Smoking prevalence among Asian Americans: Associations with education, acculturation, and gender

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ABSTRACT

There is evidence that smoking prevalence rates are related to acculturation, education, and gender among Asian Americans. However, no studies have examined how smoking rates among Asian Americans vary based on acculturation, education, and gender together. This study used National Health Interview Survey (NHIS) data (2010–2018) to examine cigarette smoking prevalence among Asian American men and women aged 18 and older (N = 14,680). Multivariate logistic regression models were used to estimate associations between educational attainment (i.e., college graduate or higher vs some college or lower), years spent in the United States (U. S.) as a proxy for acculturation (i.e., less than 10 years (less acculturated) vs 10 years or more (more acculturated) vs U.S.-born), and cigarette smoking prevalence across gender controlling for age, marital status, poverty (at/above vs below poverty threshold), country of origin (Chinese vs Filipino vs Asian Indian vs Other Asian), and the survey year. Current smoking prevalence was 9.0 % among all Asian Americans − 5.0 % among women and 13.5 % among men. Among respective gender-specific subgroups, U.S.-born Asian women without a college degree and more acculturated Asian immigrant men without a college degree had the highest odds of smoking (OR: 4.096 [95 % CI: 2.638, 6.360] and 1.462 [95 % CI: 1.197, 1.774], respectively). Findings indicated that less educated U.S.-born Asian women and less educated Asian immigrant men are at greatest risk for smoking. Smoking prevalence among Asian Americans is highly related to acculturation, education, and gender. Findings may inform development of policies and programs that are targeted toward smoking cessation among Asian Americans.

1. Introduction

1.1. Background

Cigarette smoking is the leading preventable cause of morbidity and mortality in the United States (U.S.) (Gfroerer et al., 2013; Prochaska et al., 2017; US Department of Health and Human Services, 2014). In 2019, 14 % of U.S. adults were current smokers, and cigarette smoking caused more than 480,000 deaths per year (Cornelius et al., 2020). Previous studies have shown that the prevalence of smoking among Asian Americans is lower than the general U.S. population (7 % vs 14 %) (Centers for Disease Control and Prevention, 2020; Cornelius et al., 2020; US Department of Health and Human Services, 2014). Thus,

smoking among Asian Americans has remained relatively understudied. The prevalence of smoking has only dropped by 1.8 % from 9.2 % to 7.4 % in Asian Americans while it has decreased by 6.1 % from 21.1 % to 15.0 % in non-Hispanic White, 5.9 % from 20.5 % to 14.6 % in non-Hispanic Black, and 2.7 % from 12.5 % to 9.8 % in Hispanic in the last decade (American Lung Association, 2019).

Previous research has indicated that the prevalence of smoking in Asian Americans may be under-reported due to exclusive use of English language instruments (Chae et al., 2006; Lew & Tanjasiri, 2003; Rao et al., 2022; Glenn et al., 2009). Smoking prevalence in Asian countries is generally much higher than in the U.S. For instance, the World Health Organization reported that smoking rates in Japan, South Korea, and China were 22 %, 22 %, and 25 % respectively in 2018 (World Health

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Organization, 2019). Due to substantial heterogeneity in smoking rates based upon gender, educational attainment, country of origin, and level of acculturation (e.g., U.S.-born vs Asian immigrants), examination of smoking rates in Asian Americans requires consideration of these important variables (An et al., 2008; Chae et al., 2006; Drouhot & Garip, 2021; Ma et al., 2004; Tsai et al., 2008; R. Yang & Charles, 2021). Thus, failing to address those in Asian smoking prevalence is inequitable and a missed opportunity for public health intervention.

It is well-established that acculturation is an important predictor of immigrant health (An et al., 2008; Castro et al., 2009; Kuerban, 2016; Lee et al., 2000; Ma et al., 2004; Ra et al., 2013; Rodriquez et al., 2019; Sam & Berry, 2006). Acculturation is a process whereby immigrants develop relationships with the new culture of their host country, which results in changes in health beliefs and behaviors (Cornelius et al., 2020; Ma et al., 2004). There is a broadly accepted paradigm that U.S. immigrants, including Hispanics and Asians, tend to be healthier than their U.S.-born counterparts, but they tend to adopt health-deteriorating behaviors (e.g., eating junk food, being sedentary) as they become more acculturated to the U.S. culture (Kuerban, 2016; Ra et al., 2013; Rodriquez et al., 2019). Thus, it is critical to consider differences among not only immigrants vs US born counterparts, but also immigrants at different levels of acculturation in Asian American health (Ma et al., 2004; Ra et al., 2013; Rodriquez et al., 2019; Sam & Berry, 2006; Sandberg, 1974).

Although greater U.S. acculturation has been linked with an increase in risky health behaviors, this link has not been consistently supported regarding smoking behaviors (Abraído-Lanza et al. 2005; An et al. 2008; Choi et al. 2008; Crespo et al. 2001; Kandula and Lauderdale 2005; Shelley et al. 2004). Research has shown that Asian female immigrants that are more acculturated to the U.S. are more likely to smoke (Ma et al., 2004; Patel et al., 2018; Rodriquez et al., 2019); whereas studies have indicated mostly opposite findings among male immigrants (An et al., 2008; Ma et al., 2004; Patel et al., 2018). In most Asian cultures, men are more likely to use tobacco products than women partially because many Asian cultures consider female smoking to be socially unacceptable (Li & Hummer, 2015; Maxwell et al., 2005; Morrow & Barraclough, 2010; Patel et al., 2018; Tsai et al., 2008). There is evidence that the risk of any form of tobacco use increases among Asian immigrant women as they acculturate more to the U.S. cultural norms (An et al., 2008; Gotay et al., 2015; Maxwell et al., 2005; McCarthy et al., 2005; Patel et al., 2018; Reiss et al., 2015; Sandberg, 1974; J. Zhang & Wang, 2008). It may be due to the US culture where female smoking is more acceptable (An et al., 2008). Conversely, tobacco use among Asian immigrant men typically declines with increasing acculturation because tobacco use is typically less prevalent among males in the U.S. than is the case in most Asian countries (An et al., 2008; Gotay et al., 2015; Patel et al., 2018; Reiss et al., 2015; J. Zhang & Wang, 2008). Thus, more U.S. acculturated Asian men and less acculturated Asian women are more likely to be non-smokers (Centers for Disease Control and Prevention, 2011; Lee et al., 2000; Martins et al., 2015; Moeschberger et al., 1997), compared with less U.S. acculturated Asian men and more acculturated Asian women, respectively.

Level of educational attainment is highly related to smoking prevalence in the U.S. Specifically, smoking rates generally decrease with increased education (Agaku et al., 2020; Fujiwara & Kawachi, 2009; Gage et al., 2018; Heckman et al., 2016; Leas et al., 2020; Nguyen-Grozavu et al., 2020; Tsai et al., 2008). In addition, there is evidence that lower levels of education were related to the usual pattern of increased smoking rates with increasing acculturation. Ra and her colleagues (2013) reported that U.S. acculturation tends to be positively associated with higher smoking behavior among less educated Korean immigrants. Another study on Asian immigrants in the U.S. reported that those with less than 12 years of education were more likely to be current smokers with longer residence in the U.S. (Li & Hummer, 2015).

As mentioned above, previous studies have investigated the relationships between acculturation and smoking and the moderating effects of education or gender (Li & Hummer, 2015; Ra et al., 2013; Cho et al., 2004; Shelley et al., 2004; Pampel et al., 2020; An et al., 2008; Ma et al., 2004; An et al, 2008; Mukherjea et al, 2014). Yet, no studies have examined how smoking rates among Asian Americans vary based on acculturation, education, and gender examined concurrently. Thus, this study aims to examine differences in smoking prevalence attributed to educational attainment, acculturation, and gender and identify the highest risk subgroups for smoking among Asian Americans using nationally representative data, which includes non-English speaking Asian immigrant populations. Based on previous research, we hypothesized that the relationship between acculturation level (i.e., U.S.-born vs newer immigrants vs older immigrants) and smoking rates would be modified by educational attainment, and the highest risk groups for smoking accounting for educational attainment and the level of acculturation will be different across gender within Asian subgroups.

2. Methods

2.1. Data

This study used the Integrated Public Use Microdata Series National Health Interview Survey (IPUMS NHIS) data from 2010 to 2018 (Blewett et al., 2019). The sample for this analysis was restricted to adults aged 18 or older who reported their ethnicity as non-Hispanic and Asian yielding a final sample size of 14,680. The analyses were weighted to account for the complex sample design. Detailed information about the sample design, sampling weights, and surveys are available at the NHIS IPUMS Health Surveys website. The study procedure was reviewed by the Institutional Review Board at the University of Oklahoma Health Sciences Center (IRB#:14371).

2.2. Measures

The main predictors of current smoking prevalence were acculturation and educational attainment in multivariate logistic regression models for the overall Asian American sample as well as women and men, separately. For acculturation, we included not only the length of residence in the U.S. but also the nativity. Thus, this sample included both foreign-born and U.S.-born Asians, years spent in the U.S. They were categorized into three groups and used as a proxy of acculturation based on previous research (Abraído-Lanza et al., 2006; Li & Hummer, 2015; Ra et al., 2013; Cho et al., 2004; Shelley et al., 2004; Pampel et al., 2020; An et al., 2008; Ma et al,. 2004). The three levels of acculturation were: 1) less than 10 years (less acculturated immigrants), 2) 10 years or more (more acculturated immigrants), and 3) U.S.-born Asians. Educational attainment was dichotomized into "some college or less" (less educated) vs "college graduate or more" (highly educated) since Asian Americans overall have the highest percentage of adults with college degree or higher among all races (Ryan & Bauman, 2016). Smoking prevalence was assessed using a binary categorical variable (i.e., current smoker vs not current smoker). Current smokers were those who reported having smoked at least 100 cigarettes during their lifetimes and smoked every day or some days in the last month at the time of interview.

Covariates included age, marital status, poverty status, the interview language (i.e., English" vs "Other"), country of origin, and survey year. Marital status was dichotomized as "married or living with a partner" vs "separated, divorced, widowed, or never married." Poverty status was coded as "at/above poverty threshold" vs "below poverty threshold" where poverty was defined as "the ratio of family income to the U.S. Census Bureau's poverty thresholds for the year in question" by the NHIS.

2.3. Analyses

Three multivariate logistic regressions for 1) all Asian Americans, 2)

women only, and 3) men only were conducted to estimate the odds of being a current smoker depending on educational attainment and years spent in the U.S. adjusted for age, marital status, poverty status, interview language, and the survey year. All analyses were performed using RStudio (1.4.1717). We took into account the NHIS complex sampling design to obtain proper variance estimates by using provided weights in the dataset (Blewett et al., 2019; IPUMS Health Surveys).

3. Results

3.1. Descriptive analyses

Table 1 displays weighted distributions of the predictor variables across all Asian Americans as well as women and men separately. Overall, the average age was 44.5 years old (SD = 17.7). Most participants (i.e., 59.1 %) reported being married or living with a partner, 15.2 % were living below the poverty threshold, and 93.4 % had English proficiency sufficient to respond the interview in English. Among all Asian American respondents, 76.9 % were foreign born and immigrated to the U.S. (23.2 % lived in the U.S. for less than 10 years, 53.7 % lived in the U.S. for 10 years or longer) and 23.1 % were born in the U.S. Educational attainment was slightly higher among men than women, 59.4 % of men vs 54.0 % of women reported having graduated college or more. Men were 21.6 % Chinese, 17.0 % Filipino, 28.3 % Asian Indian, and 33.0 % other Asian; whereas women were 22.8 % Chinese, 22.1 %

Table 1
Descriptive Statistics of Sociodemographic Characteristics.

| | Non-Hispanic Asian Americans | | | | | |
| | All | | Female | | Male | |
	N	%	N	%	N	%
Age (M/SD)	44.5	17.71	45.5	18.07	43.4	17.20
Marital Status						
Married/living with partner	8,563	59.1 %	4,521	58.5 %	4,042	59.8 %
Poverty						
Below poverty threshold	2,351	15.2 %	1,289	15.8 %	1,062	14.6 %
Interview Language						
English	13,604	93.4 %	7,201	92.8 %	6,403	94.2 %
Educational Attainment						
College or more	7,831	56.5 %	3,994	54.0 %	3,837	59.4 %
Years spent in the US						
Less than 10 years	3,439	23.2 %	1,778	22.7 %	1,661	23.8 %
10 years or more	7,642	53.7 %	4,231	55.1 %	3,411	52.1 %
U.S.-born	3,599	23.1 %	1,821	22.2 %	1,778	24.1 %
Country of Origin						
Chinese	3,144	22.2 %	1,698	22.8 %	1,446	21.6 %
Filipino	3,109	19.7 %	1,838	22.1 %	1,271	17.0 %
Asian Indian	3,127	24.2 %	1,395	20.6 %	1,732	28.3 %
Other Asian	5,300	33.8 %	2,899	34.5 %	2,401	33.0 %
Smoking Status						
Current Smoker	1,411	9.0 %	434	5.0 %	977	13.5 %
Unweighted N	14,680		7,830		6,850	

Source National Health Interview Survey 2010–2018.
N: raw sample size; %: Weighted percentage.
M: mean; SD: standard deviation.
Prevalence estimates are weighted to reflect survey design and differential non-response.

Filipino, 20.6 % Asian Indian, and 34.5 % other Asian. Among Asian Americans 5.0 % of women and 13.5 % of men were current smokers.

Table 2 presents crude frequencies and weighted distributions of current smoking prevalence, stratified by educational attainment and level of acculturation for the overall sample as well as women and men separately. Prevalence of current smoking was higher among individuals with lower (i.e., some college or less) vs higher educational attainment (i.e., college graduate or more) at all levels of acculturation, and the same patterns were found in both men and women. In terms of acculturation, prevalence of current smoking increased as duration of U.S. residence increased in less educated subgroups in the overall Asian American sample (10.4 % among less acculturated immigrants vs 13.1 % among more acculturated immigrants vs 17.0 % among U.S.-born). However, the effects of acculturation on smoking prevalence were different across genders. While there were large differences between genders in low acculturation (immigrants with less than 10 years of residence in U.S.) and low educational attainment subgroups (3.5 % in females vs 18.8 % in males), the subgroups of U.S.-born higher educational attainment brought gender differences in cigarette smoking prevalence closer (4.7 % in females vs 6.1 % in males) (See Table 2).

Table 3 presents relations between each predictor variable and current smoking. Compared to immigrants with less than a college education and less than 10 years in the U.S. (reference group), those with a college degree and 10 years or more in the U.S. had significantly lower prevalence of current smoking overall and also for women and men separately (overall OR: 0.444 [95 % CI: 0.321, 0.615]; women OR: 0.368 [95 % CI: 0.171, 0.791]; men OR: 0.459 [95 % CI: 0.317, 0.662]). Similarly, U.S.-born respondents with a college degree had significantly lower prevalence of smoking overall and for men (overall OR: 0.417 [95 % CI: 0.286, 0.607]; men OR: 0.446 [95 % CI: 0.282, 0.708]) compared to the reference group. U.S.-born women with a college degree were not significantly different from the reference group.

Fig. 1 shows the marginal probabilities and odds of current smoking among Asian Americans by educational attainment and acculturation level. The subgroup of immigrants who had resided in the U.S. less than

Table 2
Unweighted frequencies and weighted probabilities of dependent variables.

| | Currently Smoking | | | | | |
| Years spent in US | <10Y | | 10Y+ | | US born | |
Educational Attainment	N	% (95 % CI)	N	% (95 % CI)	N	% (95 % CI)
Total						
some college or less	123	10.4 (8.4, 12.4)	487	13.1 (11.8, 14.4)	346	17.0 (14.9, 19.1)
college graduate or more	164	6.8 (5.6, 8.0)	194	4.7 (3.9, 5.4)	97	5.3 (4.3, 6.4)
Female						
some college or less	24	3.5 (1.9, 5.2)	140	6.2 (5.1, 7.3)	159	16.5 (13.8, 19.2)
college graduate or more	24	1.8 (1.0, 2.6)	39	1.5 (1.0, 2.0)	48	4.7 (3.3, 6.1)
Male						
some college or less	99	18.8 (14.9, 22.7)	347	23.3 (20.7, 25.9)	187	17.5 (14.4, 20.6)
college graduate or more	140	11.8 (9.7, 14.0)	155	7.8 (6.4, 9.2)	49	6.1 (4.3, 7.8)

Source National Health Interview Survey 2010–2018.
N: raw sample size; %: Weighted percentage.
<10Y: less than 10 years in the U.S., 10Y+: 10 years or more in the U.S.
Prevalence estimates are weighted to reflect survey design and differential non-response.

Table 3

Logistic regression results predicting odds of current smoking among Non-Hispanic Asian Americans.

	Currently Smoking		
	All	Female	Male
	Adjusted OR (95 % CI)	Adjusted OR (95 % CI)	Adjusted OR (95 % CI)
(Intercept)	0.096 (0.064,0.143)	0.018 (0.007,0.049)	0.512 (0.323,0.810)
Covariates			
Sex			
Female	1		
Male	3.286 (2.849,3.789)		
Age	0.989 (0.985,0.993)	0.989 (0.983,0.995)	0.988 (0.983,0.994)
Marital Status			
Never Married/ Divorced/Widowed/ Separated	1	1	1
Married/Living with a partner	0.886 (0.769,1.020)	0.814 (0.650,1.020)	0.898 (0.740,1.091)
Poverty			
At/Above poverty threshold	1	1	1
Below poverty threshold	0.959 (0.797,1.153)	1.055 (0.768,1.449)	0.911 (0.733,1.133)
Interview Language			
Other	1	1	1
English	0.774 (0.593,1.009)	2.519 (1.146,5.537)	0.561 (0.409,0.769)
Country of Origin			
Chinese	1	1	1
Filipino	1.891 (1.527,2.342)	2.946 (1.950,4.450)	1.481 (1.136,1.932)
Asian Indian	0.868 (0.682,1.104)	0.604 (0.334,1.091)	0.894 (0.681,1.174)
Other Asian	1.885 (1.578,2.253)	2.127 (1.424, 3.177)	1.875 (1.505,2.335)
Year	0.973 (0.947,1.000)	0.964 (0.919,1.012)	0.980 (0.948,1.013)
Predictors			
Years Spent in U.S.			
Less than 10 years	1	1	1
10 years or more	1.542 (1.195,1.989)	2.115 (1.241,3.605)	1.456 (1.066,1.987)
U.S. born	1.508 (1.149,1.979)	4.099 (2.399,7005)	0.890 (0.635,1.248)
Educational Attainment			
Some college or less	1	1	1
College graduate or more	0.741 (0.561,0.979)	0.649 (0.321,1.314)	0.741 (0.538,1.021)
Years Spent in U.S.: Educational Attainment			
Less than 10 years: Some college or less	1	1	1
10 years or more: College graduate or more	0.444 (0.321,0.615)	0.368 (0.171,0.791)	0.459 (0.317,0.662)
U.S. born: College graduate or more	0.417 (0.286,0.607)	0.462 (0.206,1.037)	0.446 (0.282,0.708)

Table 3 (*continued*)

	Currently Smoking		
	All	Female	Male
Unweighted N	14,680	7,830	6,850

Source: National Health Interview Survey 2010–2018.
CI: confidence interval, OR: odds ratio.

10 years (i.e., less acculturated) and were less educated was the reference group for each analysis (i.e., all sample, women, and men).

Compared to the reference group, among all Asian Americans without a college degree, odds of smoking were significantly higher if they were immigrants who resided in the U.S. for 10 years or more (OR: 1.537 [95 % CI: 1.323, 1.786]) or U.S.-born (OR: 1.507 [CI: 1.209, 1.878]). In all subgroups of Asian Americans with a college degree, regardless of the level of acculturation, the odds of smoking were significantly lower compared to the reference group (OR for immigrants who resided in the U.S for less than 10 years: 0.741 [CI: 0.583, 0.932]; OR for immigrants who resided in the U.S. for 10 years or more: 0.507 [CI: 0.399, 0.638], and OR for the U.S.-born: 0.463 [CI: 0.353, 0.613], respectively). Similar negative associations between educational attainment and current smoking prevalence were also found in both gender subgroups.

Among respective gender-specific subgroups, U.S.-born Asian women without a college degree (OR: 4.096 [95 % CI: 2.638, 6.360]) and immigrant men without a college degree who resided in the U.S. for 10 years or more had the highest odds of smoking (OR: 1.462 [95 % CI: 1.197, 1.774]).

4. Discussion

The primary purpose of this study was to examine the intersectionality of acculturation, education, and gender as it influences smoking prevalence in the Asian American population and to identify the highest risk subgroups for smoking among the Asian American population. Overall, higher level of education was associated with lower smoking prevalence in both Asian men and women. The effects of acculturation on smoking prevalence were not consistent across gender and were modified by educational attainment. Among Asian immigrants, highly educated men and women were less likely to be current smokers the longer they resided in the U.S.; however, less educated immigrant men and women were more likely to smoke as they lived longer in the U.S. U.S.-born Asian women tended to be more likely to smoke than Asian immigrant women while U.S.-born Asian men tended to be less likely to smoke than Asian immigrant men regardless of their educational attainment. Overall, findings indicate that US-born Asian women without a college degree and Asian immigrant men without a college degree that have resided in the U.S. for at least 10 years have the highest smoking prevalence of all Asians in the U.S.

Our findings are consistent with previous research studies that have indicated that Asians with a college degree are less likely to smoke regardless of gender and level of acculturation. The negative relationship between higher education and smoking is well documented (US Department of Health and Human Services, 2014; Leas et al., 2020; Nguyen-Grozavu et al., 2020; Pierce et al., 1989). The "socio-ecological effect" indicates that more highly educated individuals have fewer friends who smoke, are exposed to fewer smoking advertisements, and perceive stronger anti-smoking norms (de Walque, 2007; Nguyen-Grozavu et al., 2020; Leas et al., 2020). This could be a primary driver of lower smoking prevalence among Asian Americans.

The observed differences in smoking prevalence based on educational attainment support the idea of segmented assimilation (Abraído-Lanza et al., 2006; Li & Hummer, 2015; Ra et al., 2013). As mentioned earlier, smoking rates differ greatly across levels of education – highly educated Asian immigrants were less likely to smoke than less educated
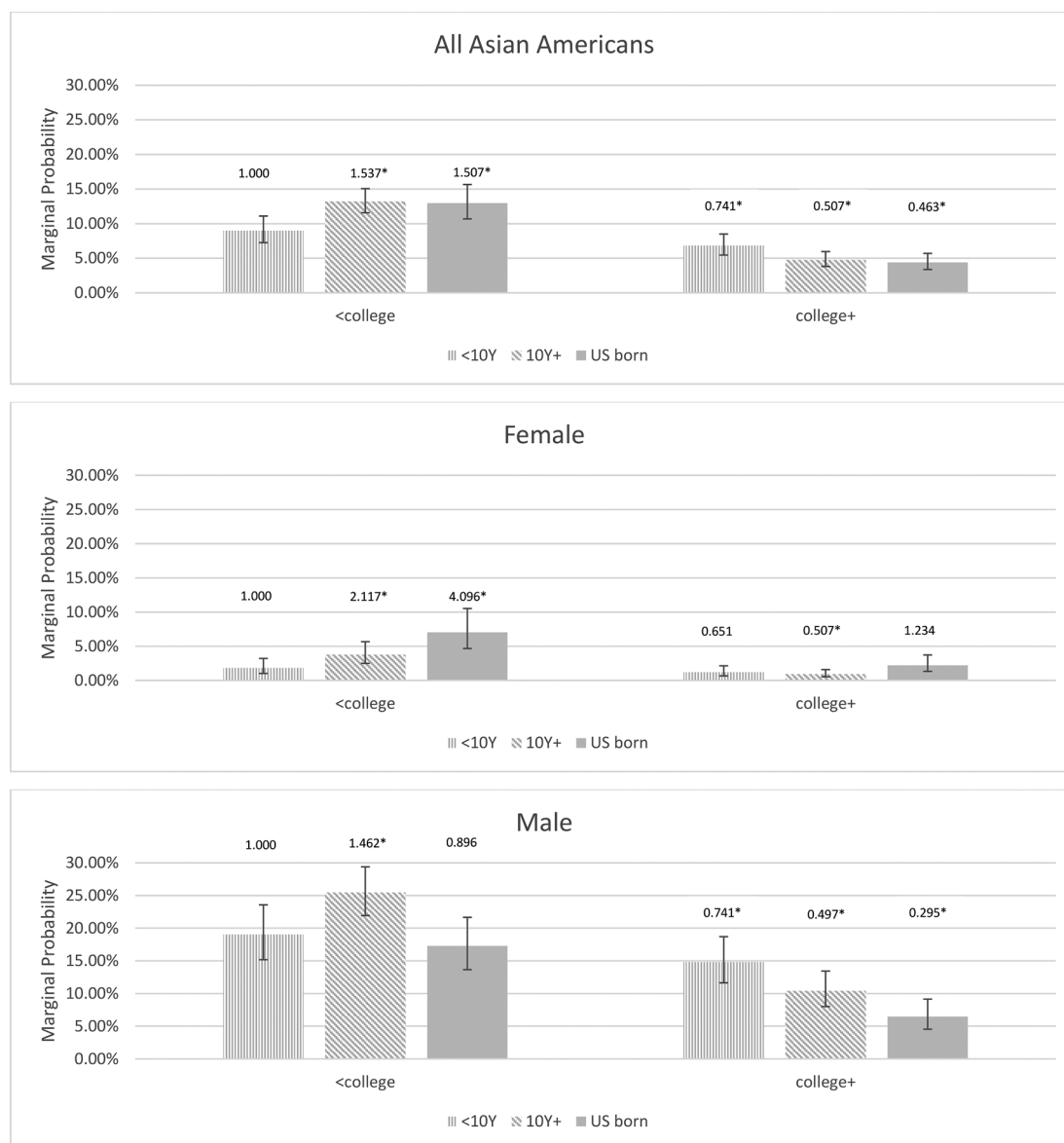
Fig. 1. Marginal Probabilities and Odds Ratios of Current Smoking by Educational Attainment and Level of Acculturation Notes: Odds ratios are included in the figure with a reference group (OR: 1.000). Reference group: the subgroup of immigrants who had resided in the U.S. less than 10 years (i.e., less acculturated) and were less educated for each analysis (i.e., all Asian Americans, women, and men). All models were adjusted for age, marital status, poverty status, the interview language, country of origin, and survey year. * indicates significant odds ratio at *p <.05*. Confidence intervals are included in the text. < college: some college or less, college+: college graduate or more, < 10Y: less than 10 years in the U.S., 10Y+:10 years or more in the U.S.

Asian immigrants. Moreover, smoking rates among highly educated Asian immigrants were lower among those with longer residence in the U.S. Conversely, less educated immigrants tended to have greater prevalence of smoking with greater length of U.S. residence. Highly educated immigrants may settle into higher income neighborhoods and interact with others with higher levels of education and thus be more likely to adopt anti-tobacco sentiments (Li & Hummer, 2015; Ra et al., 2013). In contrast, individuals with less education and fewer financial resources tend to start at the bottom of the occupational hierarchy (Li & Hummer, 2015; Ra et al., 2013). They likely have more direct daily contact with lower income adults and other immigrants that have higher smoking prevalence rather than higher income adults and college graduates that are less likely to smoke (Li & Hummer, 2015; Ra et al., 2013). However, this was not applied to U.S.-born Asian American men and women who were considered most acculturated to the U.S. culture.

Smoking behaviors are influenced by cultural norms (An et al., 2008; Tsai et al., 2008). Regardless of level of education, Asian female

immigrants were less likely to smoke than U.S.-born women while Asian male immigrants were more likely to smoke than U.S.-born Asian men. In most Asian countries, smoking among men is much higher than women, although there has been a rapid increase in the rate of smoking among women in Asian countries (J. J. Yang et al., 2019). Due to traditional values and normative gender expectations, female smoking is socially less acceptable in Asian countries than in the U.S. (An et al., 2008; Tsai et al., 2008). Even though the smoking rate among women in the U.S. has declined steadily, it still remains higher than that of women in Asian countries (J. J. Yang et al., 2019; M. Zhang et al., 2019). U.S.-born Asian women who are more acculturated to the U.S. culture where gender equality is more valued and female smoking is viewed more favorably, tend to be more likely to smoke than Asian immigrants (An et al., 2008). Conversely, U.S.-born Asian men smoke less than Asian male immigrants since smoking is generally less tolerated in the U.S. than in Asian countries (An et al., 2008; Ma et al., 2004).

This study has several limitations. First, we used cross-sectional data

to examine smoking prevalence among Asian Americans. Thus, it was not possible to disentangle the temporal order of educational attainment and period of residence in the U.S. among Asian immigrants. Educational attainment may have occurred either prior to immigration to the U.S. or afterwards. Second, we used years of living in the U.S. as a proxy measure for acculturation (Abraído-Lanza et al., 2006; Li & Hummer, 2015; Ra et al., 2013) and included survey language (English vs other) as a covariate in the analyses. Although duration of residence is one of the most important dimensions of acculturation (Li & Hummer, 2015), other studies have used various scales to measure acculturation in greater detail, which include a series of questions on cultural lifestyle and indigenous beliefs that are associated with smoking behaviors (Schwartz et al., 2010; Wallace et al., 2010). Incorporating an acculturation scale in the NHIS survey or other surveys could help improve understanding of the interactions between education and acculturation and the trajectories of smoking prevalence among Asian Americans. In addition, we could not disaggregate the Asian subgroups based on their ethnicity due to the complexity of the analysis and lack of the sample size. Asian Americans are culturally heterogeneous, thus the findings of this study may not be generalized to a certain Asian ethnicity. Future study with sufficient sample size should examine the same relationships and how the findings differ based on their ethnicity.

5. Conclusions

This study addresses an important gap in the literature on smoking in Asian Americans. This is the first study to examine the intersectionality of acculturation, education, and gender as it influences smoking prevalence in the Asian American population. Findings indicated that smoking prevalence among Asian Americans is highly dependent upon interactions among these variables. Specifically, U.S.-born Asian women without a college degree and Asian immigrant men without a college degree were identified as the subgroups with the greatest risk for smoking. Findings from the current study may inform development of policies and programs that are targeted toward smoking cessation among Asian Americans by focusing on reducing the prevalence of smoking in those subgroups at high risk. For instance, smartphone-based just-in-time smoking cessation interventions could be developed to address the specific needs of U.S.-born Asian women without a college degree and Asian immigrant men without a college degree. Identifying smoking related risk behaviors (e.g., smoking urges, stress, alcohol use) and providing tailored intervention content in real-time may help reduce smoking cigarettes across Asian American populations (see Hébert et al., 2020).

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The authors do not have permission to share data.

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