Ethnic-by-gender differences in cigarette smoking among Asian and Pacific Islanders

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We examined the interaction between ethnicity and gender in predicting the likelihood of having ever smoked (vs. having never smoked) and being a current smoker (vs. being a former smoker) and in predicting years spent as a regular smoker. These relationships were examined while controlling for the possible confounding effects of sociodemographics, psychosocial factors, and chronic medical conditions. The analysis examined cross-sectional data from 1,158 people of Native Hawaiian, Filipino, Japanese, and White ethnic ancestry, finding large ethnic and gender–ethnic differences in the prevalence of former and current smoking. Multiple regression analyses showed significant gender × ethnicity interactions in predicting the likelihood of having ever smoked but not in the likelihood of being a current smoker (vs. having quit) or in the duration of years spent smoking. The results of the present study have important implications for smoking prevention programs among men and women in three distinct Asian and Pacific Islander ethnic groups.

Introduction

Cigarette smoking is the leading preventable cause of disease and death in the United States (U.S. Department of Health and Human Services [USDHHS], 2004), making it a serious public health concern. Many severe medical illnesses are associated with cigarette smoking, such as heart disease, chronic bronchitis and emphysema, and lung cancer (Thun, Apicella, & Henley, 2000). Most at risk are an estimated 45.8 million U.S. adults who continue to smoke, in addition to another 46 million former smokers (Center for Disease Control and Prevention [CDC], 2004). National U.S. data suggest gender differences in the overall prevalence of current cigarette smoking and former cigarette smoking, with a slightly higher prevalence for males (26% and 25%, respectively) than females (21% and 20%, respectively; CDC, 2002). However, large ethnic and ethnic × gender differences exist in the prevalence of cigarette smoking.

Ethnic differences in cigarette smoking

Ethnic differences in the prevalence of cigarette smoking are typically underestimated because of aggregate reporting practices that combine, for example, Asian and Pacific Islander groups into a single category. The latter includes Native Hawaiians, who are pooled with other Pacific Islanders and people of Asian descent in most national surveys (USDHHS, 1998). When aggregated, data show that the prevalence of cigarette smoking is about 15% for Asian Americans and Pacific Islanders as a group (USDHHS, 1998). Whereas 15% is relatively low, disaggregated data show large variation among subpopulations. For

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example, data from Hawaii suggest that the prevalence of current cigarette smoking ranges from 32% to 34% for Native Hawaiians (Kaholokula, Grandinetti, Crabbe, Chang, & Kenui, 1999; Salvail, Huang, & Nguyen, 2002) to 19.8% for Filipinos and 15.6% for Japanese (Salvail et al., 2002). Nationally, these rates compare with 40.8% for American Indians and Alaska Natives, 23.6% for Whites, 22.4% for Blacks, and 16.7% for Hispanics (CDC, 2004).

Gender disparities across ethnic groups in cigarette smoking

Gender disparities across ethnic groups also exist in the prevalence of cigarette smoking. For example, research shows a significantly higher prevalence of current cigarette smoking among Native Hawaiian women (35%) compared with Native Hawaiian men (27.7%; Kaholokula et al., 1999). Other studies report a similar gender pattern of current cigarette smoking among American Indians and Alaska Natives (29.1% for men vs. 42.5% for women; CDC, 2002). However, among other U.S. ethnic groups, men are more likely than women to be current cigarette smokers: 27.1% for Black men versus 18.7% for Black women, 22.7% for Hispanic men versus 10.8% for Hispanic women, and 25.5% for White men versus 21.8% for White women (CDC, 2004). Ethnic–gender smoking patterns also may differ by age. For example, in a study of U.S. Air Force recruits aged 17–35 years ($M = 19.8$ years), Ward et al. (2002) found that non-Hispanic White female recruits were significantly more likely to be current daily smokers (31.6%) than were non-Hispanic White male recruits (29.4%), whereas Black male recruits were more likely to be current daily smokers (9.8%) than were Black female recruits (5.6%). Overall, across ethnic groups by gender, smoking prevalence is higher for Native Hawaiian and American Indian/Alaska Native women (35% and 42.5%, respectively) than it is for non-Hispanic White women (21.8%), Hispanic women (10.8%), and Asian-American women (6.5%; CDC, 2004).

Sociocultural and psychosocial factors and chronic illnesses associated with cigarette smoking

Research suggests that ethnic and gender differences in smoking prevalence could be attributed to sociocultural and psychosocial factors, including socioeconomic status, acculturation status and stressors, and health beliefs and perceptions (Hsia & Spruijt-Metz, 2003; Shelley et al., 2004; Singh & Siahpush, 2002; Winkleby, Schooler, Kraemer, Lin, & Fortmann, 1995). For example, smoking behavior has been more consistently associated with depressive symptoms (Borrelli et al., 1999) and the desire to control one's weight (Gritz, Klesges, & Meyers, 1989) among women than men. Yet, these factors—depressive symptoms and the need for weight control—may manifest themselves differently in women's smoking behaviors depending on ethnicity, especially given possible differences in health beliefs and body image concerns (e.g., Fulkerson & French, 2003; Hanson, 1999). Therefore, psychological and sociocultural factors could account for the observed gender differences in the prevalence of cigarette smoking across ethnic groups.

Gender disparities in morbidity rates also could account for the differences in smoking status across ethnic groups. Within some ethnic groups in the United States, the rates of morbidity related to health problems are higher among males than females. For example, mortality and morbidity rates are higher among Native Hawaiian males than among Native Hawaiian females (Braun, Look, & Tsark, 1995; Braun, Look, Yang, Onaka, & Horiuchi, 1996), which could account for the reported differences in smoking prevalence (e.g., more women are alive to be counted or more men may have quit smoking because of their higher rates of chronic disease). Therefore, chronic medical conditions (e.g., respiratory conditions) could account for the observed differences in the prevalence of cigarette smoking across genders within certain ethnic groups.

Rationale and goals of the present study

Understanding ethnic differences in the relationship between smoking status and gender has important implications for developing targeted smoking prevention and cessation programs to specific populations (Forthofer & Bryant, 2000; Kreuter, Lukwago, Bucholtz, Clark, & Sanders-Thompson, 2003). Toward this end, we examined gender differences in cigarette smoking by ethnicity while controlling for sociodemographic (e.g., age, education level, and marital status) and psychosocial factors (e.g., emotional distress and social support), and the presence of medical conditions associated with cigarette smoking. Given the tendency for aggregate data reporting to mask ethnic-group variation, we analyzed three Asian and Pacific Islander groups separately—Native Hawaiians, Japanese, and Filipinos—and Whites.

Specifically, we examined a series of research questions that look at ethnicity and gender effects on three smoking-related behaviors: Initiation, cessation, and duration. The first research question, related to initiation of smoking, examined the interaction between ethnicity and gender on the likelihood of regular smoking at some time in the life course (compared with individuals who had never

smoked at the time of the survey). We examined whether the gender differences between ethnic groups could be explained by sociodemographics, psychosocial factors, and medical conditions that could affect smoking behavior. The second research question, related to smoking cessation, examined the effects of gender and ethnicity on the likelihood of continued smoking behavior (compared with former smokers), net of the same controls. Finally, we analyzed the data for interaction effects between ethnicity and gender on the number of years spent as a regular smoker, again attempting to explain these differences via sociodemographics, psychosocial factors, and medical conditions.

Method

Participants

Cross-sectional data came from the Kohala Health Research (KHR) Project (formerly known as the Native Hawaiian Health Research [NHHR] Project). The KHR Project was a multiethnic, community-based epidemiological study of diabetes and cardiovascular disease risk factors among adult residents (aged 18 years or older) of the North Kohala district on the island of Hawaii. Of the 1,462 participants in the KHR Project, 304 were excluded because they were outside the four major ethnic groups of interest. This selection yielded a sample of 1,158 individuals (623 females and 535 males), including 489 (43%) Native Hawaiians, 184 (16%) Filipinos, 190 (16%) Japanese, and 295 (25%) Whites.

Assessment instruments

Cigarette smoking status was assessed using a detailed questionnaire that inquired about current and past smoking behaviors including age at initiation (e.g., "How old were you when you first started smoking cigarettes fairly regularly?"), amount (e.g., "Have you smoked at least 100 cigarettes in your entire lifetime?" and "On the average, how many cigarettes do/did you usually smoke a day?"), and duration (e.g., For how many years have you been or were you a regular smoker?"). Based on the criteria commonly used by other studies to define smoking status (Anda et al., 1990; Kaholokula et al., 1999), we identified participants as current smokers if they had smoked 100 or more cigarettes in their lifetime and were currently smoking at the time of the study, as former smokers if they had smoked 100 or more cigarettes in the past but were no longer smoking, and as never-smokers if they had smoked less than 100 cigarettes in their entire life.

Sociodemographic data were collected using a personal history data form and included gender, age, education level, marital status, and ethnic ancestry. Ethnic ancestry data were based on participants' self-report, which included percentage of blood quantum (i.e., less than 25%, 25%–49%, 50%–74%, 75%–99%, and 100%). Participants were defined as Native Hawaiian if they self-reported any Native Hawaiian blood quantum or descent from individuals residing in the Hawaiian Islands prior to Western contact in 1778. Otherwise, participants were defined as White if they reported having only White ancestry, Japanese if they reported only Japanese ancestry, and Filipino if they reported only Filipino ancestry. Because of small numbers, we excluded from this analysis individuals who reported multiple non-Hawaiian ethnicities. This schema of ethnic classification is standard in Hawaii (Braun et al., 1996).

Medical and health data were collected using a detailed clinical and medical history data form designed by the KHR Project. Based on participants' self-report, these data included prescription and over-the-counter medication use, present and past medical conditions (e.g., hypertension, diabetes, heart and lung conditions, stroke, high cholesterol, and cancer), reproduction history and hormone use for females, and other health problems (e.g., ulcer, arthritis). Clinical measures included height and weight (from which body mass index [BMI] was calculated), blood pressure, blood glucose levels, and lipid profiles, which were collected according to standardized protocols adopted by the KHR Project (Grandinetti et al., 1998).

Psychosocial data were collected using the Center for Epidemiological Studies–Depression (CES-D) scale and the Lubben Social Network Scale (LSNS). The CES-D scale (Radloff, 1977) is a 20-item self-report measure of depressive symptoms designed for research use among the general population; it provides an index of cognitive (e.g., "I thought my life had been a failure"), affective (e.g., "I felt depressed"), and behavioral (e.g., "I talked less than usual") symptoms using a 4-point rating scale from 0=rarely or none of the time to 3=most or all of the time. Total possible CES-D scale scores range from 0 to 60; higher scores indicate greater frequency of depressive symptoms, and consistent with prior studies, a score of 16 or greater was used to categorize participants as having depression. The use of the CES-D scale as a measure of depressive symptoms among different ethnic groups has been supported in several previous studies (Beekman et al., 1997; Hertzog, Alistine, Usala, Hultsch, & Dixon, 1990; Radloff, 1977).

The LSNS was used to assess social support. Only the six-item subscale of the ten-item LSNS (Lubben, 1988) was used in this study. The six-item subscale assessed social support by asking about availability

of assistance from family (three items) and friends (three items), on a 5-point rating scale from 1=definitely true to 5=definitely false. Examples of LSNS items are "When I feel lonely, there are several people I can talk to," "I often meet or talk with family or friends," and "There is at least one person I know whose advice I really trust." Total possible LSNS scores range from 6 to 30, and lower scores indicate greater social support. Based on a median-split, participants who scored less than 9 on the LSNS were grouped as having high social support (otherwise participants were grouped as having low social support). The use of the LSNS as a measure of social support has been supported in previous studies (Lubben, 1988; Newsom & Schulz, 1996).

Procedures

For a detailed explanation of the procedures used in the KHR Project, see Grandinetti et al. (1998) and Mau et al. (1997). Briefly, the KHR Project recruited Native Hawaiian participants who had participated in a previous NHHR study via telephone, mail, or a home visit. Other participants (both Native Hawaiian and non-Native Hawaiian) were recruited via telephone using a cross-reference directory, local public television announcements, flyers posted at community centers and stores, and presentations given to community organizations. The eligibility criteria for participation in the KHR Project were as follows: (a) 18 years of age or older, (b) resident of North Kohala, Hawaii, and (c) if female, not pregnant at the time of the study. Participation required a 2-hr clinical examination and interview at the KHR community clinic, following informed consent procedures. As an incentive, participants were given a US$20 gift certificate to a local grocery store on completion of the exam and interview. The clinical exam consisted of fasting and post-oral glucose tolerance test blood draws, vital signs (i.e., temperature and blood pressure), anthropometric measurements (i.e., weight, height, waist and hip circumference, and sagittal diameter), electrocardiogram testing, urine sampling, and pulmonary testing. On completion of clinical exams, a series of questionnaires was administered, which included a medical history data form, a physical activity form, a dietary form, and a series of psychosocial measures that included the CES-D scale and LSNS.

Data reduction and statistical analyses

Obesity was indicated by a BMI of 30 or more (coded as 1; otherwise 0). Based on the ICD-10 general categories of medical conditions (World Health Organization, 1992), we created two indicators for having a circulatory or a respiratory medical condition based on reported histories of (a) heart condition, stroke, or hypertension (b) or asthma, acute and chronic bronchitis, emphysema, and other lung problems (coded as 1; otherwise 0, respectively). Three additional dichotomous variables were constructed for participants who reported having a history of cancer (any cause), diabetes (self-report or fasting blood glucose ≥ 125 mg/dl or 2-hr postchallenge blood glucose ≥ 200 mg/dl; Puavilai, Chanprasertyotin, & Sriphrapradaeng, 1999), or hypercholesteremia (self-report or total cholesterol >239).

All statistical analyses were done using JMP Statistical Software for Windows, release 5.1. Chi-square analyses were used to evaluate the association between ethnic groups and all other categorical variables, and between smoking status and all other categorical variables within each ethnic group and the combined sample. Analysis of variance (ANOVA) and Tukey–Kramer HSD post-hoc analysis were used to test ethnic differences on continuous variables. We conducted multiple logistic regression analyses to evaluate the interaction between ethnicity and gender on two smoking status outcomes: Never smoked versus ever smoked (initiation examination) and former smoker versus current smoker (cessation examination). All logistic regression analyses included age, marital status, education level, CES-D-assessed depression, LSNS-assessed social support, obesity, and medical conditions. The first model (model 1) of each multiple logistic regression analyses included the main effects of ethnicity and gender and their interaction term. Model 2 added sociodemographic variables, followed by the addition of psychosocial variables in model 3 and, finally, medical conditions in model 4. We conducted multiple regression analyses to examine the interaction between ethnicity and gender in predicting number of years spent as a regular smoker, net of sociodemographic and psychosocial factors, and medical conditions.

Two important limits to this analysis deserve note. First, because they are cross-sectional, these data are not suitable for specifying causal relationships. However, they do permit us to examine statistical associations and patterns that may differentiate smoking initiation and cessation by gender and ethnicity and to test whether these differences are attributable to sociodemographics, psychosocial factors, and specific medical conditions. Second, although the sampling methods used for data collection limit the generalizability of our analyses, we are able to investigate differences between groups, test how gender interacts with ethnicity in determining smoking behaviors, and draw several conclusions about further research needed in this area.

Results

Descriptive characteristics

A summary of the participants' characteristics and descriptive data are presented in Table 1, pooled together and separately by ethnic group. In the combined sample (N=1,158), the prevalence of former smoking was 32.6%, the prevalence of current smoking was 17.2%, and the combined (ever-smoked) prevalence was 49.8%. The duration of years smoked ranged from less than a year to 67 years, with a mean of 18.8 years (SD=13.9; not

Table 1. Participants' characteristics across categorical variables by ethnic groups and the combined sample.

Characteristics	Native Hawaiians		Filipinos		Japanese		Whites		Combined	
	n	%	n	%	n	%	n	%	n	%
Total	489	43	184	16	190	16	295	25	1158	100
Smoking status[c]										
Never smoked	237	48.5 (47.9)	103	56.0 (53.1)	106	55.8 (56.2)	135	45.8 (46.1)	581	50.2
Former smokers	141	28.8 (31.3)	48	26.1 (29.3)	66	34.7 (36.1)	123	41.7 (42.3)	378	32.6
Current smokers	111	22.7 (20.8)	33	17.9 (17.6)	18	9.5 (7.7)	37	12.5 (11.6)	199	17.2
Ever smoked[a]	252	51.5 (52.1)	81	44.0 (46.9)	84	44.2 (43.8)	160	54.2 (53.9)	577	49.8
Gender										
Female	266	54.4	113	61.4	97	51.0	147	49.8	623	53.8
Male	223	45.6	71	38.6	93	49.0	148	50.2	535	46.2
Age groups[c]										
18–29 years	75	15.3	14	7.6	8	4.2	17	5.7	114	9.9
30–39 years	123	25.2	31	16.8	18	9.5	39	13.2	211	18.2
40–49 years	123	25.8	25	13.6	38	20.0	102	34.6	291	25.1
50–59 years	88	18.0	39	21.2	28	14.7	81	27.5	236	20.4
60 years or older	77	15.7	75	40.8	98	51.6	56	19.0	306	26.4
Marital status[c]										
Never married	107	21.9	20	10.9	25	13.1	50	17.0	202	17.4
Currently married	310	63.4	129	70.1	132	69.5	178	60.3	749	64.7
Disrupted marriage[b]	72	14.7	35	19.0	33	17.4	67	22.7	207	17.9
Education level[c]										
Less than high school	53	10.8	67	36.4	25	13.1	7	2.4	152	13.1
High school graduate	328	67.1	63	34.2	92	48.4	115	39.0	598	51.7
Some college	83	17.0	31	16.9	39	20.5	57	19.3	210	18.1
College graduate	25	5.1	23	12.5	34	18.0	116	39.3	198	17.1
CES-D scores										
<16 (no depression)	437	89.4	169	91.8	180	94.7	270	91.5	1056	91.2
≥16 (depression)	52	10.6	15	8.2	10	5.3	25	8.5	102	8.8
LSNS scores[c]										
≥9 (low social support)	203	41.5	98	53.0	103	54.2	149	50.5	553	47.7
<9 (high social support)	286	58.5	86	47.0	87	45.8	146	49.5	605	52.2
Obesity (BMI≥29) [c]										
No	256	52.4	151	82.1	163	85.8	252	85.4	822	71.0
Yes	233	47.6	33	17.9	27	14.2	43	14.6	336	29.0
Respiratory condition[c]										
No	350	71.6	139	75.5	163	85.8	207	70.2	859	74.2
Yes	139	28.4	45	24.5	27	14.2	88	29.8	299	25.8
Cancer history[c]										
No	472	96.5	180	97.8	178	93.7	263	89.2	1093	94.4
Yes	17	3.5	4	2.2	12	6.3	32	10.8	65	5.6
Circulatory condition[c]										
No	337	68.9	113	61.4	103	54.2	231	78.3	784	67.7
Yes	152	31.1	71	38.6	87	45.8	64	21.7	374	32.3
High cholesterol history[c]										
No	363	74.2	110	59.8	115	60.5	228	77.3	816	70.5
Yes	126	25.8	74	40.2	75	39.5	67	22.7	342	29.5
Diabetes history[c]										
No	398	81.4	151	82.1	154	81.1	281	95.2	984	85.0
Yes	91	18.6	33	17.9	36	18.9	14	4.8	174	15.0

Note. BMI, body mass index; CES-D, Center for Epidemiological Studies–Depression; LSNS, Lubben Social Network Scale. Age-adjusted prevalence estimates for smoking statuses are in parentheses.
[a]The ever-smoked category includes former and current smokers and is not included in the chi-square analysis between ethnic groups and smoking status.
[b]Disrupted marital status includes people who are separated, divorced, or widowed.
[c]A statistically significant ($p \leqslant .01$) association was found based on chi-square analysis between ethnic groups and the characteristic.

shown in table). Slightly more than half of the participants were female (54%) and had successfully completed high school or the equivalency exam (52%), and two-thirds were currently married (65%). Depression was apparent in 8.8% of all respondents. Obesity was apparent in 29% of all respondents. Nearly half (47.7%) of the participants reported having low social support. Roughly 26% had a history of a respiratory condition, 6% had cancer, 32% had a circulatory condition, 30% had high cholesterol, and 15% had a history of diabetes.

Generally, the Native Hawaiian sample had the youngest age distribution; the fewest college graduates; the highest social support levels; the highest prevalence of obesity, depression, and respiratory conditions; and the highest prevalence of current smokers. The Japanese group had the oldest age distribution; the lowest prevalence of obesity, depression, and respiratory conditions; the highest prevalence of circulatory conditions; and the lowest prevalence of current smokers. The White group had the highest prevalence of people who ever smoked, and the Filipino group had the lowest prevalence of people who ever smoked.

Age-adjusted prevalence of smoking statuses by ethnicity and gender

Because the relationship among gender, ethnicity, and smoking behavior is affected by age, which varied significantly in our sample, we recalculated the prevalence of smoking statuses after adjusting for age (shown in parentheses in Table 1). After this adjustment, Japanese participants were most likely to have never smoked (56.2%), with the fewest current smokers (7.7%). Whites were most likely to have smoked at one time (42.3%), with the lowest prevalence of never-smokers (46.1%). Filipinos had the fewest former smokers (29.3%), and Native Hawaiians the most current (20.8%) smokers. Among participants who reported having ever smoked, the prevalence of former smoking compared with the prevalence of current smoking varied significantly, $\chi^2(3, n=577)=27.83$, $p<.0001$, across ethnic groups. The prevalence of former smoking among those who had ever smoked was as follows: Japanese, 78.6%; Whites, 76.9%; Filipinos, 59.3%; and Native Hawaiians, 56.0%.

Table 2 presents the age-adjusted prevalence of former smokers, current smokers, and those who never smoked, considering gender as well as ethnicity. Among female participants, Japanese were the least likely to have ever smoked (22.7%), followed by Filipinos (32.4%), Native Hawaiians (45.7%), and Whites (56.8%). White women had the highest prevalence of former smokers (45.7%), followed by Native Hawaiians (23.6%), Japanese (18.9%), and

Table 2. Unadjusted and age-adjusted prevalence of various cigarette smoking statuses by gender within ethnic groups.

| Smoking status | Native Hawaiians | | | | Filipinos | | | | Japanese | | | | Whites | | | |
| | Females | | Males | | Females | | Males | | Females | | Males | | Females | | Males | |
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Never smoked	140	52.6 (54.3)	97	43.5 (40.4)	79	69.9 (67.6)	24	33.8 (31.0)	73	75.3 (77.4)	33	35.5 (34.5)	63	42.9 (43.2)	72	48.7 (48.8)
Former smoker	62	23.3 (23.6)	79	35.4 (40.4)	19	16.8 (18.6)	29	40.8 (46.0)	19	19.6 (18.9)	47	50.5 (53.7)	66	44.9 (45.7)	57	38.5 (39.1)
Current smoker	64	24.1 (22.1)	47	21.1 (19.2)	15	13.3 (13.8)	18	25.4 (23.0)	5	5.1 (3.7)	13	14.0 (11.8)	18	12.2 (11.1)	19	12.8 (12.1)
Ever smoked[a]	126	57.4 (45.7)	126	56.5 (59.6)	34	30.1 (32.4)	47	66.2 (69.5)	24	24.7 (22.7)	60	64.5 (65.5)	84	57.1 (56.8)	76	51.3 (51.2)

Note. Age-adjusted prevalence is presented in parentheses.
[a] The ever-smoked category includes former and current smokers.

Table 3. Stepwise logistic regression analysis predicting people who ever smoked (reference=never smoked; N=1,158).

Variable	Model 1: Ethnicity, gender, and ethnicity × gender		Model 2: Inclusion of sociodemographic variables		Model 3: Inclusion of sociodemographic and psychosocial variables		Model 4: Inclusion of sociodemographic, psychosocial variables, and medical conditions	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Japanese[a]	1.60	0.95–2.69	1.66	0.98–2.84	1.68	0.99–2.88	1.72	1.00–2.98
Native Hawaiian	0.82	0.57–1.18	0.86	0.58–1.28	0.83	0.56–1.25	0.73	0.49–1.16
Filipino	1.13	0.67–1.91	1.34	0.78–2.30	1.37	0.80–2.36	1.46	0.84–2.52
Gender (female=0; male=1)	2.32***	1.78–3.03	2.46***	1.87–3.24	2.42***	1.84–3.20	2.48***	1.88–3.28
Japanese × gender	2.39**	1.43–4.04	2.39**	1.42–4.06	2.40**	1.43–4.10	2.45***	1.46–4.19
Native Hawaiian × gender	0.62*	0.43–0.90	0.60**	0.41–0.87	0.59**	0.41–0.86	0.58**	0.40–0.85
Filipino × gender	1.97*	1.17–3.34	2.14**	1.27–3.66	2.17**	1.29–3.73	2.22**	1.31–3.82

Note. Sociodemographic variables are age, marital status, and education level; psychosocial variables are depression and social support; medical conditions are obesity, respiratory conditions, cancer, circulatory conditions, high cholesterol, and diabetes; OR, odds ratio; CI, confidence intervals.
[a]Comparison ethnic group is Whites.
*$p<.05$; **$p<.01$; ***$p<.0001$.

Filipinos (18.6%). The most current smokers were found among Native Hawaiian women (22.1%), followed by Filipinos (13.8%), Whites (11.1%), and Japanese (3.7%).

Among the male participants, Filipino men had the highest age-adjusted prevalence of having ever smoked (69.5%) compared with Native Hawaiian (59.6%), Japanese (65.5%), and White (51.2%) men. Japanese men had the highest rate of former smoking (53.7%), followed by Native Hawaiians (40.4%), Filipinos (46.0%), and Whites (39.1%). The highest age-adjusted prevalence of current smoking was seen in Filipinos (23.0%), followed by Native Hawaiians (19.2%), Whites (12.1%), and Japanese (11.8%).

Also noteworthy are the within-ethnic-group contrasts between men and women. Only among Native Hawaiians were women more likely than men to be current smokers, even after adjusting for age. And, among those who had ever smoked (current plus former smokers), Japanese and White women had the highest prevalence of former smoking (79.2% and 78.6%, respectively), compared with Filipino (55.9%) and Native Hawaiian (49.2%) women. Japanese and White men had the highest prevalence of former smoking (78.3% and 78.6%, respectively), compared with Native Hawaiian (62.7%) and Filipino (61.7%) men. The prevalence of current smoking among those who had ever smoked was as follows: Native Hawaiians, 44%; Filipinos, 40.7%; Whites, 23.1%; and Japanese, 21.4%. Within ethnic-by-gender groups among those who ever smoked, Native Hawaiian women had the highest prevalence of current smoking (50.8%), compared with Filipino (44.1%), White (21.4%), and Japanese (20.8%) women. Filipino and Native Hawaiian men had the highest prevalence of current smoking (38.3% and 37.3%, respectively), compared with Japanese (21.7%) and White (21.4%) men.

However, statistically significant differences were observed only between women across ethnic groups, $\chi^2(3, n=268)=22.94$, $p<.0001$.

Predicting smoking initiation

To analyze the initiation of cigarette smoking by gender across ethnic groups, we examined the interaction between gender and ethnicity in predicting the likelihood of having ever smoked at some point in the lifetime (combining former and current smokers) in reference to having never smoked. As shown in Table 2, White women were more likely than White men to have ever smoked, but among all other groups, men were more likely than women to have ever smoked. To test the statistical significance of this apparent interaction, we performed multiple logistic regression analysis, incrementally adjusting for the main effects of ethnicity and gender, socio-demographics (age, marital status, and education level), psychosocial factors (depression and social support), and history of medical conditions (obesity, respiratory, circulatory conditions and history of cancer, high cholesterol, and diabetes). Statistically significant ethnic × gender interactions remained after adjusting for their main effects, sociodemographics, psychosocial factors, and medical conditions (Table 3). The difference between men and women among Japanese and Filipino participants is approximately twice as large as the gender difference among Whites, while among Native Hawaiians the difference is approximately 60% of the gender difference among Whites.

Because of the complexity in interpreting odds ratios based on interaction terms, we present the probability of having ever been a smoker across genders by ethnicity in Figure 1. The figure demonstrates that not only are the slopes of the probability
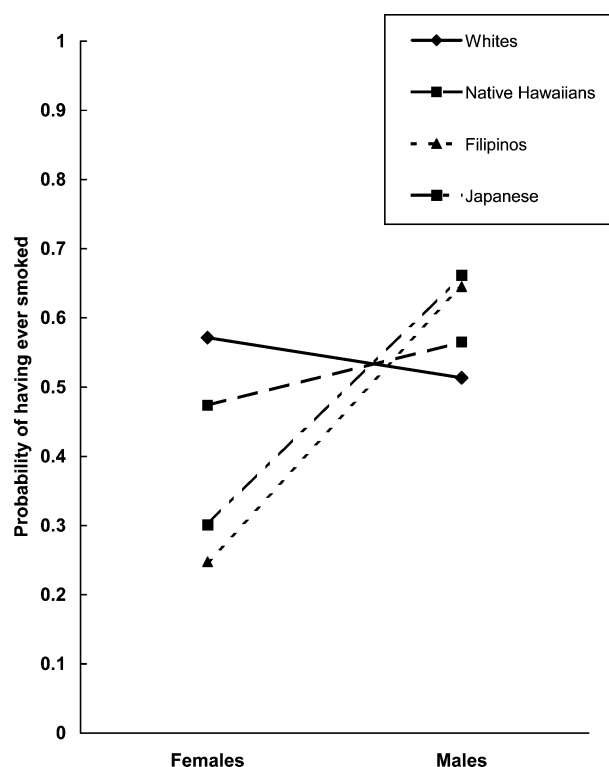
Figure 1. Probability of having ever smoked (vs. never smoked) across genders by ethnicity.

plots different, indicating interaction, but they are in opposite directions, further illustrating that the probability of ever smoking among Japanese, Filipino, and Hawaiian men was higher than in women of the same ethnic groups. In contrast, among Whites the probability of ever smoking was higher among women. Also of note, among all participants combined, men were significantly more

likely than women to have ever smoked, after adjusting for all covariates (model 4).

Predicting smoking cessation

To examine cessation of cigarette smoking by gender across ethnic groups, we examined the interaction between gender and ethnicity in predicting the

Table 4. Stepwise logistic regression analysis predicting current smokers (reference = former smokers; n = 567).

Variable	Model 1: Ethnicity, gender, and ethnicity × gender		Model 2: Inclusion of sociodemographic variables and years as a regular smoker		Model 3: Inclusion of sociodemographic, years as a regular smoker, and psychosocial variables		Model 4: Inclusion of sociodemographic, years as a regular smoker, psychosocial variables, and medical conditions	
	OR	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*	*OR*	*95% CI*
Japanese[a]	2.90*	1.20–7.81	1.92	0.63–6.19	1.92	0.64–6.17	1.91	0.62–6.25
Native Hawaiian	0.34***	0.20–0.60	0.87	0.41–1.84	0.84	0.40–1.79	0.79	0.35–1.75
Filipino	0.43*	0.20–0.93	0.35*	0.13–0.98	0.35*	0.13–0.98	0.35*	0.12–0.98
Gender (female=0; male=1)	0.87	0.57–1.35	0.60	0.34–1.04	0.59	0.34–1.03	0.60	0.34–1.05
Japanese × gender	1.20	0.49–3.21	0.91	0.30–2.88	0.93	0.31–2.94	0.92	0.30–2.93
Native Hawaiian × gender	0.66	0.38–1.15	0.97	0.48–1.94	0.94	0.47–1.89	0.94	0.47–1.92
Filipino × gender	0.90	0.42–1.94	0.55	0.20–1.49	0.55	0.20–1.50	0.56	0.20–1.54

Note. Sociodemographic variables are age, marital status, and education level; psychosocial variables are depression and social support; medical conditions are obesity, respiratory conditions, cancer, circulatory conditions, high cholesterol, and diabetes; *OR*, odds ratio; and *CI*, confidence intervals.
[a]Comparison ethnic group is Whites.
*p<.05; ***p<.0001.

Table 5. Number of years spent as a regular smoker across ethnicity by combined sample and gender ($n = 563$).

	Native Hawaiians		Filipinos		Japanese		Whites	
	Mean	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total[d]	$18.1_{b,c}$	.86	24.9_a	1.5	$21.8_{a,b}$	1.5	15.3_c	1.1
Female[e]	$16.9_{a,b}$	1.1	22.8_a	2.1	$17.6_{a,b}$	2.5	13.5_b	1.3
Male[f]	19.3_b	1.3	26.5_a	2.2	$23.6_{a,b}$	1.9	17.3_b	1.7

Note. SD, standard deviation. Means with different subscripts (a,b,c) differ significantly at $p<.05$ by Tukey–Kramer HSD post-hoc analysis.
[d] $F(3, 563) = 10.46$, $p<.000$; [e] $F(3, 261) = 4.79$, $p<.01$; [f] $F(3, 298) = 4.91$, $p<.01$.

likelihood of being a current smoker in reference to having been a former smoker, adjusting for socio-demographics, psychosocial factors, and history of medical conditions. However, we observed no statistically significant ethnic × gender interactions (Table 4). Filipinos were significantly more likely to be current smokers, compared with the other three ethnic groups, after adjusting for all covariates (model 4 of Table 4).

Predicting years of smoking

The data show statistically significant differences in the number of years spent as a regular smoker by ethnicity (Table 5). Filipinos reported the most years and Whites the fewest, while Hawaiians and Japanese were in between the two. Based on Tukey–Kramer HSD post-hoc analysis, Filipinos smoked for significantly more years than did Native Hawaiians and Whites (but not Japanese), and Japanese smoked for significantly more years than did Whites (but not Filipinos or Native Hawaiians).

When analyzing by gender, we found similar results for males and females in the order of ethnic groups by years of smoking (first Filipino, then Japanese, Native Hawaiian, and White), although men spent more years smoking than did women (Table 5). Based on Tukey–Kramer HSD post-hoc analysis, the significant differences in means were between Filipinos and Whites for both genders and between Filipinos and Native Hawaiians for males.

The results of our multiple regression analysis showed no statistically significant ethnic × gender interactions in predicting the number of years spent as a regular smoker after adjusting for the main effects of ethnicity and gender, sociodemographics, psychosocial factors, and history of medical conditions.

Discussion

The present study examined the interaction between ethnicity and gender in predicting smoking statuses (never smoked vs. ever smoked and former smoking vs. current smoking) and in predicting years spent as a regular smoker, after adjusting for sociodemographics, psychosocial factors, and medical conditions. Although the study is limited by dependence on self-reported smoking behavior, the strengths of the study are the use of a large community-based sample, the comparison of people from distinct ethnic groups, and the consideration of a variety of independent variables that could affect the relationship between cigarette smoking and gender across ethnic groups.

We found significant between-ethnic group differences in the age-adjusted prevalence of former and current cigarette smoking. To summarize, the prevalence of former cigarette smoking was highest among Whites, followed by Japanese, Native Hawaiians, and Filipinos, and the prevalence of current cigarette smoking was highest among Native Hawaiians, followed by Filipinos, Whites, and Japanese.

The prevalence of current cigarette smoking among Filipinos was comparable to that found in other studies, but our estimates for Native Hawaiian, Japanese, and White participants were considerably lower than other estimates (e.g., Kaholokula et al., 1999; Salvail et al., 2002). Consistent with past studies, however, is the relatively higher smoking rates among Native Hawaiians compared with the other three major ethnic groups in Hawaii. Our lower estimates, compared with those reported earlier, could be the result of our adjusting rates by age to control for higher prevalence among younger adults than older adults. Nevertheless, the present findings support the notion that large ethnic disparities exist in the prevalence of cigarette smoking. Furthermore, the findings also support the importance of not aggregating people of Asian and Pacific Island ancestries into a single category in behavioral health research because it could mask important between-group differences.

The present findings also support the notion of large gender differences across U.S. ethnic groups in the prevalence of former and current smoking. To summarize, Native Hawaiian women were most likely to be current cigarette smokers, whereas Japanese women were least likely to be current smokers. In contrast, Filipino men were most likely to be current smokers, whereas Japanese men were least likely to be current smokers.

Our finding that Native Hawaiian women have a higher prevalence of current cigarette smoking and lower prevalence of former smoking compared with Native Hawaiian men is comparable to Kaholokula

et al.'s (1999) findings; however, the difference in current cigarette smoking prevalence between Native Hawaiian men and women was smaller in the present study. The prevalence of current cigarette smoking among White women in the present study was considerably lower than that reported by other studies (CDC, 2004; Ward et al., 2002). We cannot compare our findings regarding the prevalence of cigarette smoking among Japanese and Filipinos by gender because of a lack of such reports in the literature.

In examining ethnic × gender differences, we found that the relationship between having ever smoked (compared with having never smoked) and gender were significantly influenced by ethnicity. This relationship could not be explained entirely by sociodemographics, psychosocial factors, and medical conditions. Specifically, White women were considerably more likely to have ever smoked, compared with women of the other three ethnic groups, and Native Hawaiian women were considerably more likely than Japanese or Filipino women to have ever smoked. As for men, we observed no significant between-ethnic group differences in the probability of having ever smoked, even after controlling for sociodemographics, psychosocial factors, and medical conditions. When comparing between genders within ethnic groups, we found that Japanese and Filipino men were considerably more likely to have ever smoked than were women of the same ethnicities. Native Hawaiian men had a higher likelihood than Native Hawaiian women of having ever smoked. In contrast, White women were more likely than White men to have ever smoked.

It was beyond the scope of the present study to examine ethnocultural factors associated with the observed ethnic × gender interaction in accounting for the likelihood of having ever smoked. However, possible explanations for why White and Native Hawaiian women smoked considerably more than Filipino and Japanese women could be related to differences in beliefs about gender roles (e.g., masculine vs. feminine behaviors), in willingness to engage in high-risk behaviors, in acculturation level, and in the acceptance of smoking by others of their own ethnic or peer groups. For example, distinct gender roles may be more prevalent among Japanese and Filipinos of Hawaii (Ponce, 1980; Rogers & Izutsu, 1980), in which smoking could be viewed as a more masculine behavior, and thereby, women of these two ethnic groups may be more likely to avoid smoking. Studies that examined the relationship between acculturation and smoking found that more acculturated women of some ethnic minority groups (e.g., Koreans and Hispanics) are more likely to smoke than their less acculturated counterparts

(Hofstetter et al., 2004; Marin, Perez-Stable, & Marin, 1989).

Other possible explanations for women of certain ethnic groups being more likely to smoke than others could be related to differences in economic and family stressors or their response to such stressors. For example, a Canadian study found that single mothers were significantly more likely to smoke than were married mothers with children under 25 years of age (Kirkland, Greaves, & Devichand, 2004). Future studies examining ethnic × gender differences in initiation of cigarette smoking should consider examining specific ethnocultural and sociocultural factors such as those mentioned here.

Although significant ethnic × gender differences was found for cigarette smoking initiation, we found no significant ethnic × gender interactions in predicting cessation of cigarette smoking or duration of cigarette smoking in years. These findings suggest that women and men across the ethnic groups examined in the present study did not differ considerably either in smoking cessation rates (model 1 of Table 4) or in the number of years spent as a regular smoker (not shown). With respect to smoking cessation, our results fall into the mix of prior findings about gender differences. Some studies have reported that women are less likely to quit cigarette smoking and more likely to relapse than men after attempts to quit (e.g., Bjornson et al., 1995; Wetter et al., 1999), whereas other studies have reported no such differences between men and women (e.g., Gritz et al., 1998).

The present findings have important implications for smoking prevention and cessation for three Asian American and Pacific Islander ethnic groups. First, given that sociodemographics, psychosocial factors, and medical conditions could not account for all of the observed differences in having ever smoked, future studies should explore the influence of sociocultural factors, including specific health beliefs, acculturative stress, and cultural acceptance of tobacco use. Focus group research may help expose specific cultural beliefs and norms related to smoking and how these differ by gender and may generate ideas for gender-specific approaches to smoking prevention within ethnic groups.

Further, the present findings support the importance of understanding ethnic differences in smoking behaviors and the need for culturally specific approaches to cessation interventions. Filipino participants were significantly more likely to be current smokers than were participants of the other three ethnic groups. This lower cessation rate among Filipino participants could not be explained by sociodemographic differences, psychological factors, or medical conditions. Again, focus group research could elucidate specific sociocultural reasons that

could better explain lower rates of smoking cessation among Filipinos, which would have important implications for the design of smoking cessation programs targeting this ethnic group. These efforts may lead to the formulation of new models and research related to achieving smoking cessation among specific ethnic groups.

Acknowledgments

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