our study. We appreciate your time. Have a great day.

If screened *yes* for all questions: You are eligible to participate in the study. May I ask your name? [*Participant gives name.*]

Mr./Ms._____, I want to schedule a date for your interview. The interview will be conducted in videoconference. After we set the date of the interview, I will follow up with you on the link for the videoconference. Which days and time of the week are you available?

[*Record interview date and time. Note participant's name and phone number.*]

Participant Name: _____
Phone Number: _____
Date: _____
Time: _____
Location: _____

Closing: Okay. Mr./Mrs.____, I will send a reminder text message (or email) a day before scheduled interview. Then, I will call you on [**date**] at [**time**]. Thank you. Have a great day.

Appendix D: In-depth Semi-structured Interview Protocol (English)

Thank you for taking the time to talk to me. I am a Ph.D. student at the University of Maryland College Park. This study is to explore your thoughts and experiences with alternative tobacco products, your experiences in adjusting to life in the US, and the multiple factors that influenced your views of alternative tobacco products. I am interested in learning about your experiences and hearing your opinions.

I want to assure you that this conversation is confidential – that means that your responses will not be shared with any person who is not a staff in this study. We will also protect your identity and privacy. If you feel uncomfortable at any point, you can choose not to answer a question or to end the interview. Before I proceed to the discussion, I would like to read a consent form explaining our study procedure, benefits and risks that might be involved with the study in order to obtain your consent. [*Review consent forms*.] If you agree to participate, I would like to get your verbal agreement to participate in this study. I will need to record it to keep it in our record if you do not mind. Would you please say, "I agree to participate in the study"?

I value what you have to say, and to that end, I'd also like your permission to record our conversation to make sure we get everything right. Are you okay with recording this session?

I also would like to remind you that there are no right or wrong answers for this interview. You are free to share your opinions.

Acculturation

1) How long have you lived in the U.S.?
2) Can you tell me about your immigration experience?
   [PROBE: Why did you come to U.S.? Who did you come with? In what ways was it easy to adjust to U.S. society? In what way was it difficult? What do you like or dislike about the U.S. culture? What are some ways that you still keep Korean culture or custom?]
3) How comfortable do you speak, read, and write English?
   [PROBE: How long have you been speaking, reading, and writing English? Have you had a formal education in the U.S.? How difficult was it for you to learn the English language? Can you tell me your experiences?]
4) Which language do you speak at home?
5) Have you felt more discriminated or experiences any discrimination since the pandemic due to the COVID-19? If yes, can you tell me more about it?

Alternative Tobacco Product Experiences/Use (Remind participants what ATP means)

1) What type of alternative tobacco product have you heard of? Have you ever used any of these products?
   If participant uses any ATP products, ask:
   a. Why did you decide to use these products?
   b. Tell me about your experiences with these tobacco products.
      [PROBE: Ask about flavor, taste, craving symptoms, frequency of use, brand, etc.]
2) Have you ever used these tobacco products when you were in Korea?
   a. If a participant answers *Yes*,
      Tell me about your experiences with these tobacco products in Korea.
      [PROBE: Ask about taste, craving symptoms, frequency of use, brand, etc.]
   b. How are your tobacco experiences in the U.S. different from your experiences in Korea? How has your views on tobacco change since you moved to the U.S.?
3) When do you normally smoke or use alternative tobacco products? Could you tell me more about your cravings or wanting for these products?
4) How has the pandemic situation influence your smoking habit? How has your smoking habit changed since the pandemic?

Harm Perceptions

1) What are your opinions about alternative tobacco products to your health?
2) What are your opinions about harmfulness of alternative tobacco products comparing to conventional cigarettes? Why do you think so?
3) Could you tell me how your perceptions of smoking or using any tobacco products has changed after you moved to the U.S.?

Peer and Family Influence

Think about someone important to you (friends and family), what are their opinions toward using alternative tobacco products? How do their opinions influence your use of these tobacco products?

1) What do your friends and family think about your use of these products? [PROBE: Do they approve or disapprove of you using these tobacco products?]
2) Do any of your parents smoke cigarettes or use any other tobacco products?
   If a participant asks Yes, ask:
   a. How does their use of these tobacco products influence your use of these tobacco products?
3) How does your friends' or peers' use of these tobacco products influence your use of these tobacco products?
   [PROBE: Are you more likely to smoke cigarettes or use of alternative tobacco products by yourself or with your friends? Do you feel pressure to smoke or use of tobacco products when you are with your friends?]

Exposure to Alternative Tobacco Product Marketing and Advertisement

1) Have you ever seen or noticed any alternative tobacco products being advertised?
   If a participant says NO, then ask:
   a. How might your smoking habits be influenced by tobacco product marketing and advertisements?
   If a participant says YES, then ask:
   a. Which alternative tobacco product marketing and ads were you exposed to? Where have you seen or noticed advertisements? *[PROBE: Provide some examples: At gas stations, convenience stores, or other retail stores, on billboards, in newspapers or magazines, on radio, on television, at events like fairs, festivals, or sporting events, at nightclubs, bars, or music concerts, on websites or social media sites.]*
   b. Tell me about how you felt when you saw these marketing ads and promotions.
   c. Do you have any favorite advertisement ads or promotions? Why do you like it?
   d. Have you seen alternative tobacco product marketing ads and promotions targeted for Koreans?
   e. If you have seen or been exposed to tobacco product marketing ads an promotions in South Korea, how is alternative tobacco product marketing in the United States different from South Korea?
   f. How have your smoking habits changed after seeing these marketing ads and promotions?
2) What kind of marketing and promotions do you think the most influential to foreign-born Korean residents or you? Why do you think so?

Conclusions

1) Can you tell me what actions can be taken to support Korean community in discouraging people from using alternative tobacco products?
2) Do you have other concerns about alternative tobacco product use in your community you'd like to share?

Thank you so much for sharing your thoughts and time. Have a great day!

Appendix E: List of Codes and Definitions for Study 3

Codes	Definition
Acculturation	"The dual process of cultural and psychological changes that takes place as a result of contact between two or more cultural groups and their individual members" (J.W. Berry, 2005)
Years in the U.S.	The number of years that a participant has lived in the U.S.
Age at migration	Age when a participant moved to the U.S. for living, studying and working.
Primary language at home	A language the most frequently spoken or used at home
English proficiency	Ability to speak, write and read English and the level of confidence in speaking, writing, and reading English
Media preference	Whether a participant prefers to listen or watch Korean media vs. American media
Food preference	Whether a participant prefers to eat Korean foods vs. American foods (or any other international foods)
Social circle	Preference of social circles (e.g. Korean friends vs. American friends)
Cultural experience	A participant's positive or negative experience while they reside in the U.S. and how an individual keeps his or her own custom
Reason for migration	A reason why a participant moved or migrated to the U.S.
Discrimination	The unjust treatment of the difference between one thing and another
Status discrimination	Any unjust treatment experience due to visa status and individual social status
Racial discrimination	Any unjust treatment experience due to race, ethnicity or skin color
Stress	
Acculturative stress	Perceived stress related to acculturation (e.g. visa status, English ability, cultural gap, feeling distance from families and friends in Korea, not feeling connected to Americans, loneliness, etc.)
Daily life stress	Perceived stress related to daily life instances (e.g. family matters, relationship, daily tasks at home and any personal circumstances)
Academic/Career stress	Perceived stress due to jobs, schools and other career achievement
Coping strategies	How participant deals with stress and manages stress
Age at first smoke	A participant's age when he or she smoked or used tobacco products for the first time
Motivation for initiation	Reasons or motivation for smoking initiation
Triggers for smoking	Frequency or time when a participant urges or wants to smoke; Or the circumstances that drive

Codes	Definition
	a participant to smoke (e.g. Alcohol use, social circumstances like social gathering)
Conventional cigarette experience	Participant's smoking experience on regular or conventional cigarettes
Difference in smoking behavior	Difference in smoking behavior due to culture (e.g. smoking behavior while visiting Korea vs. smoking behavior while in the U.S., gender difference)
ATP Use	A participant's alternative tobacco product use behavior
E-cigarette experience	Participant's smoking experience on e-cigarettes
Hookah experience	Participant's smoking experience on hookahs ("Water pipes")
Cigar experience	Participant's smoking experience on cigars
Pipe experience	Participant's smoking experience on pipes
Smokeless tobacco experience	Participant's smoking experience on smokeless tobaccos
Flavor experience	Participant's experience adding or using flavor, or flavor preference for any tobacco products
Marijuana experience	Participant's experience using marijuana as blunt and as liquid with electronic nicotine delivery system
Reasons for cigarettes	Participant's reasons for smoking or not smoking cigarettes
Reasons for ATP use	Participant's reasons for ATP use
Reasons for e-cigarettes	Participant's reasons for using or not using e-cigarettes
Reasons for hookahs	Participant's reasons for using or not using hookahs
Reasons for cigars	Participant's reasons for smoking or not smoking cigars
Reasons for pipes	Participant's reasons for smoking or not smoking pipes
Reasons for smokeless tobacco	Participant's reasons for using or not using smokeless tobacco
Triggers for smoking	Frequency or time when a participant urges or wants to smoke; Or the circumstances that drive a participant to smoke (e.g. Alcohol use, social circumstances like social gathering)
COVID-19 experience	Individual's COVID-19 experience
COVID-19 discrimination	Any unjust treatment experience related to COVID-19
Smoking during COVID-19	Changes in smoking habits during COVID-19
Addiction symptoms	Participant's experience in craving, wanting or urgency for tobacco product use
Brand	The name of the tobacco product brand that a participant have used
Purchasing	Participant's tobacco product purchase habit (e.g. how they purchase tobacco products and where to buy them, price)
Reasons for quitting smoking	Reasons why a participant attempt to quit smoking or quit smoking

Codes	Definition
Cigarette harm perceptions	Individual's perceptions of harm or risk caused by conventional cigarettes
ATP harm perceptions	Individual's perceptions of harm or risk caused by alternative tobacco products
Harm perceptions (e-cigarettes)	Individual's perceptions of harm or risk caused by e-cigarettes
Harm perceptions (hookahs)	Individual's perceptions of harm or risk caused by hookahs ("Water pipes")
Harm perceptions (Cigars)	Individual's perceptions of harm or risk caused by cigars
Harm perceptions (Pipe)	Individual's perceptions of harm or risk caused by pipe
Harm perceptions (smokeless tobacco)	Individual's perceptions of harm or risk caused by smokeless tobacco
Differences in harm perceptions	Any changes in individual's perceptions of harm or risk as a result of contact between two cultures (Korea vs. U.S.)
Peer and Family Influence	How participant's smoking behaviors are influenced by peer or family members
Peer influence	Peer's influence on participant's smoking behavior
Family influence	Family influence on participant's smoking behavior
Tobacco Product Marketing and Ads Exposure	Participant's tobacco product marketing, advertisement or promotion exposure experiences on any alternative tobacco products
Media marketing exposure	Participant's experience hearing or seeing ATP advertisement on radio or TV, and how they react to those ads
Online marketing exposure	Participant's experience hearing or seeing ATP advertisement on social media, website and online, and how they react to those ads
Store marketing exposure	Participant's experience hearing or seeing ATP advertisement at the gas station, convenient store and smoke shop, and how they react to those ads
Bars/Clubs/Restaurant marketing exposure	Participant's experience hearing or seeing ATP advertisement at bars, clubs, restaurants and how they react to those ads
Ethnic targeted Marketing	Participant's experience hearing or seeing ATP marketing targeted to Koreans or Asians; Participant's opinions what types of marketing strategies that drives or motivates Koreans to initiate, purchase and smoke ATPs.
Marketing influence on smoking	Any marketing exposure that changes participant's smoking or tobacco product purchasing habits
Smoking prevention recommendations	Participant's recommendations for smoking prevention program targeted to Koreans

Appendix F: UMD IRB Application Materials

INITIAL APPLICATION PART I

University of Maryland College Park
Institutional Review Board
IRB Initial Application - Part 1

Last edited by: Esther Roh
Last edited on: April 25, 2020
[click for checklist]

☐ **Full**
☑ **Expedited**
☐ **Exempt**

[1599512-1] Acculturation and Multilevel Factor Influence on Alternative Tobacco Product Use among Non-U.S. Citizen Immigrants

Answer all questions on this form completely, include attachments and obtain signatures of Co-Investigators and your department IRB Liaison prior to final submission on IRBNet.

I. Principal Investigator

Name: Esther Roh, MS **Status:** Graduate Student
Department: SPHL- Public Health
Phone: 571-232-1123 **Email:** echoi124@umd.edu
Address: Department of Behavioral and Community Health, SPH Building, 4200 Valley Drive University of Maryland College Park, MD 20742-2611

II. Faculty Advisor N/A ☐

Note: A faculty advisor is required if the PI is a student resident or fellow and the Faculty Advisor MUST sign this package through IRBNet.

Name: Craig Fryer
Department: SPHL- Public Health
Phone: 301-405-0818 **Email:** csfryer@umd.edu
Address: SPH Building, 4200 Valley Drive University of Maryland College Park, MD 20742-2611

III. Co-Investigators N/A ☑

Note: All co-investigators MUST sign this package through IRBNet.

Name:
Department:
Phone: **Email:**
Address:

IV. Funding Information N/A ☐

Note: A copy of the awarded grant application (minus budgetary information) must be provided.

Status	Funding Type	Sponsor Name	ORAA #	COI
Pending	Other Private Funds	Asian American Center of Frederick		No

Funding Title:

V. Project Information

Lay Summary:

Using multiple methodologies, the primary purpose of this dissertation is to understand multi-level factors that influence alternative tobacco product use among non-U.S. citizen immigrants. This study has three research aims: 1) to examine the relationship between acculturation, harm perception of ATP and their use among non-U.S. citizen immigrants using waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH); 2) to examine the relationship between acculturation, peer and family use of tobacco products, exposure to ATP marketing and promotion, and ATP use among non-U.S. citizen immigrants using the same dataset; and 3) to explore acculturation and ATP experiences, and individual, interpersonal and organizational factors that influence ATP use among Korean immigrants qualitatively (through in-depth interview).

Requested Review Path:

- ☐ Full
- ☑ Expedited
- ☐ Exempt

Projected Completion Date: 05/21/2021

Research Category:

- ☐ Faculty or Staff Research
- ☑ Graduate Student Research
- ☐ Student/Faculty Collaboration
- ☐ Undergraduate Student Research
- ☐ Other:

Academic Committee Review:

- ☐ Yes - Masters committee
- ☑ Yes - Dissertation committee
- ☐ No additional academic review required

Participant Incentives:

- ☐ Cash
- ☐ Check
- ☐ Raffle/ Lottery:
- ☐ Extra Credit/ Course Credit:

☐ Gift:

☐ Food:

☑ Other:

Each interview participant will receive a visa card by mail or an electronic visa card.

☐ Not Applicable

VI. Performance Sites

Performance Sites Engaged in Human Subject Research:
(where the research will be conducted)

☐ UMCP - Campus:

☐ University of Maryland - Extension:

☐ Campus Health Center

☐ Universities at Shady Grove:

☐ Schools:

☐ Prison/Jail:

☑ Other:

We will not begin any in-person research until the research restrictions instituted by the Division of Research at UMCP have been lifted. The interview will be conducted videoconference (Zoom) during the research restriction period due to COVID-19. When the research restrictions are lifted in the future, We will provide options to participants that they can participate in the interview either thru videoconference or in-person in several locations, including group study rooms and private study rooms at local public libraries in Maryland and Virginia, and a meeting room at a local community organization.

Is this an international study?

☐ Yes *[complete Section 10 of Initial Application Part 2]*

☑ No

If yes: **International Sites:**

VII. Subject Information

Targeted Populations:

☑ Normal adult/healthy persons

☐ Cognitively impaired persons

☐ Economically disadvantaged persons

- ☐ Educationally disadvantaged persons
- ☐ Elderly/aged persons
- ☐ Hospital patients or outpatients
- ☐ Illiterate persons
- ☐ Individuals with physical disabilities
- ☑ Minority group(s)
- ☐ Minors/children
  [inclusion of anyone under 18 requires a Parental Consent Form]
- ☑ Non-English speakers
- ☐ Pregnant women
- ☐ Prisoners
- ☐ Students (non-minors)
- ☐ UMCP employees
- ☐ Other special characteristics and special populations:

Informed Consent Process:

- ☑ Informed consent will be obtained from subjects and documented with a signed, written consent form
- ☐ Informed consent will be obtained from subjects, but no signed consent form will be used. This includes oral consent and implied consent (e.g., completing a survey).
  [please see the Requesting a Waiver of Informed Consent Guidance]
- ☐ Fully informed consent will not be obtained from all subjects. This includes deception, withholding information, etc.
  [please see the Requesting a Waiver of Informed Consent Guidance]

Will you be collecting health information from or as a HIPAA covered entity?
(See the HIPAA section of the IRB website for more information and additional resources.)

- ☑ No
- ☐ Yes, data are de-identified or constitute a limited data set.
- ☐ Yes, subject's authorization will be obtained or a waiver or alteration of authorization will be requested.
  [complete IRB Form HIPAA]

VIII. Research Procedures

Research Procedures:

- ☐ Records review - retrospective
- ☐ Records review - prospective
- ☐ Education research
- ☐ Behavioral experiments
- ☐ Behavioral observation
- ☐ Questionnaires/surveys

- [x] Interviews
- [x] Audiotaping/videotaping
- [ ] The Internet
- [ ] Deception
  [describe debriefing process in Section 7 of Initial Application Part 2]
- [ ] Cancer Interventions (health promotion, implementation, etc.)
- [ ] None of the above

Biomedical Procedures:

- [ ] Tissue banking
- [ ] Biopsy
- [ ] Blood draw:
- [ ] Use of pre-existing tissues
- [ ] Clinical tests
- [ ] Radiology
- [ ] Radiation/X-ray/DEXA
- [ ] fMRI
  [use IRB fMRI templates]
- [ ] Pregnancy screening
- [ ] EKG
- [ ] EEG
- [ ] Genetic analysis
- [x] None of the above

IX. Assurances and Signatures

Assurances
This research, once approved, is subject to continuing review and approval by the IRB. The principal investigator will maintain records of this research according to IRB guidelines. If these conditions are not met, approval of this research could be suspended or terminated.

Electronic signatures certify that:

- The signatory agrees that he or she is aware of the policies on research involving participants of the University of Maryland College Park and will safeguard the rights, dignity, and privacy of all participants.
- The information provided in this application form is correct.
- The principal investigator will seek and obtain prior written approval from the IRB for any substantive modification in the proposal, including but not limited to changes in cooperating investigators/ agencies as well as changes in procedures.
- Unexpected or otherwise significant adverse events in the course of this study which may affect the risks and benefits to participation will be reported to the IRB.
- The research will not be initiated and subjects cannot be recruited until final written approval is granted.

The following signatures are required for new project submissions:

- Principal Investigator
- Research Advisor(s)
- IRB Liaison (click here for list)

INSTRUCTIONS TO RESEARCHERS

[top]

Now that you have completed this document, check your work, attach all appropriate documents, electronically sign and submit your work. Based on your responses, the following additional documentation must be included with this package before submission. Upload additional documentation in the Designer.

Documents available in the IRBNet Forms and Templates Library:

- Consent Form (template and Completion Guide in Library)

Additional required documentation:
No additional documents are required for this project.

If you have any questions, please refer to the guidelines in the IRBNet Forms and Templates Library or contact irb@umd.edu.

INITIAL APPLICTAION PART 2

1. Abstract:

The primary purpose of this dissertation is to understand acculturation and multiple factors that influence alternative tobacco product (ATP) use among U.S. foreign-born residents using quantitative and qualitative methods. In the quantitative part of this dissertation, de-identified, restricted-use data from Waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) study will be analyzed to examine the influence of acculturation, harm perceptions of ATP, peer and family tobacco product use and exposure to marketing advertisements on ATP use among 2,885 samples of U.S. foreign-born residents who are 18 years and older. The data will be obtained from the National Addiction & HIV Data Archive Program (NAHDAP). In the qualitative part, various factors that shape ATP use among 16 to 24 non-U.S. citizen Korean residents in Washington, D.C., metropolitan area who are between the ages of 18 and 39 will be explored through one-hour in-depth interview. Interview subjects will be recruited through various mediums including social media, UMD student and faculty listserv, and local community networks. All subjects will be asked to provide the verbal consent before the interview. Participation in the study is completely voluntary. Any subjects will be excluded if they are unable provide the verbal consent due to their mental/cognitive disability and any other personal reasons. The interview will be conducted using the videoconference (Zoom) during the period of COVID-19 research restriction or in-person near subjects' neighborhood when COVID-19 research restriction is lifted. During the interview, participants will be asked a series of open-ended questions about their acculturation experience, harm perceptions, peer and family influence of ATP use, exposure to ATP marketing and promotion and how COVID-19 affects their smoking behaviors.

2. Subject Selection:

a. Recruitment:

Study 1 and study 2: Quantitative analyses of de-identified, restricted-use data from Waves 3 and 4 of the Population Assessment of Tobacco and Health (PATH) study will be conducted. Thus, there are no human subjects involved in these two studies.

Study 3: The recruitment flyers will be distributed via social media, such as KakaoTalk, MissyUSA, Facebook, Instagram, and UMD student and faculty listserv. The flyers will also be distributed by staff at MyLife Foundation, which is located in Catonsville, MD. MyLife Foundation is a non-profit organization that provides anti-smoking education, prevention, and intervention programs for Korean immigrants in Baltimore and Howard Counties, Maryland. Staff at MyLife Foundation will help distribute

recruitment advertisements to their program participants, partners, and network via their listserv and social media. The PI will also ask existing research participants to recruit other potential participants through their social network. The same flyers will be used for all of these distribution channels. All flyers will be done in both English and Korean because the study will be aimed for both English-speaking and Korean-speaking non-U.S. citizen Korean adults. The sample recruitment flyers in both languages are attached.

a. Eligibility Criteria:

Study 1 and 2: Samples of 2,885 U.S. foreign-born residentswho are18 years of age and older from Waves 3 and 4 of the PATH Study will be included. Once the publicly available data is obtained, the final sample of U.S. foreign-born adults who smoked or used non-cigarette tobacco products will be selected.

Study 3: Eligible criteria includes individuals who 1) are between the ages of 18 and 39, 2) are descendants of South Korea, 3) reside in District of Columbia (DC), Virginia and Maryland, 4) are non-U.S. citizen, 5) use any tobacco products, and 6) who are able to read, listen and speak either English or Korean. Participants will be excluded from study if they are unable to provide informed consent due to mental and cognitive disability.

b. Rationale:

Study 1 and 2: Although ATP use among U.S. adults has continued to increase in recent years, not much is known about ATP use among U.S. foreign-born residents. There are very few number of studies done in the past, and prior studies have mixed findings about the impact of acculturation on smoking behavior and harm perceptions about ATPs among this population. Given these limitations, it is essential to investigate on ATP use among this population with representative samples from the national data.

Study 3: About 75.2% of Koreans in Washington, DC metropolitan area were born outside of the U.S., and about 80.2% of them speak a language other than English at home. Smoking was identified as an important health concern among Asian American immigrants in Washington, D.C. Metropolitan area. Moreover, Korean adult immigrants have one of the highest smoking prevalence among Asian immigrants. Current state and national surveys have a limitation in collecting ethnic sub-group data and underestimated their smoking behavior, thus it is important to explore culture, social norms, and smoking experiences among Korean immigrants. Participants between the ages of 18 and 39 are included in the study because nearly two thirds of the Asian American who smoked were found to have begun smoking as young adults between the ages of 18 and 25, and Asian Americans between age 18 and 39 reported that they had the higher prevalence of ATP use than older smokers who are 40 years and older. For example, a recent study suggested that the prevalence of e-cigarette use among Asian Americans between the

ages of 18 and 39 were higher than individuals who are 40 years and older. Generally speaking, subjects who are 18 years and older are of legal age to purchase tobacco products and have the legal authority to make decisions to participate or not to participate in the study. Additionally, majority of participants in the research would be men because empirical literature have suggested that smoking is almost exclusively a male behavior among Korean immigrants and is more socially acceptable. Moreover, Korean men's smoking status is significantly related to acculturation. Participants will be excluded in the study if they are unable to provide informed consent due to mental and cognitive disability.

c. Enrollment Numbers:

Study 1 and 2: Samples of 2,885 U.S. foreign-born residents in the U.S.

Study 3: Minimum 16 to 24 non-U.S. citizen Koreans

b. Rationale for Enrollment Numbers: Click here to enter text.

Study 1 and 2: The PATH Study sample was selected using a four-stage, stratified probability sample design. The final sample (N=2,885) of U.S. foreign-born adults who used non-cigarette tobacco products from Waves 3 and 4 will be utilized for these studies.

Study 3: The total enrollment numbers for study 3 will be conducted until thematic saturation is reached, with 16 to 24 participants, based on recommendations for the ideal number of interviews of meaning saturation (Hennink et al. 2017; Morse, 2015).

3. Procedures:

We will not begin any in-person research until the research restrictions instituted by the Division of Research at UMCP have been lifted.

Study 1 and 2: The secondary data analyses will be conducted for these two studies. Data used in studies one and two are de-identified, restricted-use data. We will request the PATH restricted-use files access from the National Addiction & HIV Data Archive Program (NAHDAP). The data points that will be extracted for analysis include acculturation measures (years of residency in the U.S., proficiency in English and language spoke at home), harm perceptions about ATPs (e-cigarettes, cigars, cigarillos, filtered cigars, pipe tobacco, hookah, snus, smokeless tobacco), peer and family use of ATPs, exposure to ATP marketing advertisements and promotions (have noticed ATP advertisement in past 30 days and has a favorite ATP advertisement), ATP use (past 12 months of ATP use and past 30 days of ATP use), and demographic information (education, household income, marital status, gender, race and age) from Wave 3 (October 2015 – October 2016) and Wave

4 (December 2016 – January 2018). After data access is granted from the NAHDAP, all data analyses will be done within the Virtual Data Enclave (VDE). In the VDE, Waves 3 and 4 data of the PATH Study will be combined using SAS 9.4 statistical software. The combined data will be cleaned and re-coded into new response categories, and new variables will be created as necessary. After the data cleaning procedure, data analyses will be completed. The PI will submit a request to obtain VDE output, then NAHDAP staff will send the output to the PI. The results of the analyses will be presented with tables and graphs.

Study 3:

First, PI will check the eligibility of participants. Participants will be selected if they meet all of the eligibility criteria. Then, after eligibility is determined, PI will schedule an hour-long interview and send a copy of informed consent form to each participant by email or mail so that participants will read it before the interview. Before the interview, we will ask participants to give us permission to video-record the interview. After participants give the PI permission to do so, the interview will be video-recorded for accuracy of the comments made during the interview. We will conduct an hour-long in-depth interview using videoconference (Zoom) during the research restriction period. When the research restrictions are lifted, we will provide options for participants that they can participate in the interview either using videoconference or in-person near participants' neighborhood, including group study rooms and private study rooms at local public libraries and community centers. During the interview, participants will be asked a series of open-ended questions about their acculturation experience, harm perceptions, peer and family influence of ATP use, exposure to ATP marketing and promotion and how COVID-19 affects their smoking behaviors. We will also ask participants to complete a brief demographic survey. In the survey, we will ask participants about gender, date of birth, education level, marital status, employment status, state of residence, years in the U.S., household income, and English proficiency level. The demographic survey will be prepared both in English and Korean. Participants' personal identification will be replaced with study ID. Only the study ID will be placed in the survey. After the interview, each participant will receive $40 visa card or check for their participation. In previous research, this incentive amount was deemed appropriate for an hour long interview. Incentives will be mailed to the participants or sent electronically after the interview. We will ask participants' mailing addresses if they prefer to receive their incentives by mail. All video-recorded interviews will be transcribed by Express Transcribe transcription and Vrew software for analyses. The PI will, then, transcribe interview transcriptions verbatim and review them to assure quality of the transcriptions. If transcriptions are in Korean, the transcriptions will be translated into English by PI and reviewed by the second trained researcher who is bilingual in English and Korean. All collected data will be analyzed using NVivo12. All

transcribing and data analyses will be conducted on the PI's password protected computer. The results of the analyses will be presented in a research paper. We will ensure that all identified data will be stored on the PI's password protected computer, locked cabinet and the PI's office. All non-identified data will be stored separately from all identifiable information in a designated, password protected computer. All personal and sensitive information will be protected and will not be released to the third party without participant's consent. Only the PI will be able to access to identifiable data. All original data will be kept for a period not to exceed three years from the end of the study. After three years, all data will be destroyed.

4. Risks:

There is no direct benefit for subjects in all studies (study 1, 2 and 3).

Study 1 and 2: The dataset contains no personally identifiable information. To date, not much is known about ATP use among foreign-born residents in the U.S. and factors influencing their use of these products. The results of these studies can benefit immigrant community in the future through improved understanding of how to prevent the use of these products among foreign-born residents, in turn, improve health of immigrant population.

Study 3: The results of this study can help us to learn more about smoking behaviors among U.S. foreign-born Korean residents. The study might benefit Korean community in the future through improved understanding of how to prevent the use of these products among U.S. foreign-born Korean residents. The Korean community can use the published article for planning targeted health programs and improving health of their community. Some potential risks will be protected at the maximum level by ensuring their privacy and confidentiality. Thus, the anticipated benefits of the research to subjects will outweigh the potential risks.

5. Benefits:

There is no direct benefit for subjects in all studies (study 1, 2 and 3).

Study 1 and 2: There are no human subjects involved

Study 3: The results of this study can help us to learn more about smoking behaviors among U.S. foreign-born Korean residents. The study might benefit Korean community in the future through improved understanding of how to prevent the use of these products among U.S. foreign-born Korean residents. The Korean community can use the published article for planning targeted health programs and improving health of their community. Some potential risks will be protected at the maximum level by ensuring their privacy and

confidentiality. Thus, the anticipated benefits of the research to subjects will outweigh the potential risks.

6. Confidentiality:

Any breach of confidentiality will be minimized by storing all data in a secure location, such as locked office, locked cabinet and password protected computer.

Study 1 and 2: The dataset contains no personally identifiable information. All restricted-use data and output will remain in the Virtual Data Enclave (VDE) to protect the confidentiality of the individuals represented in the data. All data analyses will be done within the VDE to protect confidentiality of the individuals represented in the data. The VDE allows researchers to launch a virtual machine on their own desktop but operates from a server at Inter-university Consortium for Political and Social Research (ICPSR). Data files and software remain on the ICPSR server. Only the PI and advising faculty will be able to access to restricted-use data. The access period for data is two years. If more time is needed to complete the project, then the PI will request an extension of the access to the restricted-use data for another year.

Study 3: Participants will provide their personal information to the PI and may discuss their personal experiences and stories during the interview. We will ensure that all discussion during the interview will be kept private. When we publish our findings from these participants, participants' identities will be protected to the maximum extent possible by replacing all personally identifiable data in the study with special identification numbers. These identification numbers will not identify the individual but will be used to link the study data with personal information for limited and specific purposes. All non-identified data will be stored separately from all identifiable information in a designated, password protected computer. All personal and sensitive information will be protected and will not be released to any third party without subject's consent. Participants' information may be shared with representatives of the University of Maryland, College Park, governmental authorities or appropriate medical professionals if a subject is in danger of if we are required to do so by law. Only the PI will be able to access to identifiable data. All research records will be kept for three years. After three years, all electronic records will be deleted from computer and all hard copies of data will be shredded.

7. Consent Process:

Study 1 and 2: We are requesting a waiver of consent. No subjects will be recruited for these studies. These studies involve no more than minimal risk to subjects and will not adversely affect their rights and welfare because no subject will be contacted for this investigation. We will only use data that

were already collected before this investigation. The datasets that will be used for analysis contain no identifiable information. All data that will be used for the research will be restricted solely to the PI. The research could not practicably be carried out without the waiver because subjects will only be identified by study ID or case numbers. There will be no study interventions and no contact with the subjects. Subjects' identities will not be identifiable in publications resulting from this investigation.

Study 3: We are requesting a waiver of written consent. We will obtain verbal consent from the subjects. We will provide consent forms to the subjects by email prior to the interview date. On the day of the interview, the PI will explain all procedures involved in the study, including the purpose of the collection and the use, disclosure of the information, interview process, the risks, benefits and confidentiality assurances; then obtain verbal consent from each participant if they agree to proceed further with the study. The research involves no more than minimal risk to the subjects, as the information we will obtain during the interview is not extremely sensitive. The magnitude of harm or discomfort anticipated in the interview are very low and are no greater than those ordinarily encountered daily life or during the interview. The precaution taken to keep all discussion during the interview private and de-identifying of the collected data further minimize the major risk, which is breach of confidentiality. Obtaining signed consent could be considered an invasion of privacy and cause subjects undue anxiety due to their immigrant status. The research could not practicably be carried out without a waiver of written consent because some participants (e.g. undocumented immigrants) may fear of being identified due to their personal and legal reasons, thus may refuse to sign the consent form. The waiver will not adversely affect the rights and welfare of the subjects because the interview would not stop subjects from seeking help for smoking cessation or change their current health behaviors. Participants can make decisions about their own health behaviors regardless of the research. The results of research would have no effect on the subject. Participation in the research is completely voluntary. The verbal consent process for all participants will be video-recorded for record keeping purposes. Whenever appropriate, the subjects will be provided with additional pertinent information after participation. For example, if any subject asks about smoking cessation resources after participation, we will provide them with a list of local health care resources that they may contact for further care.

8. Conflict of Interest:

There will be no potential conflict of interest in this dissertation.

9. HIPAA Compliance:

This study does not require HIPAA compliance.

10. Research Outside of the United States:

N/A

11. Research Involving Prisoners:

There are no prisoners involved in this study.

12. SUPPORTING DOCUMENTS

Your Initial Application must include a **completed Initial Application Part 1 (On-Line Document),** the information required in items 1-11 above, and all relevant supporting documents including: consent forms, letters sent to recruit participants, questionnaires completed by participants, and any other material that will be presented, viewed or read to human subject participants.

The consent forms in your approved IRBNet PACKAGE must be used. When creating or editing your consent form, please provide the most recent IRBNet package number at the bottom, right corner of the consent form. This ensures you are using the most "up-to-date" version of the form.

To find your IRBNet package number, go to the MY PROJECTS tab and click on the title of your project. In the PROJECT OVERVIEW page, your IRBNet package number will be listed at the top, next to your project title.

3. Consent Form (English)

Institutional Review Board
1204 Marie Mount Hall ● 7814 Regents Drive ● College Park, MD 20742 ● 301-405-4212 ● irb@umd.edu

CONSENT TO PARTICIPATE

Project Title	Tobacco Product Use and Marketing Exposure among Foreign-Born Korean Residents
Purpose of the Study	This research is being conducted by Esther Roh, doctoral student at the University of Maryland, College Park. We are inviting you to participate in this research project because you are non-U.S. citizen Korean residents who are between the ages of 18 and 39 and have experience smoking tobacco products. The purpose of this research project is to explore tobacco product use and various factors that influence tobacco product use among foreign-born Korean residents in the Washington D.C. metropolitan area (DC, MD and VA).
Procedures	The procedure involves a one-hour, virtual interview. If eligible, you will be asked to share your opinions and feelings about experiences living in the U.S., smoking various tobacco products and exposing to tobacco marketing. Interview questions will include: *How did you move to the U.S.? In what way was it easy or difficult for you to adjust to the U.S. society? What are your opinions about tobacco products to your health? Can you tell me about your experiences with tobacco products?* The interview will be video-recorded for accuracy of the comments made during the interview. The research will take place online using videoconference.
Potential Risks and Discomforts	There may be some risks from participating in this study. You may feel discomfort or uneasiness when answering some questions about your personal immigration and smoking experiences during the interview. If you become uncomfortable, you have a right to skip questions. Participation in this research is completely voluntary. We will ensure that we keep any risk of discomfort to a minimum.
Potential Benefits	There are no direct benefits to you from participating in this research, but the results may help us to learn more about smoking behaviors among non-U.S. citizen Korean residents in the Washington D.C. metropolitan area. We hope that, in the future, other Koreans in your community might benefit from this study through improved understanding of how to prevent the use of these products among non-U.S. citizen Korean residents. Other researchers might use the results of this study for planning health programs for non-U.S. citizen Korean residents to improve health of Korean community.

Confidentiality	Any potential loss of confidentiality will be minimized by not including your name on any collected data and storing your personal information in a secured location, such as a locked office and a password protected computer. We will replace all personally identifiable data in the study with special identification numbers. Thus, your identity and privacy will be protected. Only Ms. Roh, advising faculty and her research assistants will have access to the collected data. We will ensure that all discussion during the interview will be kept private. We will not share your personal issues you shared during the interview to anyone outside of this study. All original data (video recordings, transcripts, consent forms, and screening documents) will be stored in the locked office space of Ms. Roh. Computer-based files will only be available to the research team (PI, advising faculty and research assistant). All original data will be kept for a period not to exceed three years from the end of the study. After three years, all data will be destroyed. When we write a report or article about this research project, your identity will be protected to the maximum extent possible. Your information may be shared with representatives of the University of Maryland, College Park or governmental authorities if you or someone else is in danger or if we are required to do so by law.
Compensation	If you are eligible for the study, you will receive $40 in visa card or check for your participation. The compensation will be mailed or sent electronically after the interview. You will be responsible for any taxes assessed on the compensation. Your name and address will be collected to receive compensation.
Right to Withdraw and Questions	Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify. If you decide to stop taking part in the study, if you have questions, concerns, or complaints, or if you need to report an injury related to the research, please contact the investigator: **Esther Roh, Doctoral Student** **Department of Behavioral and Community Health** **University of Maryland School of Public Health** **2242 Valley Dr.** **College Park, MD 20742**

	echoi124@umd.edu **(301)458-0455**	
Participant Rights	If you have questions about your rights as a research participant or wish to report a research-related injury, please contact: University of Maryland College Park Institutional Review Board Office 1204 Marie Mount Hall College Park, Maryland, 20742 E-mail: irb@umd.edu Telephone: 301-405-0678 For more information regarding participant rights, please visit: https://research.umd.edu/irb-research-participants This research has been reviewed according to the University of Maryland, College Park IRB procedures for research involving human subjects.	
Statement of Consent	Your verbal consent indicates that you are at least 18 years of age; you have read this consent form or have had it read to you; your questions have been answered to your satisfaction and you voluntarily agree to participate in this research study. You will receive a copy of this consent form. If you agree to participate, please say, “Yes, I agree to participate in this research study.”	
Name and Date	**NAME OF PARTICIPANT** **[Please Print]**	
	DATE	
	Verbal Consent Received	☐ Yes ☐ No

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