PREVALENCE AND PREDICTORS OF SMOKING BEHAVIOR AMONG SAMOANS IN THREE GEOGRAPHICAL REGIONS

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Objectives: Provide comprehensive data on smoking behavior among Samoans.

Design: Cross-sectional, using systematic random sampling procedures, and in-person interviews.

Setting: US Territory of American Samoa, Hawaii, and Los Angeles, California.

Participants: 1834 adult, non-institutionalized Samoans.

Intervention: None

Main Outcome Measures: Prevalence and independent predictors of smoking.

Results: Approximately one fourth (26.6%) of Samoans were current smokers, with 31.4% of men and 22.5% of women currently smoking. More current smokers were found in American Samoa (28.9%), followed by Hawaii (26.9%) and Los Angeles (24.1%, $P<.001$). At each site, Samoan men compared with the women were significantly more likely to smoke ($P<.001$), initiate smoking earlier ($P<.05$), and smoke more cigarettes ($P<.05$). Cessation rates for the sample were very low. Predictors of smoking included being younger, male, married, less educated, with lower income, and more acculturated.

Conclusion: The high smoking and low cessation rates indicate that smoking-related diseases will be significant causes of morbidity and mortality for Samoans for many years. The findings further underscore the importance of documenting smoking patterns and their determinants for subgroups rather than aggregates such as Asian American and Pacific Islanders. If Samoans are to meet the Healthy People 2010 tobacco goals, there is a need to: 1) develop tailored tobacco awareness and cessation programs based on the recommendations made by the Taskforce on Community Preventive Services; 2) understand the complex interactions between social, cultural, and psychological determinants of smoking and cessation behaviors; and 3) develop policies to limit availability of tobacco, environmental exposure from tobacco, and increase cessation efforts. (*Ethn Dis*. 2005;15:305–315)

Key Words: Minority Group, Pacific Islander, Samoan, Smoking, Tobacco Use

INTRODUCTION

Smoking is the leading cause of preventable illness and death in the United States. The Surgeon General's recent report confirmed that smoking is a major contributor to illness and death in all of the major minority population groups.[1] Smoking rates vary by racial/ethnic group, with the lowest prevalence rates noted for Asian Americans and Pacific Islanders (AAPI). However, AAPIs constitute a diverse group with more than 30 distinct ethnic and national subgroups speaking more than 500 different languages.[1] Moreover, local surveys have documented wide variations and identified subgroups with high smoking rates.[2–4] Unfortunately, use of aggregate rates (ie, for AAPIs), although providing increased precision of estimates, tends to obscure the unique health habits, disease patterns, and needs of heterogeneous subgroups. In spite of the recognized value of data on various minority groups, few data are available on the unique habits and health problems of many groups such as Pacific Islanders (as opposed to AAPI) and particularly American Samoans (henceforth "Samoans"), the indigenous peoples of the US Territory of American Samoa (henceforth "American Samoa").

Several studies have attributed migration-related changes in disease morbidity and mortality.[5,6] The majority of this research has focused on cancer and cardiovascular disease morbidity and mortality. Migration studies, however, have focused less on health behaviors (including smoking behaviors). Samoans have migrated worldwide, especially to countries such as United States, Australia, and New Zealand primarily in pursuit of better educational and employment opportunities. This population, similar to other migrant populations, provides a unique opportunity to explore and understand the effects of migration and changes in social and cultural environments on health and health behaviors.

Samoans are the second-largest Pacific Islander group (15.2%, $N=133,281$ in the US mainland and an additional 50,545 in the US Territory) after Hawaiians.[7,8] Most reside in American Samoa and in urban centers in Hawaii, California, Utah, and Washington State.[8] The US Territory includes the eastern Samoan archipelago, which was ceded to the United States in 1900 and 1904. In the United States, Samoans are

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among the most rapidly growing populations.[8]

Although several reports have pointed out the need for additional data on smoking behavior among Pacific Islanders and sub-groups among them, data on smoking prevalence; trends in smoking behavior; and characterization of smoking behavior by sociodemographic, cultural, and migration factors for Pacific Islanders in general and Samoans in particular are scarce.[1,9–12] Most of the data reported have been collected as part of studies that did not primarily focus on the characterization of smoking behavior. Before the widespread use of imported cigarettes, Samoans smoked a "cigar," which was tobacco rolled in dried banana leaves. Following the introduction of tobacco products (including cigarettes), a rapid increase in smoking among Pacific Islanders have been reported from Oceania[13] and other Pacific Islands including Cook Islands, Fiji, Kiribati, Nauru, New Caledonia, Niue, Tuvalu, and the independent state of Samoa.[12] In addition, higher smoking rates among Pacific Islander men and women compared to those in developed countries have been documented.[13] Other local surveys have reported high smoking prevalence among Pacific Islanders in New Zealand,[14] the independent state of Samoa (formerly Western Samoa),[15] the US Territory of Guam,[16] and other south Pacific Islands including American Samoa.[13,17,18] One of the few surveys documenting smoking behavior in American Samoa conducted among a sample of 81 individuals aged between 14 and 32 years revealed that 18% were current smokers, 13% were former smokers, and 69% were nonsmokers.[19] No smoking prevalence rates have been reported for Samoans residing in the US mainland (including Hawaii).

Several reports have documented a higher propensity among Samoans for illness and death from diseases attributable to smoking. For instance, rates for lung cancer and other smoking-associated cancers are higher among Samoans and other Pacific Islander groups than non-Hispanic Whites.[20–22] Lung cancer is the most commonly diagnosed cancer for Samoan men and the second most commonly diagnosed cancer (after breast cancer) for Samoan women, accounting for 26% and 11.3%, respectively, of all cancers diagnosed.[22] In addition, Samoans had elevated risks for other smoking-related cancers, including cancers of the nasopharynx, liver, and stomach.[21,22] Cardiovascular disease-related morbidity and mortality rates and associated risk factors (including smoking) are relatively high among Samoans in New Zealand,[17] independent state of Samoa,[15,23] American Samoa,[24–26] and Hawaii.[26] In addition, among AAPIs Samoans have the highest age-adjusted mortality rate, with heart diseases and cancer being the leading cause of death.[20]

No evidence-guided tobacco awareness and cessation programs specifically target Samoan communities in the US mainland and Hawaii. In American Samoa, there is a Centers for Disease Control and Prevention-sponsored tobacco awareness program but no tobacco-cessation program. Data about smoking habits in minority population groups and the sociodemographic and cultural factors associated with tobacco use are important for understanding current and future health problems and developing effective prevention and control programs.[1,9,10,12,13,17] These data are even more important if minority populations are to meet the Healthy People 2010 leading indicator goals for a reduction in smoking by adults to 12% and enhancing cessation attempts by adult smokers to 75% of the adult smoking population.[27]

The purpose of this report is to present the prevalence and sociodemographic predictors of smoking behavior among Samoans residing in three geographic locations, American Samoa; Oahu, Hawaii (henceforth "Hawaii"); and Los Angeles County, California (henceforth "Los Angeles"). We also report on levels of consumption, sex, and site differences on smoking behavior, and knowledge and attitudes regarding smoking. This report is the first to systematically document and provide population-based estimates of smoking behavior prevalent in this indigenous population from three locations. In addition, the findings from this report will provide preliminary insights into the effects of migration and the interplay of sociodemographic factors on health behavior. Lastly, the findings will facilitate the development of targeted smoking cessation programs.

METHODS

Data for this report are from a larger study that examined the cancer control needs of Samoans, including site-specific cancer incidence and cancer-related knowledge, attitudes, and practices.[28–30] In this report, we present results related to the prevalence and predictors of smoking among Samoan adults residing in American Samoa, Hawaii, and Los Angeles, California. The institutional review boards of the University of California at Irvine and the National Office of Samoan Affairs approved the research protocol. Prior to their participation, the research participants signed written informed consent.

Study Design and Procedures

We used a cross-sectional study design with systematic random sampling

procedures to identify eligible households and recruit and interview 1834 eligible adult (18 years or older), non-institutionalized, eligible Samoan men and women residing in the three study sites. To be eligible, a household had to be the residence of a self-identified Samoan with at least one member 18 years of age or older. In American Samoa, we randomly sampled households from US Census data listings. In Los Angeles and Hawaii, we developed sample frames based on household address listings provided by Samoan faith-based and social service organizations. According to leaders of Samoan faith-based and social service organizations, an estimated 85%-90% of Samoans residing in Hawaii and Los Angeles are affiliated with Samoan-speaking faith-based organizations. The sample frames for Hawaii and Los Angeles comprises 4,346 and 4,828 households, respectively. To validate the completeness of the sample frames at these sites, we queried respondents surveyed for names and addresses of their family members and Samoan friends and neighbors. More than 90% of the names generated by this approach were already part of the two sample frames. The cooperation rates[31] were 99.8% in American Samoa, 95.9% in Hawaii, and 93.6% in Los Angeles. Further details on the sampling and random selection methods and study procedures (including survey development and implementation) are discussed elsewhere.[28–30]

The surveys, conducted between June 1996 and April 1997, were administered in person in either English or Samoan by specially trained, bicultural, and bilingual Samoan interviewers at the place of residence of eligible respondents. The surveys averaged approximately 40 minutes, and the respondents received a gift of $15 for their participation. Most interviews were conducted during weekday evenings and Saturdays, with the interviewers making up to three attempts to contact eligible respondents before eliminating them from the study.

Measures

The questionnaire was based on the National Health Interview Survey (NHIS),[32] its cancer control supplement,[33] and on findings of our presurvey focus groups. The questionnaire's content areas included cancer-related knowledge, attitudes, use of screening and early detection examinations, access to care indicators, health status, smoking and alcohol use behaviors, acculturation measures, and sociodemographics. The questionnaire was translated into Samoan by using standard procedures.[34] Prior to its administration, the questionnaire was pilot-tested and appropriately revised.

This report focuses on sociodemographics, smoking behavior, and knowledge and attitudes regarding smoking. The sociodemographic variables included age, sex, years of education, marital status, employment status, yearly family income, and acculturation level. Acculturation level was measured by using a modified five-item language assimilation scale.[35] The scale contains items measuring language preference (English or Samoan) to read, think, talk with friends, and use when growing up. The scale scores ranged from 1 to 5, mean=2.38 (SD=1.14), median=2.20, and Cronbach's alpha=0.90. The scale scores were dichotomized[35] into groups that were "less" (score <2.2) or "more" (≥ 2.2) acculturated.

Smoking behavior was measured in terms of smoking status (non-smoker, former smoker, or current smoker), age at first starting to smoke, and number of cigarettes currently smoked. Non-smokers were defined as those adults who had never smoked or smoked <100 cigarettes in their entire life. Former smoker were defined as those adults who had smoked ≥ 100 cigarettes in their life and had quit smoking. Current smokers were defined as adults who currently smoked.

To assess knowledge about smoking behavior and the risk for cancer, respondents were asked whether, in their opinion, smoking increased a person's chance for getting cancer of the lung, breast, cervix, colon, liver, prostate, and oral cavity (yes = 1, no or do not know = 0). Three statements assessed attitudes regarding smoking and its harmful effects on health: smoking by a pregnant woman may harm the baby; most deaths from lung cancer are caused by cigarette smoking; and, even if a person has smoked for >20 years, there is a health benefit to quitting. Responses to these three statements were coded "1" if there was agreement and "0" if there was disagreement or no opinion with the statement.

Analysis

We used the Mantel-Haenszel χ^2 statistic[36] to assess differences between smoking status and sociodemographics, knowledge and attitude, and test for sex differences after adjusting for differences across sites. We constructed multivariate logistic regression models to identify independent predictors of current smoking behavior. Besides an overall logistic regression model (for the three sites), we constructed individual models for each of the sites to further explore the effects of migration and sociodemographic factors on smoking behavior. Predictor variables included in the models for each site were similar to those included in the final overall model. The final logistic regression model (determined after stepwise and confirmatory logistic regression analyses) included predictor variables such as age, sex, marital status, education level, and acculturation level. Dummy variables were created for the trichotomous independent variable age. For each categorical variable in the model, the referent category had an odds ratio (OR) of 1.0. Variables income and employment status showed multicollinearity ($r>0.25$); therefore, the income variable, which is known to be inaccurate in survey research, was excluded from the stepwise multivariate analyses. All other independent variables were relatively uncorrelated ($r<0.25$).

Table 1. Socio-demographic characteristics of 1,834 respondents surveyed in American Samoa, Hawaii, and Los Angeles

	All (*N*=1,834)		Am. Samoa (*N*=609)		Hawaii (*N*=610)		Los Angeles (*N*=615)	
Characteristics	***N***	**%**	***N***	**%**	***N***	**%**	***N***	**%**
Age								
18–34	749	40.8	264	43.3	250	41.0	235	38.2
35–54	772	42.1	253	41.5	257	42.1	262	42.6
55 or greater	313	17.1	92	15.1	103	16.9	118	19.2
Sex								
Female	986	53.8	323	53.0	325	53.3	338	55.0
Male	848	46.2	286	47.0	285	46.7	277	45.0
Marital status*								
Married	1216	66.4	436	71.6	373	61.2	407	66.3
Single	616	33.6	173	28.4	236	38.8	207	33.7
Employment status*								
Not in the workforce	893	48.7	258	42.4	340	55.8	295	48.0
In the workforce	940	51.3	351	57.6	269	44.2	320	52.0
Education level, years*								
0–8 years	179	9.8	61	10.0	70	11.5	48	7.8
9–12 years	1096	59.8	351	57.6	391	64.1	354	57.6
13 or greater	559	30.5	197	32.3	149	24.4	213	34.6
Income level*								
Less than $20,000	1021	64.3	411	75.3	402	74.0	208	41.6
$20,000 or greater	568	35.7	135	24.7	141	26.0	292	58.4
Acculturation level*								
More acculturated	1014	55.3	217	35.6	397	65.1	400	65.0
Less acculturated	820	44.7	392	64.4	213	34.9	215	35.0

For some socio-demographic characteristics the sample size does not add up to 1,834 due to missing values.
* $P<.001$. The χ^2 statistic was used to test for significant differences between study sites and socio-demographic variables.

The logistic regression results appear as ORs and 95% confidence interval (CI),[37] which provide the basis for evaluating the magnitude of differences. Statistical analyses were conducted by using SPSS Professional Statistic 7.5 (SPSS Inc., Chicago, IL).[38]

RESULTS

Sample Characteristics

Table 1 presents demographic characteristics of the 1834 Samoans surveyed from American Samoa, Hawaii, and Los Angeles. The study sample was about evenly divided between the three study sites. Overall, most respondents were between ages 18–54 years (82.9%), female (53.8%), married (66.4%), in the workforce (51.3%), with 9 to 12 years of education (59.8%), with yearly family income <$20,000 (64.3%), and with higher levels of acculturation (55.3%). Some significant differences were seen between the respondents surveyed in the three study sites on socio-demographic variables such as marital status, employment, education, income, and acculturation levels. Compared with respondents in American Samoa, those in Hawaii and Los Angeles were proportionally less likely to be married (71.6% vs 61.2% and 66.3%, respectively, $P<.001$) and more likely to not be in the workforce (42.4% vs 55.8% and 48.0%, respectively, $P<.001$) and have higher acculturation levels (35.6% vs 65.1% and 65.0%, respectively, $P<.001$). Respondents surveyed in American Samoa and Los Angeles (32.3% and 34.6%, respectively, $P<.001$) were proportionally more likely than those in Hawaii (24.4%) to have 13 or more years of education. Respondents in American Samoa (75.3%) and Hawaii (74.0%) were proportionally more likely than those in Los Angeles (41.6%, $P<.001$) to report an annual household income level <$20,000.

Prevalence of Smoking Behavior

Among the Samoans surveyed in the three study sites, approximately one fourth (26.6%, $N=488$) were current smokers, 9.5% ($N=174$) were former smokers, and 63.9% ($N=172$) were non-smokers. More than one half of the current smokers had begun smoking before the age of 19 years (55.6%) and smoked <15 cigarettes per day (53.7%) (data not shown).

Table 2 presents smoking prevalence

by sociodemographic characteristics and the three study sites. Across the three study sites were proportionally more current smokers in American Samoa (28.9%), followed by Hawaii (26.9%), and Los Angeles (24.1%). In addition, more former smokers were in Los Angeles (14.3%), followed by Hawaii (10.7%) and American Samoa (3.4%). The current smokers were proportionally more likely to be younger (18–34 years; 32.4%), male (31.4%), single (31.2%), in the workforce (29.8%), with 9–12 years of education (30.7%), with incomes <$20,000/year (28.5%), with higher acculturation levels (30.2%), and residing in American Samoa. Former smokers were proportionally more likely to be aged 55 years or older, male, married, not in the workforce, have <9 years of education, have incomes ≥$20,000/year, have lower acculturation levels, and reside in Los Angeles.

Table 2. Prevalence of smoking behavior by socio-demographic characteristics (*N*=1,834)

	Non-Smoker (*N* = 1,172)		Former Smoker (*N*=174)		Current Smoker (*N*=488)	
Characteristics	***N***	**%**	***N***	**%**	***N***	**%**
Age, years*						
18–34	462	61.7	44	5.9	243	32.4
35–54	486	63.0	77	10.0	209	27.1
55 or greater	224	71.6	53	16.9	36	11.5
Sex*						
Female	680	69.0	84	8.5	222	22.5
Male	492	58.0	90	10.6	266	31.4
Marital status†						
Married	791	65.0	129	10.6	296	24.3
Single	379	61.5	45	7.3	192	31.2
Employment status†						
Not in the workforce	588	65.8	97	10.9	208	23.3
In the workforce	583	62.0	77	8.2	280	29.8
Education level, years*						
0–8 years	133	74.3	27	15.1	19	10.6
9–12 years	668	60.9	91	8.3	337	30.7
13 or greater	371	66.4	56	10.0	132	23.6
Income level†						
Less than $20,000	648	63.5	82	8.0	291	28.5
$20,000 or greater	384	67.6	62	10.9	122	21.5
Acculturation level†						
More acculturated	619	61.0	89	8.8	306	30.2
Less acculturated	553	67.4	85	10.4	182	22.2
Study site*						
American Samoa	412	67.7	21	3.4	176	28.9
Hawaii	381	62.5	65	10.7	164	26.9
Los Angeles	379	61.6	88	14.3	148	24.1

For some socio-demographic characteristics the sample size does not add up to 1,834 due to missing values.
* $P<.001$.
† $P<.01$.
The χ^2 statistic was used to test for significant differences between smoking status and socio-demographic variables.

Gender and Study Site-Based Differences in Smoking Behavior

Among the Samoans surveyed, 31.4% of men and 22.5% of women reported current smoking (Table 3). Smoking was significantly more common among Samoan men than women at each site ($\chi^2=23.5$, $df=1$, $P<.001$). Men were more likely than women to start smoking at age 18 or earlier (58.6% vs 51.9%; $\chi^2=4.5$, $df=1$, $P<.05$) and more likely to smoke 15 or more cigarettes per day (51.5% vs 39.3%; $\chi^2=5.93$, $df=1$, $P<.05$). There was no difference between men and women in the proportion of ever-smokers who quit ($\chi^2=0.1$, $df=1$, $P=.71$).

Smoking status differed significantly across sites for both men and women (χ^2 with 4 $df=23.0$, $P<.001$ and $\chi^2=29.1$, $P<.001$ for men and women, respectively). Among men, the highest frequency of current smokers was observed in American Samoa (35.3% vs 27.7% in Hawaii and 31.0% in Los Angeles) while among women, current smoking was more common in Hawaii (26.2%) than at other sites (23.2% in American Samoa and 18.3% in Los Angeles). The proportion of former smokers was smaller in American Samoa (4.5% for men and 2.5% for women) than in Hawaii (11.2% for men and 10.2% for women) or Los Angeles (16.2% for men and 12.7% for women; χ^2 with 2 $df=18.1$, $P=.001$ and $\chi^2=22.9$, $P<.001$ for men and women, respectively). No significant differences were seen between sites in age at smoking initiation or amount smoked.

Knowledge and Attitudes Regarding Smoking as Risk Factor for Morbidity and Mortality

Current smokers were less likely than non-smokers to identify smoking as a risk factor for most cancers for which there is available epidemiologic evidence (Table 4). Current smokers were less likely than non-smokers to indicate that smoking was a risk factor for cancers of the oral cavity (87.5% vs 93.4%, $P<.001$), cervix (71.2% vs 81.2%, $P<.001$), and liver (78.5% vs

83.9%, $P<.05$). For breast cancer, where epidemiologic evidence of higher risk with smoking behavior is still wanting, current smokers were again less likely than non-smokers to identify smoking as a risk factor (82.0% vs 88.8%, $P<.05$).

The majority of the respondents, regardless of their smoking status, were in agreement with the attitudinal statements on the health effects of smoking. The vast majority of current smokers and non-smokers agreed that smoking by a pregnant woman may harm the baby and that even if a person has smoked for >20 years, there is a health benefit to quitting. Current smokers were proportionately less likely than non-smokers (86.3% vs 92.5%, $P<.001$) to agree that most deaths from lung cancer are caused by cigarette smoking.

Predictors of Current Smoking Behavior, Overall and by Study Site

The importance of migration effects and the interplay of sociodemographic factors on current smoking behavior were explored in an overall multivariate model (for the three study sites) and individual multivariate models for each study site (Table 5). In the overall model, current smokers compared with non- and former smokers were significantly more likely to be: younger (18–34 years; OR=2.79, $P<.001$; 35 to 54 years: OR=2.58, $P<.001$), male (OR=1.70, $P<.001$), married (OR=1.43, $P<.01$), have 9–12 years of education (OR=1.56, $P<.001$), and have higher acculturation levels (OR=1.27, $P<.05$). In terms of independent predictors of current smoking behavior within each site, age was a significant predictor in each of the three study sites. Other site-specific predictors of current smoking behavior included: male gender and 9–12 years of education (in American Samoa and Los Angeles), being married (in Hawaii), and with higher acculturation levels (in American Samoa).

Table 3. Smoking characteristics by sex and study site

Characteristics	All		Am. Samoa		Hawaii		Los Angeles	
	N	%	*N*	%	*N*	%	*N*	%
Male*								
Current smoking status								
Non-smokers	492	58.0	172	60.1	174	61.1	146	52.7†
Former smokers	90	10.6	13	4.5	32	11.2	45	16.2
Current smokers	266	31.4	101	35.3	79	27.7	86	31.0
Age at smoking initiation, years‡								
15 or younger	69	26.1	23	22.8	24	30.8	22	25.9
16–17	50	18.9	14	13.9	18	23.1	18	21.2
18	36	13.6	18	17.8	9	11.5	9	10.6
19–24	82	31.1	31	30.7	22	28.2	29	34.1
25 or older	27	10.2	15	14.9	5	6.4	7	8.2
Cigarettes smoked per day‡								
14 cigarettes or less	113	48.5	47	56.0	32	42.1	34	46.6
15–24 cigarettes	102	43.8	31	36.9	37	48.7	34	46.6
25 cigarettes or more	18	7.7	6	7.1	7	9.2	5	6.8
Female								
Current smoking status*								
Non-smokers	680	69.0	240	74.3	207	63.7	233	68.9†
Former smokers	84	8.5	8	2.5	33	10.2	43	12.7
Current smokers	222	22.5	75	23.2	85	26.2	62	18.3
Age at smoking initiation, years‡								
15 or younger	44	20.2	10	13.7	20	23.5	14	23.3
16–17	42	19.3	11	15.1	19	22.4	12	20.0
18	27	12.4	12	16.4	11	12.9	4	6.7
19–24	75	34.4	30	41.1	23	27.1	22	36.7
25 or older	30	13.8	10	13.7	12	14.1	8	13.3
Cigarettes smoked per day‡								
14 cigarettes or less	105	60.7	32	59.3	41	58.6	32	65.3
15–24 cigarettes	60	34.7	22	40.7	24	34.3	14	28.6
25 cigarettes or more	8	4.6	0	0.0	5	7.1	3	6.1

* Sample sizes for data on current smoking status by gender for each site are as follows. Male: Total=848, American Samoa=286, Hawaii=285, Los Angeles=277; Female: Total=986, American Samoa=323, Hawaii=323, Los Angeles=338. The sample sizes do not add up to those expected (ie, males=848, females=986) due to missing values.

† $P<.001$ significance for differences across sites.

‡ Data on age at initiation and cigarettes smoked per day are only for current smokers. Sample sizes by gender for each site are as follows. Male: Total=266, American Samoa=101, Hawaii=79, Los Angeles=86; Female: Total=222, American Samoa=75, Hawaii=85, Los Angeles=62. The sample sizes do not add up to those expected due to missing values.

DISCUSSION

This study provides the first comprehensive, population-based estimates on smoking prevalence and predictors of current smoking behavior for Samoan men and women residing in three geographical regions. Furthermore, the study highlights the effects of migration and the interplay of sociodemographic factors on smoking behavior. The study confirms that cigarette smoking is a major health risk among Samoan men and women. Nearly one third of Samoan men and one fourth of Samoan women surveyed were current smokers. Significant predictors of current smoking in Samoans included younger age, being married, lower levels of education, and more acculturation. After adjusting for these factors, Samoan men were more than twice as likely to smoke as were

Table 4. Knowledge and attitudes regarding smoking as a risk factor by smoking behavior

Characteristics	Non-Smoker		Former Smoker		Current Smoker	
	N	%	*N*	%	*N*	%
Knowledge†						
Smoking is a risk factor for cancer of the:						
Lung	1096	93.5	165	94.8	451	92.4
Oral cavity	1095	93.4	162	93.1	427	87.5*
Cervix§	552	81.2	56	66.7	158	71.2*
Liver	983	83.9	146	83.9	383	78.5†
Prostate‖	344	69.9	69	76.7	184	69.2
Breast§	604	88.8	69	82.1	182	82.0†
Colorectum	899	76.7	132	75.9	359	73.6
Attitude¶						
Smoking by a pregnant woman may harm the baby	1138	97.1	171	98.3	469	96.1
Most deaths from lung cancer are caused by cigarette smoking	1084	92.5	155	89.1	421	86.3*
Even if a person has smoked for more than 20 years, there is a health benefit to quitting	1033	88.1	160	92.0	428	87.7

* $P<.001$ by the χ^2 statistic.
† $P<.05$.
‡ Percent agreement with statements that smoking is a risk factor for the particular cancer.
§ Questions were asked only of women (*N*=986).
‖ Question as asked only of men (*N*=848).
¶ Percent agreement with the statements on health effects of smoking.

Table 5. Adjusted odds ratios for predictors of current smoking behavior, overall and per study site

Predictors	Overall (*N*=1,832)		Am. Samoa (*N*=609)		Hawaii (*N*=609)		Los Angeles (*N*=614)	
	OR	CI	OR	CI	OR	CI	OR	CI
Age, years								
18–34	2.79	1.85–4.21*	2.21	1.12–4.37‡	3.01	1.37–6.63†	3.31	1.57–7.01†
35–54	2.58	1.73–3.86*	2.32	1.19–4.53‡	2.04	1.00–4.32‡	3.76	1.84–7.68*
55 or greater	1.00		1.00		1.00		1.00	
Sex								
Female	1.00		1.00		1.00		1.00	
Male	1.70	1.37–2.11*	2.10	1.43–3.08*	1.19	0.81–1.73	2.38	1.59–3.55*
Marital status								
Single	1.00		1.00		1.00		1.00	
Married	1.43	1.13–1.81†	1.08	0.72–1.64	2.01	1.34–3.00*	1.33	0.86–2.08
Education level, years								
0–8 years	0.74	0.42–1.30	0.76	0.32–1.87	0.75	0.28–2.01	0.61	0.17–2.23
9–12 years	1.56	1.22–1.98*	1.52	1.00–2.29*	1.45	0.93–2.28	1.98	1.28–3.05†
13 years or greater	1.00		1.00		1.00		1.00	
Acculturation level								
Less acculturated	1.00		1.00		1.00		1.00	
More acculturated	1.27	1.00–1.61‡	1.98	1.31–3.00*	0.94	0.59–1.50	1.39	0.85–2.27

* $P<.001$.
† $P<.01$.
‡ $P<.05$.
OR=odds ratio; CI=confidence interval.

The study confirms that cigarette smoking is a major health risk among Samoan men and women.

Samoan women. Samoan men smoked more cigarettes per day than women and started smoking at an earlier age. Moreover, Samoan men and women who had ever smoked were less likely to quit smoking.

The prevalences of smoking behavior observed among Samoan men and women were similar to those documented for non-Hispanic Whites and Hispanics.[1,39] The prevalence of current smoking among Samoan men (31.4%) was slightly higher than among non-Hispanic White men (27.6%) and exceeded rates reported for Hispanic men (22.9%). The prevalence of smoking among Samoan women (22.5%) was slightly lower than non-Hispanic White women (24.4%) but substantially higher than Hispanic women (15.1%). Age-specific prevalence rates for current smoking were not significantly different between Samoans and non-Hispanic Whites younger than age 55. Samoan men and women smoked fewer cigarettes per day compared to non-Hispanic Whites (6.4% vs 21.6% smoked 25 or more cigarettes per day).

Although Samoan men were more likely to smoke compared to non-Hispanic Whites, they smoked significantly fewer cigarettes per day and began to smoke at a later age. Twenty-two percent of Whites smoked ≥25 cigarettes per day,[1] while only 6% of Samoans were heavy smokers. The most striking difference in smoking habits between Samoans and non-Hispanic Whites was with respect to smoking cessation. While one half of all non-Hispanic White smokers quit smoking,[1] only one fourth of Samoan smokers quit. Low rates for smoking cessation in Samoans were seen in men and women and at each site. Cessation rates in men and women were lowest in American Samoa, where only 4.5% of men and 2.5% of women who smoked reported quitting. Low rates for smoking cessation were also noted in Guam.[16]

When compared with Asian-American men and women, striking differences were seen in the prevalence of smoking behavior among Samoan men and women. The prevalence of current smoking behavior among Samoan men was lower than Asian-American men (data based on local studies), such as Cambodians, Chinese, Koreans, Laotians, and Vietnamese, among whom the rates were between 33.6% and 72.0%.[9] On the other hand, the prevalence of current smoking behavior among Samoan women was higher than Asian-American women, such as Cambodians, Chinese, Hmong, Koreans, Laotians, and Vietnamese, among whom the rates were between 0.4% and 21.5%.[9] The use of the "catch-all" AAPI category to estimate smoking prevalence rates for Asian Americans and Pacific Islanders would be misleading, especially since, based on national surveys, the prevalence of smoking among AAPI men and women are reportedly 25.1% and 5.8%,[1] respectively; a gross underestimation of the rates observed for Samoan men and women in this population-based study. Documentation of these distinctions is important for the development of appropriate, evidence-based tobacco awareness and cessation programs and formulation of effective policy initiatives for the Samoan communities.

The prevalence of current smoking among Samoans in this study was consistent with smoking rates reported for other groups of Pacific Islanders.[13–18,40] The prevalence of current smoking rates among Samoan men was lower than those reported for some Pacific Islanders, such as Native Hawaiians, Guamanians, Palauans, and Chuukese,[9,12,13,16] among whom smoking rates were between 38.0% and 58.3%. A similar difference was observed between Samoan women and women from Pacific Island regions, such as Hawaii, Palau, and Guam, where smoking rates were between 34.0% and 67.2%.[9,12,13,16] Other studies have documented that approximately 33% to 56% of Samoan, Cook Island, Tongan, and Niuean men residing in New Zealand were current smokers,[17] a prevalence higher than observed in European populations in New Zealand.[14] Equally high rates have been observed in the independent state of Samoa[15] and various other island nations in the South Pacific.[18,40]

Smoking patterns in the Pacific and among Pacific Islanders who have migrated to the US mainland and Hawaii reflect the relatively recent introduction of commercially manufactured cigarettes and a steady increase in promotion and advertising by tobacco companies.[13,41] This pattern was consistent with the relatively recent epidemic of smoking in the Pacific Island populations, beginning in the 1960s. In contrast, smoking rates for US men increased dramatically beginning in the 1920s, reaching a peak around 1950.

The predictors of current smokers among Samoans are similar to those identified among other racial/ethnic groups.[1] Interestingly, preliminary stepwise multivariate analyses revealed no main effects of the three geographical regions on current smoking behavior. When the interplay of sociodemographic factors were examined within each site, different factors predicted current smoking behavior. These multivariate analyses, coupled with the bivariate results indicating lower smoking rates and higher quitting rates in Los Angeles as compared with American Samoa, may be due to the positive effects of general smoking cessation efforts in the US mainland. A few findings of concerns include the higher smoking rates among Samoan women and the addictive nature of the behavior for the communities.

The study findings have several programmatic implications. The results provide evidence for the development of targeted interventions that can be very specific for sex, educational attainment, and acculturation levels. Furthermore, the findings suggest that the Samoan communities in the three geographic regions, except for some statistical differences but with no practical or clinical significance, were well aware of the impact of smoking behavior on health and had attitudes that could be considered positive for programmatic interventions. High levels of knowledge and positive attitudes are necessary but not sufficient conditions for behavior change. Additional research is necessary to understand social, cultural, and cognitive levers which could translate positive knowledge and attitudes into behavior change. Given that no awareness and cessation programs specifically target Samoans, further research is essential to understand the nature, scope, format, delivery methods of effective and efficient programmatic interventions which target sociobehavioral change, and structural and legislative reforms. Programs for Samoans would need to be specifically developed around successful, evidence-based models identified by the Task Force on Community Preventive Services.[42–44]

Future research on smoking behavior among Samoans needs to explore further the psychological, cultural, and social dimensions of this behavior. Traditionally, Samoans do not have a preventive view of health, as reflected in poor use of cancer preventive services,[28–30,45] and this view may contribute to the uptake of smoking behavior and preclude effective cessation efforts. Future research needs to address this health belief and its influence on preventive behavior, especially cessation behavior. Other areas of research include the evaluation of evidence-based models for cessation programs found to be effective among other minority communities.

Policy implications of this research can be discussed at two levels. First, the data reported in this study further underscore the importance of documenting needs specific to a community rather than at the aggregate level. To reiterate, use of aggregate rates (ie, for AAPIs), although providing increased precision of estimates, tends to obscure the unique health habits, disease patterns, and needs of heterogeneous subgroups. Local studies among subgroups of Pacific Islanders using sufficiently large sample sizes can provide reliable estimates of behavior patterns. These data are imperative if every racial/ethnic minority is to meet the Healthy People 2010 goals for tobacco use.[27] Second, policy initiatives need to be defined by the American Samoa Government, the American Samoa Medical Care Authority, and the American Samoa Department of Public Health to address economic and legislative recourse found successful in other states to reduce the availability of tobacco products and environmental exposure from tobacco, and increase cessation efforts. These policy-driven approaches are essential in light of the fact that no comprehensive tobacco awareness and cessation programs exist in the US Territory.

Limitations of this study are those inherent in survey research. The data, being self-reports, are subject to recall bias and social desirability bias. These biases may underestimate the true prevalence of smoking behavior. Although the study used rigorous sampling methods, there remains the potential sample bias from noninclusion of individuals (in Los Angeles and Hawaii) because of their nonaffiliation with sources that provided the household address lists at these sites. The sampling procedure in Los Angeles and Hawaii would exclude Samoans with little or no contact with Samoan-speaking churches, Samoan social networks and social service organizations, and those who were social isolates. We cannot determine the nature of bias caused by the potential exclusion of these individuals. More assimilated (or acculturated) Samoans were likely excluded from the study. If our assumption is correct, exclusion of the more assimilated Samoans would underestimate the prevalence rates since our data suggest that the more acculturated Samoans were more likely to be current smokers.

In conclusion, this study is the first that presents systematically documented population-based prevalence data, identifies predictors of smoking behavior, and documents levels of consumption and sex differences of smoking behavior among Samoans in three distinct geographical locations. Furthermore, the study explores the potential impact of migration and the interplay of sociodemographic factors on current smoking behavior. The results of this study underscore the importance of understanding the health behaviors and illness in racial/ethnic subgroups of the population. Among the major racial/ethnic subgroups in the US population, smoking rates derived from the NHIS are lowest for AAPI women and lower in AAPI men compared to non-Hispanic Whites.[1] Data based on the aggregate group, as demonstrated by the findings of this study, are likely to understate the importance of smoking-related morbidity and mortality, leading to inadequate planning for preventive programs and health services that target Samoans.[46] The high frequency of smoking among Samoans and low likelihood of quitting, coupled with evidence supporting an increasing trend in smoking,[16] lead to the conclusion that smoking-related diseases will be significant causes of illness and death for the Samoan community for many years. The data further argue for smoking cessation education programs that specifically target the Samoan population in the US Territory and the mainland.

ACKNOWLEDGMENTS

This research was supported by a grant from the National Cancer Institute (UOI-CA-64434) to the National Office of Samoan Affairs. The contents of the article are solely

the responsibility of the authors and do not necessarily represent the views of the funding agency.

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