Immigration and Acculturation in Relation to Health and Health-Related Risk Factors Among Specific Asian Subgroups in a Health Maintenance Organization

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Objectives. We sought to determine how risk factors for disease vary among Asian subgroups.

Methods. Using data from a case–control study conducted at Northern California Kaiser Medical Centers (from 1996 to 2001), we compared prevalence of selected risk factors among Asian subgroups and evaluated the associations of these risk factors with sociodemographic factors.

Results. Chinese and Japanese patients had a lower body mass index (kg/m^2) than did other Asians. In all subgroups, being born in the United States was associated with having a body mass index greater than 25 kg/m^2. Compared with other Asians, more Japanese and multiple-race Asians smoked, and more Filipino and multiple-race Asian smokers started smoking at 18 years or younger. Filipinos and multiple-race Asians also were more likely to report diabetes.

Conclusions. These data support the importance of efforts to distinguish among Asian subgroups in public health practice and research. (*Am J Public Health.* 2004;94:1977–1984)

The Office of Management and Budget (OMB) defines Asians and Pacific Islanders (APIs) as "person[s] having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands."[1,2] This growing population in the United States includes Chinese, Japanese, Filipinos, Koreans, Pacific Islanders (e.g., Native Hawaiians and Samoans), Southeast Asians (e.g., Vietnamese and Hmong), and persons from the Indian subcontinent.[3] In addition to their cultural diversity, US APIs differ in their immigration history. Statistics based on the 1990 census show that although 80% of Japanese residents were born in the United States, only 20% of Vietnamese were born here.[4] APIs also have become increasingly integrated with other racial groups: Of the 4% of the California population identifying with more than 1 race in the US Census, more than a quarter identified with an API group.[5]

Because data on Asians have tended to be aggregated in studies, little is currently known about how anthropometric and lifestyle characteristics that represent risk factors for several major diseases vary among Asian subgroups. Studies that have presented disaggregated data have shown heterogeneity in health profiles among subgroups[3,6–16] and by birthplace and acculturation.[7,9,17–34] Thus, aggregating this heterogeneous population may mask important health differences among specific subgroups.[35,36]

The objective of this study was to examine variations in selected constitutional and lifestyle characteristics among specific Asian subgroups in the Northern California Kaiser membership population. Toward this aim, we compared the prevalence of purported risk (and protective) factors, including anthropometry, soy consumption, smoking, alcohol consumption, physical activity, general health status, and disease conditions, among each major Asian subgroup with the corresponding prevalences among all Asians (the combined subgroups) and among Whites (reference group representing the health profile of the "host" country). We also determined for each subgroup the effect of sociodemographic and immigration and acculturation characteristics on the odds of particular risk factors.

METHODS

Study Population

We used data from a case–control study of bone fractures conducted in 5 Northern California Kaiser Permanente Medical Care Program (KPMCP) centers in Hayward, Oakland, San Francisco, Santa Clara, and South San Francisco.[37,38] KPMCP is a group practice prepaid health maintenance organization (HMO) with approximately 2.5 million members in 14 counties of Northern California (approximately 25% of the population). Case and control subjects were identified for November 1996 through May 2001 and were interviewed through October 2001.

Specific information about the ascertainment of case and control subjects has been published elsewhere.[37,38] Briefly, eligible case subjects were Kaiser members aged 45 years and older who were identified weekly through computerized radiology, inpatient, and outpatient records as having a fracture of the foot, forearm, humerus, pelvis, or shaft of the tibia or fibula. Non-Whites were oversampled. Overall, 67.8% of eligible case patients agreed to participate, for a total of 3168 case participants.

Control subjects were randomly sampled from the computerized Kaiser membership records over the same time period as case patients, within specific gender, race/ethnicity, and age groups. Overall, 74.6% of eligible control subjects agreed to participate, for a total of 2413 control participants.

Data Collection

Interviews were conducted by trained interviewers either in participants' homes or other place of convenience or by telephone (38.1%). Most interviews were conducted in English, although a few (n=5) were conducted in Mandarin or Cantonese. "Language barrier" was not stated by any subject as a reason for declining an interview. For case participants,

questions referred to specified periods before the fracture occurred, whereas for control participants, questions referred to specified preinterview periods. No data from proxy interviews are included in these analyses.

Study Variables

Unknown or missing values were excluded from the analyses unless otherwise specified.

Sociodemographic, immigration, and acculturation characteristics. Sociodemographic, immigration, and acculturation characteristics were the primary independent variables of interest in our analyses. Participants were asked "What is your race and ethnicity? Please tell me all that apply." The available choices (read to participants) were White, Black or African American, Hispanic or Latino, Japanese, Chinese, Filipino, Other Asian, Pacific Islander, Native American, and other. Participants indicating that they were "other Asian" were asked a subsequent question—"From what Asian countries are you a descendant?"—to assign them to a more specific group. Participants who reported belonging to more than 1 racial/ethnic group, at least one of which was an Asian group, were called "multiple-race Asians." Of the 79 multiple-race Asians, 13 identified with only Asian subgroups, and 66 identified with at least 1 Asian subgroup and 1 non-Asian subgroup. Subgroups with fewer than 30 members were combined into the "other Asians" group.

Immigrant and generational status was based on country of birth, year or age at which family moved to the United States, and country of birth of parents and grandparents. United States–born (US-born) participants who had at least 1 US-born parent were coded as US-born (> first generation) and those whose parents were both foreign-born were coded as US-born (first generation). Foreign-born participants were classified into 3 categories of foreign-born: <50% of life in US, 50%–75% of life in US, >75% of life in US. An index indicating language-speaking preference as a measure of acculturation[39–42] was constructed from the preferred language in 4 settings: reading and speaking, thinking, conversing with friends, and listening to/watching radio and TV programs. This language index ranges from 0 to 4, where 0 is preferring English in all 4 contexts, and 4 is preferring a foreign language in all 4 contexts.

Constitutional and lifestyle characteristics as disease risk factors. Self-reported weight and height were combined as body mass index (BMI)=kg/m^2. BMI categories were based both on distributions in the study sample and on categories used in previous studies.[43,44] Participants were asked their usual frequency of consumption of soy milk and tofu and of alcohol (beer, wine or champagne, hard liquor) during the past 12 months. In addition, participants were asked for their smoking history, as well as for details regarding frequency and duration of smoking. Participants were considered to be current smokers if they reported having smoked in the past year.

Participants were also asked about their participation in specific types of physical activity during the past year. We combined past-year physical activity into 3 domains: household activities, low-impact exercises or stretching, weight-bearing exercises, and recreational activities. Participants were also asked about their participation in specific types of physical activity at 16 years of age; we grouped these activity types into 3 domains: daily living activities, household or yard work, and recreational activities. A previous study in which participants were asked to recall what kinds of physical activity they engaged in 20 to 30 years ago found recall of leisure-time moderate and vigorous activity to be fair (intraclass correlation coefficients 0.40–0.45).[45,46] The specific types of activity comprising each domain are shown in Table 1.

Self-reported health and selected diseases or health conditions. Finally, participants were asked to rate their overall health on a 4-point scale, from "poor for your age" to "excellent for your age." Participants were also asked whether a doctor or other medical practitioner had ever told them that they had a specific health or medical condition (Table 1). Unknown or missing values were coded as a negative response (i.e., as not having had the condition of interest).

Statistical Analysis

We generated frequency distributions of the characteristics for Whites, all Asians, and each Asian subgroup. The distributions for Asians were adjusted to the gender and 10-year age distribution of Whites with the direct method of standardization.[47] Unconditional logistic regression was used to compute odds ratios (ORs) and 95% confidence intervals (CIs) for the associations between sociodemographic, immigration, and acculturation factors and lifestyle and constitutional characteristics adjusted for age, gender, mode of interview (phone vs in-person), Kaiser race/ethnicity (to adjust for sampling), and case–control status. All analyses were conducted with SAS version 6.12.[48]

RESULTS

Demographic Characteristics

Overall, approximately three quarters of the study population was female; the distributions of gender and age among the participants reflect the characteristics of persons who incurred fractures at the sites of interest (Table 2). Although case participants were slightly more likely than control participants to be female, all of the other characteristics were similar between case and control participants within each racial/ethnic group (data not shown).

Fewer Asians (combined group) than Whites had more than a college education. However, educational attainment varied across Asian subgroups, with Japanese having the highest levels and Filipinos having the lowest. With the exception of multiple-race Asians, more Asians were married and fewer were widowed, divorced, or separated compared with Whites. Proportionally more Japanese and multiple-race Asians were living alone compared with other Asian subgroups.

Immigrant status varied widely across subgroups; more Chinese, Filipinos, and other Asians had recently immigrated, whereas more Japanese were born in the United States. Language preference was consistent with immigrant status across subgroups, with the exception of Filipinos, among whom, despite the high proportion of foreign-born residents, a fairly high proportion of participants preferred to speak English.

Anthropometry

Asians tended to be substantially lighter and shorter than Whites (Table 1), although the proportion of participants in the highest category of weight (>70 kg) varied (from 8% among Japanese to 48% among multiple-race

TABLE 1—Gender- and Age-Adjusted[a] Distribution (%) of Health and Health-Related Risk Factors, by Race/Ethnicity

Factor	White (n = 3164)	All Asians Combined (n = 801)	Chinese (n = 263)	Japanese (n = 99)	Filipino (n = 268)	Other Asians[b] (n = 92)	Multiple-Race Asians (n = 79)
Weight (kg)[c]							
≤60	24.3	51.9	54.7	57.5	53.7	39.4	33.8
61–70	25.8	26.7	28.4	34.3	21.8	33.7	18.6
>70	49.9	21.4	16.8	8.3	24.5	26.9	47.6
Height, m							
≤1.60	20.8	54.0	48.3	62.1	58.7	58.6	47.2
1.61–1.70	43.0	33.6	38.5	28.1	33.0	27.9	29.5
>1.70	36.2	12.4	13.2	9.8	8.3	13.5	23.3
Body mass index, kg/m^2[c]							
≤25	49.6	67.0	76.8	75.2	62.3	53.3	46.3
26–30	33.0	25.8	18.4	19.3	29.2	37.6	39.8
>30	17.5	7.1	4.7	5.5	8.6	9.1	13.9
Tofu or soy milk consumption in past year							
None	66.3	16.9	4.5	3.2	28.6	18.0	30.2
<Once per week	23.1	27.0	20.0	20.8	31.1	31.4	43.0
≥Once per week	10.7	56.0	75.5	76.0	40.3	50.7	26.8
Alcohol use: ever drank any alcoholic beverage[d] in past year	73.5	45.3	36.2	61.6	48.0	54.5	49.5
Smoking							
Ever smoker	51.7	22.8	14.6	35.6	23.5	18.7	37.7
Current smoker	13.5	6.1	3.4	3.1	7.5	4.8	13.2
Started smoking at 18 years or younger, of ever smokers	60.6	35.2	14.8	9.5	57.0	32.5	43.9
Physical activity							
Adulthood (at least 4 times per month in past year)							
Household[e]	61.5	54.6	45.0	59.0	62.6	54.8	63.8
Low-impact or stretching[f]	35.9	31.3	34.1	30.2	28.0	30.8	36.0
Recreational[g]	64.6	61.2	63.4	65.1	60.7	61.0	62.4
Childhood (at least 4 times per month at 16 years)							
Daily living[h]	92.9	91.1	91.3	92.9	91.5	94.9	86.3
Household[i]	48.9	47.0	36.0	50.2	61.2	41.8	39.3
Recreational[j]	93.2	83.3	81.3	87.9	78.9	88.7	89.3
Health status: fair–poor health	12.2	15.0	13.1	15.6	16.3	12.6	19.6
Disease conditions							
Diabetes	8.1	12.9	6.4	5.5	21.2	7.8	19.9
Angina, heart attack, heart failure	10.8	6.6	3.8	5.0	6.5	7.4	16.0
Stroke or blood clot in brain	5.6	3.6	3.5	2.9	2.6	9.6	5.6
Epilepsy, seizures, convulsions, fits	2.4	0.5	0.3	0.9	0.3	0.6	0.7
Kidney disease	2.6	2.1	2.0	2.1	1.0	2.3	1.4
Cataracts	21.6	20.0	20.5	18.6	19.9	14.8	18.6
Glaucoma	5.9	6.1	5.3	7.4	5.0	7.0	7.2
Parkinson's disease	0.8	0.4	0.3	0.9	0	1.7	0

Continued

Asians). Chinese and Japanese had lower BMIs than the other Asian groups.

Foreign-born patients were less likely than US-born patients to have BMIs of less than 25 m/kg^2 (Table 3). Filipino women were considerably less likely than their male compatriots to have high BMIs, although an association with gender was not seen for any other subgroup. Among all subgroups, there was a nonsignificant trend toward lower BMIs at older ages. An inverse association between BMI and education was seen among multiple-race Asians. In multivariate models, the magnitudes and confidence intervals for each of these factors did not change appreciably (data not shown).

Soy Consumption

The percentage of Asians consuming tofu or soy milk was considerably higher than that of Whites, but among the subgroups, more Chinese and Japanese than other Asian subgroups consumed soy products (Table 1). In a multivariate regression model, soy consumption was associated with recent immigration (OR=3.1 [95% CI=1.6, 6.1] and OR=2.4 [95% CI=1.3, 4.6], respectively, among foreign-born Asians who had been in the United States 50% or less and 50% to 75% of their lives, compared with US-born Asians of second generation or later).

Alcohol Consumption

Asians were less likely than Whites to report alcohol consumption during the past year, although prevalence varied from 36% among Chinese to 62% among Japanese (Table 1). In a regression model, women were less likely than men to report ever having consumed alcohol (OR=0.4 [95% CI=0.3, 0.6]), and Asians who were never married were more likely than those who were ever married to report ever having consumed alcohol (OR=5.1 [95% CI=2.0, 12.8]). Other characteristics associated with a lower odds of drinking among Asians were older than 70 years (OR=0.5 [95% CI=0.3, 0.9], compared with Asians 60 years or younger) and preferring a foreign language in all contexts (OR=0.3 [95% CI=0.2, 0.6], compared with preferring English in all contexts). Having a college education was associated with a higher odds of drinking (OR=1.3 [95% CI=

TABLE 1—*Continued*

Arthritis	38.3	31.2	32.2	31.1	31.7	20.7	33.1
Depression	17.6	6.1	5.5	4.5	6.6	5.8	8.0
Cancer	16.1	8.3	7.7	10.7	5.1	4.3	10.8
Breast cancer	4.8	3.6	3.6	3.5	2.7	1.3	6.2
Underactive thyroid	12.4	5.8	7.2	3.6	4.1	6.5	3.7
Overactive thyroid	2.7	3.2	2.1	5.3	2.7	6.2	2.6
2 or more of the above conditions	34.5	27.3	26.7	25.9	24.0	18.6	36.4

[a]Relative distributions were adjusted to the gender and 10-year age distributions of Whites.
[b]Other Asians consisted of 24 Indians/South Asians, 20 Pacific Islanders, 17 Koreans, 3 Thai, 19 Other Southeast Asians, and 9 others.
[c]Excluded 1 White woman and 1 Chinese woman whose values for weight were determined to be outliers (269 and 26 kg, respectively).
[d]Includes beer, wine, and mixed drinks.
[e]Includes gardening or yard work, and heavy housework.
[f]Includes stretching exercises or yoga, tai chi, and calisthenics or conditioning exercises.
[g]Includes brisk walking or hiking, bicycling, taking an exercise class, swimming or water exercises, playing tennis, social dancing, running or jogging, golf, and bowling.
[h]Includes walking to bus, school, or errands.
[i]Includes working on a farm, and heavy housework.
[j]Includes calisthenics or general exercise, swimming, playing team or racquet sports, social dancing, ice or roller skating, and gym class.

0.9, 1.9], compared with having less than a college education).

Smoking

Overall, proportionally fewer Asians than Whites had ever smoked or were current smokers (Table 1). Japanese and multiple-race Asians showed the highest proportion of ever smokers (36% and 38%, respectively), and Chinese the lowest proportion (15%). Filipinos and multiple-race Asians showed the highest proportion of current smokers and also were more likely than those in the other Asian subgroups to have started smoking at 18 years or younger.

Table 4 shows that, with the exception of multiple-race Asians, women were considerably less likely than men to have ever smoked. Older age was associated with smoking among Chinese. Foreign-born Asians were less likely than their US-born counterparts to smoke, although among Japanese, the opposite trend was seen. Japanese, Filipinos, and multiple-race Asians who preferred a foreign language were less likely than their English-preferring counterparts to smoke, although the confidence intervals for these odds ratios included 1.

Physical Activity

For adulthood physical activity, Asians (combined group) had a slightly lower prevalence of engaging in household and low-impact and stretching physical activities than did Whites, although there were slight variations across subgroups (Table 1). The percentage who engaged in low-impact and stretching exercises ranged from 28% among Filipinos to 36% among multiple-race Asians. For retrospective reports of physical activity at 16 years of age, proportionally fewer multiple-race Asians compared with other subgroups engaged in daily living activities (e.g., walking to bus, school, or errands), and more Filipinos reported participating in household physical activities.

In regression models with recreational physical activities as the outcome, Japanese women were less likely than Japanese men to report participating in recreational physical activity (OR=0.2 [95% CI=0.0, 0.8]), whereas among multiple-race Asians, women were 4 times more likely than men to participate in physical activity (OR=3.9 [95% CI=1.2, 13.0]). Among Japanese, Filipinos, and other Asians, having more than a high school education was associated with more physical activity (OR=2.5 [95% CI=0.9, 7.0], OR=2.4 [95% CI=1.4, 4.2], and OR=2.8 [95% CI=1.0, 8.4], respectively). Living with someone was associated with less physical activity among Japanese and Filipinos (OR=0.2 [95% CI=0.1, 0.7] and OR=0.3 [95% CI=0.1, 1.2], respectively).

General Self-Reported Health and Selected Diseases and Health Conditions

A slightly higher percentage of Asians (combined group) than of Whites reported being in fair or poor health, from 13% among Chinese and other Asians to 20% among multiple-race Asians (Table 1). A higher percentage of Filipinos and multiple-race Asians than of Whites or of any other Asian subgroups reported having diabetes. Other notable findings regarding disease frequency were the higher prevalences of angina, heart attacks, and heart failure among multiple-race Asians and the higher prevalence of stroke or blood clots and the lower percentage of arthritis among other Asians. All of the subgroups reported lower prevalences of epilepsy, seizures, convulsions or fits, depression, cancer, and underactive thyroid compared with Whites. Among Filipinos, only older age was associated with having diabetes (data not shown).

DISCUSSION

Because previous health research has typically considered US Asians as a single group, little is known about how health and health-related risk factors vary among specific Asian subgroups.[36] Our data show substantial variation across subgroups in constitutional and lifestyle characteristics that were not detectable in the combined-group data. For example, we found that Japanese and multiple-race Asians were more likely than other subgroups to have ever smoked and that Filipinos were more likely to have started smoking at an early age. Chinese and Japanese consumed soy products more frequently than did other Asians, a finding consistent with results from a case–control study of breast cancer.[30] We also found variations in the prevalence of certain health conditions—most notably a high prevalence of diabetes among Filipinos, which, to our knowledge, has not been previously reported.

The fact that the comparability of our results with those reported in the sparse published literature on health characteristics among Asians mostly depends on where and when studies were conducted indicates that geographical and temporal heterogeneity in health may exist among Asians. For example, we found that Chinese and Japanese had lower BMIs com-

TABLE 2—Percentage Distributions of Demographic, Immigration, and Language Characteristics, by Race/Ethnicity

Characteristic	White (n = 3164)	All Asians combined (n = 801)	Chinese (n = 263)	Japanese (n = 99)	Filipino (n = 268)	Other Asians[a] (n = 92)	Multiple-race Asians (n = 79)
Gender							
Male	24.3	23.3	28.5	16.2	17.5	33.7	22.8
Female	75.7	76.7	71.5	83.8	82.5	66.3	77.2
Age, y							
45–50	14.3	18.5	15.6	7.1	17.9	31.5	29.1
51–60	25.8	31.0	29.3	15.2	33.6	38.0	39.2
61–70	22.5	29.5	29.3	30.3	32.5	23.9	25.3
> 70	37.4	21.1	25.9	47.5	16.0	6.5	6.3
Education completed (mutually exclusive categories)[b]							
High school or less	33.2	36.5	39.3	20.8	40.9	40.8	43.1
College or less	42.7	47.7	44.0	52.2	50.5	39.1	37.6
Some graduate	24.1	15.8	16.7	27.0	8.6	20.1	19.4
Marital status[b]							
Married	53.5	69.1	76.2	63.3	65.2	78.1	47.7
Widowed/divorced/separated	38.2	26.7	18.9	27.6	31.8	20.5	50.6
Never married	8.4	4.2	4.9	9.1	3.0	1.4	1.9
Living arrangement[b]							
Alone	32.1	15.3	15.5	29.2	7.2	9.8	38.6
Not alone	67.9	84.7	84.5	70.8	92.8	90.2	61.4
Immigrant status[b]							
US-born							
> First generation	75.9	11.8	13.2	33.8	2.4	4.7	42.2
First generation[c]	11.5	14.9	13.4	37.6	3.9	8.4	7.2
Foreign-born, % of life lived in US							
> 75	3.3	4.6	7.4	6.1	2.5	2.6	2.8
50–75	6.7	25.3	30.0	11.1	25.6	29.6	23.8
< 50	2.6	43.4	36.1	11.3	65.6	54.7	24.0
Language,[b] no. of non-English contexts endorsed[d]							
0	96.3	45.9	39.5	81.2	32.6	47.3	72.9
1	1.4	11.8	9.1	4.4	19.3	8.3	10.0
2	1.1	9.1	4.3	2.8	12.5	14.4	5.7
3	0.8	15.0	9.2	9.3	25.7	14.2	10.9
4	0.4	18.3	38.0	2.4	10.0	15.8	0.5

[a]Other Asians consisted of 24 Asian Indians/South Asians, 20 Pacific Islanders, 17 Koreans, 3 Thai, 19 other Southeast Asians, and 9 others.
[b]Relative distributions were adjusted to the gender and 10-year age distributions of Whites.
[c]Both parents are foreign born.
[d]Based on the following questions: "In general, in what language do you read and speak?", "In what language do you usually think?", "In what language do you usually speak with your friends?", and "What are the languages of the radio and TV programs you prefer?"

pared with other Asians, a result consistent with national data from the 1992–1994 National Health Interview Survey (NHIS)[3] and the 1995–1997 Study of Women's Health Across the Nation.[15] However, our data differ slightly from the findings of Klatsky and Armstrong[9], which showed that among Kaiser enrollees, Chinese had lower BMIs than did Japanese and Filipinos.[9] In the Klatsky study, the odds of having a BMI equal to or greater than 24.4 kg/m^2 were 1.6 to 3.0 times higher for Asian men born in the United States than for those born in Asia, although this association was not seen for women.[9] We found higher BMIs among US-born compared with foreign-born residents within all subgroups, but we did not detect effect modification by gender. The discrepancies in the BMI results among studies may reflect temporal differences in these populations, particularly given the rapidly changing immigration patterns.

Our results also showed associations of selected health characteristics with immigrant status and, to some extent, acculturation. An analysis of NHIS data on self-reported health status and other indicators of health showed better health among recent immigrants compared with their US-born counterparts.[7] The authors proposed 2 hypotheses for these observed patterns: (1) persons who immigrate tend to be healthier and more robust than those who do not (i.e., the "healthy migrant" effect[49]), and (2) other cultures tend to subscribe to and practice healthier lifestyles than those of the mainstream American culture. Asian immigrants may also be less likely than US-born Asians to report poor health or to seek professional treatment because of other cultural, economic, or political reasons,[50] including lack of financial means to pay for medical care or fear of deportation (if they are undocumented aliens). We found that foreign-born Asians were generally healthier than US-born Asians in the characteristics we examined. However, this pattern was not seen in all subgroups; for example, foreign-born Japanese were twice as likely to smoke compared with their US-born counterparts.

In our study population, immigration status appeared to be more strongly associated with constitutional and lifestyle characteristics than did language. English proficiency is often used as a marker of acculturation in studies of Hispanics/Latinos and some Asian racial/ethnic groups.[21,22,26,39–42,51] In our population, however, either acculturation was not strongly associated with the characteristics we examined or else language may not have been a sensitive measure of acculturation. In the San Francisco Bay area, Asian languages have become increasingly prevalent in the media and in stores

TABLE 3—Associations Between Sociodemographic, Immigration, and Acculturation Characteristics and Having a BMI Greater Than 25 kg/m^2, by Asian Subgroup

Characteristic	Odds Ratio (95% Confidence Interval)[a]				
	Chinese (n = 260)	Japanese (n = 99)	Filipino (n = 265)	Other Asians (n = 91)	Multiple-race Asians (n = 77)
Gender (reference: male)					
Female	0.8 (0.4, 1.4)	2.6 (0.5, 12.4)	0.3 (0.2, 0.6)	0.8 (0.3, 1.8)	1.7 (0.5, 5.7)
Age, y (reference: ≤ 60)					
61–70	1.2 (0.6, 2.2)	0.3 (0.1, 1.1)	0.7 (0.4, 1.3)	0.6 (0.2, 1.7)	1.2 (0.4, 3.7)
> 70	0.5 (0.2, 1.1)	0.6 (0.2, 1.8)	0.6 (0.3, 1.3)	0.4 (0.1, 2.6)	0.8 (0.1, 5.2)
Education completed (reference: high school or less)					
College or less	0.7 (0.4, 1.3)	0.6 (0.2, 1.8)	0.8 (0.5, 1.5)	0.7 (0.3, 1.9)	0.3 (0.1, 0.9)
Marital status (reference: married)					
Widowed/divorced/separated	2.4 (1.1, 5.2)	1.2 (0.4, 3.2)	0.8 (0.4, 1.5)	1.0 (0.3, 3.2)	2.3 (0.8, 6.3)
Never married	1.1 (0.3, 4.5)	0.4 (0.0, 4.0)	1.2 (0.3, 4.8)	1.8 (0.2, 21.7)	0.6 (0.0, 8.0)
Living arrangement (reference: live alone)					
Live with someone	0.5 (0.2, 1.1)	2.3 (0.7, 7.1)	2.7 (0.8, 9.1)	0.2 (0.0, 1.6)	0.5 (0.1, 1.6)
Birthplace (reference: US-born)					
Foreign-born	0.3 (0.2, 0.6)	0.4 (0.1, 1.4)	0.5 (0.2, 1.3)	0.3 (0.1, 1.1)	0.2 (0.1, 0.5)
Language preference (reference: mostly English[b])					
Mostly foreign language	0.8 (0.5, 1.5)	1.1 (0.2, 5.3)	1.0 (0.6, 1.8)	0.5 (0.2, 1.2)	0.7 (0.2, 2.7)

[a]Adjusted for race/ethnicity recorded in the Kaiser admissions database, mode of interview (in-person vs phone), gender, and age, except for the characteristics gender and age, which were adjusted only for Kaiser race/ethnicity and mode of interview.
[b]Language index = 0, 1, 2.

TABLE 4—Associations Between Sociodemographic, Immigration, and Acculturation Characteristics and Ever Having Smoked, by Asian Subgroup

Characteristic	Odds Ratios (95% Confidence Intervals)[a]				
	Chinese (n = 222)	Japanese (n = 94)	Filipino (n = 238)	Other Asians (n = 76)	Multiple-race Asians (n = 69)
Gender (reference: male)					
Female	0.2 (0.1, 0.4)	0.3 (0.1, 0.9)	0.1 (0.0, 0.1)	0.1 (0.0, 0.3)	0.5 (0.2, 1.8)
Age, y (reference: ≤ 60)					
61–70	1.2 (0.5, 3.1)	0.6 (0.2, 1.9)	0.6 (0.3, 1.3)	1.0 (0.3, 3.7)	4.0 (1.2, 13.6)
> 70	2.5 (1.1, 5.7)	0.5 (0.2, 1.6)	0.6 (0.2, 1.5)	3.9 (0.5, 30.9)	0.8 (0.1, 8.7)
Education completed (reference: high school or less)					
College or less	0.9 (0.4, 2.1)	0.9 (0.3, 2.7)	0.7 (0.3, 1.5)	1.0 (0.2, 4.5)	0.5 (0.2, 1.7)
Marital status(reference: married)					
Widowed/divorced/separated	1.0 (0.4, 2.4)	2.0 (0.7, 5.3)	3.0 (1.2, 7.3)	5.7 (0.9, 35.0)	3.0 (0.9, 10.2)
Never married	1.3 (0.2, 6.9)	1.9 (0.4, 10.0)	3.9 (0.7, 22.7)	3.1 (0.1, 79.8)	10.8 (0.7, 156.4)
Living arrangement (reference: live alone)					
Live with someone	2.6 (0.7, 9.6)	0.4 (0.1, 1.0)	0.6 (0.1, 2.6)	0.5 (0.1, 4.6)	0.4 (0.1, 1.6)
Birthplace (reference: US-born)					
Foreign-born	0.5 (0.2, 1.1)	2.8 (0.9, 8.3)	0.1 (0.0, 0.2)	0.1 (0.0, 1.0)	0.2 (0.1, 0.7)
Language preference (reference: mostly English[b])					
Mostly foreign language	0.9 (0.4, 2.0)	0.1 (0.0, 1.4)	0.5 (0.2, 1.2)	1.0 (0.2, 4.2)	0.4 (0.0, 3.8)

[a]Adjusted for race/ethnicity recorded in the Kaiser admissions database, mode of interview (in-person vs phone), gender, and age, except for the characteristics gender and age, which were adjusted only for Kaiser race/ethnicity and mode of interview.
[b]Language index = 0, 1, 2.

catering specifically to Asians. Also, limited English proficiency may not be as much of a barrier to immigrants navigating daily life in the United States as it may be in other parts of the country or may have been in the past; thus, English proficiency may not be reflective of the degree of acculturation among Asians in this area. English is used throughout Asia, and as a result, recent immigrants may already have some degree of English knowledge. Additional research is needed to validate appropriate measures of acculturation for specific Asian subgroups, as has been done for Hispanics.[39,40]

Although the proportion of persons of multiple race is currently small (4% in California overall), the proportion among those younger than 18 years is as high as 10% in some regions of California, such the San Francisco Bay area.[52] For most of the characteristics we examined, the prevalence among multiple-race Asians fell between those among Whites and among all Asian groups combined. Unfortunately, small numbers of participants limited our ability to examine patterns for more specific multiple-race groups. The assessment of multiple race/ethnicity in studies presents analytic challenges such as small numbers and collapsibility of groups.[53] However, the increasing numbers of people who identify with multiple races and the potential utility of research of these populations in understanding disease etiology warrant the continued collection of multiple race/ethnicity information.[53,54]

Risk factor prevalence estimates reported in this study are not representative of those in the general population, because they are based on fracture patients and persons without previous history of fracture from an HMO. The generalizability of our results is further limited by the underrepresentation among the Kaiser membership of the very lowest and highest socioeconomic strata of the general population.[55,56] Our intent was to compare health and related risk factors across the Asian subgroups within the study sample; thus, our reported prevalences should not be compared with other reports of prevalence. Because the participant interviews were conducted primarily in English, our sample may underrepresent non–English speakers. However, our data show heterogeneity in language preference: 18% of Asians preferred a foreign (non-English) language in all contexts.

All of our data are based on self-report and thus may be subject to misclassification. For example, previous studies have shown that the validity of self-reported anthropometric measures varies according to demographic factors such as age, gender, race/ethnicity, income, and education and on behavioral characteristics such as smoking and physical activity, as well as on BMI itself.[57,58] Despite the large overall number of Asians in this study, another limitation is the small numbers of participants from certain Asian subgroups, so that analyses beyond Chinese, Japanese, and Filipino were not possible. Similar analyses in larger, more representative databases—including the NHIS,[59] the National Health and Nutrition Examination Survey,[60] and the California Health Interview Study[61]—not only would provide a better understanding of health patterns in these 3 large Asian subgroups but also would yield needed information for the smaller Asian subgroups. These large databases would also allow an examination of the independent and joint effects of sociodemographic, economic, and immigration factors on health behaviors and outcomes. Our study, based on a secondary analysis of data from a case–control study of fractures, lacked potentially important information regarding sociocultural factors that may be relevant to influencing health behaviors among Asians. Despite the limitations of this study, there were several noteworthy strengths, including relatively large numbers of Chinese, Japanese, and Filipino participants; identification and inclusion of multiple-race Asians; and a detailed analysis of characteristics that have seldom been examined for specific Asian subgroups.

The heterogeneity in health and in sociodemographic, immigration, and acculturation factors among Asian subgroups reinforces the notion that epidemiological studies should, to the extent possible, collect detailed information on specific race/ethnicity and should conduct analyses to examine variations in risk factors and disease without relying on broad racial/ethnic labels. Such research would provide a basis for the development of effective public health interventions by identifying specific subpopulations that experience health disparities compared with the general population or that are at high risk of disease. ■

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S.L. Gomez conceptualized the hypothesis, conducted the data analysis, and wrote the article. J.L. Kelsey contributed to the design of the study and the collection of the data and provided overall advice on the article. S.L. Glaser and M.M. Lee contributed to the writing of the article. S. Sidney contributed to the design of the study, the collection of the data, and the writing of the article.

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