Health Behaviors, Risk Factors, and Health Indicators Associated with Cigarette Use in Mexican Americans: Results from the Hispanic HANES

ABSTRACT

Background: Cigarette smokers often engage in other, potentially deleterious, health behaviors. Such behaviors have not been well documented in Mexican American smokers.

Methods: Data from the Southwestern sample of the Hispanic Health and Nutrition Examination Survey (HHANES) were employed to investigate differences in health behaviors, risk factors and health indicators between cigarette smokers and nonsmokers among Mexican Americans. Differences between those smoking < 10 and 10 or more cigarettes per day were also examined by age group and gender.

Results: Positive associations between smoking status and heavy coffee and alcohol consumption were found across gender and age groups. Less consistent was the finding that smokers weighed less than nonsmokers. Lower systolic and diastolic blood pressures in middle-aged smokers, and higher levels of depressive symptomatology among smoking women were found. Those smoking 10 or more cigarettes per day were more likely to report heavy coffee consumption, with younger men reporting greater activity limitation due to poor health. Middle-aged men and women in the 10+ category were generally in better health than lighter smokers.

Conclusions: Modest associations between cigarette smoking, health behaviors and risk factors found in other studies were confirmed in this Mexican American population. Few significant associations between smoking and health status were noted. (*Am J Public Health.* 1991;81:859–864)

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Introduction

Cigarette smoking is the leading cause of preventable mortality in the United States with approximately 390,000 deaths annually attributed to this health behavior.[1] The prevalence of smoking varies by age, gender, and ethnicity. Males have higher rates of smoking than do women although the gap in rates has narrowed in recent years.[2] Smoking rates climb dramatically in adolescence, peak in middle age, and decline in old age. Overall, smoking rates among Mexican American men are comparable to estimates for Black American males (44 versus 41 percent)[3,4] while rates for Mexican American women are comparable to Caucasian women (25 versus 27 percent).[3,4] However, the prevalence of heavy cigarette consumption is lower among both male and female Mexican Americans than in other ethnic groups.[5]

While much research has focused on basic epidemiologic relationships between smoking and health outcomes, some research has focused on the relation between smoking and other risk factors. The importance of this research is four-fold:

● smoking may interact with other risk factors producing synergistic increases in the risk of negative health outcomes[6];

● smokers attempting to quit often need to reduce exposure to other health behaviors (e.g. alcohol consumption) which prompt smoking behavior;

● smokers who engage in multiple negative health behaviors are less likely to successfully quit smoking[7];

● change in one health behavior may lead to concomitant reductions in other health behaviors.[8,9]

Much of this research has focused on interrelations between alcohol, cigarette, and caffeine use documenting modest associations among these psychoactive substances.[10] Cigarette consumption has also been found to positively correlate with cholesterol levels,[11] but paradoxically is associated with lower blood pressure in adults.[12,13] There is also an inverse relationship between smoking and obesity.[14]

Although cigarette smoking is correlated with a number of deleterious health outcomes,[15] both gender and aging differences can influence these associations.[16] Therefore it is important to examine these differences in different age and gender groups. In addition, because most individuals do not start smoking after the age of 25, associations between smoking status and health may be influenced by two factors: those who quit smoking due to poor health; and selective survival with those most vulnerable to smoking-related mortality dying during middle age.[17] Cross-sectional analyses often reveal that older smokers are in better health than nonsmokers.[18]

The purpose of this study is to examine health behavior, risk factor, and health indicator correlates of smoking in a representative sample of Mexican Americans. Because of important age and gender differences, these associations will be examined separately by gender and age groups.

Methods

The data employed are from the Hispanic Health and Nutrition Examination Survey (HHANES) conducted during 1982–84 by the National Center for Health Statistics.[19] Our analysis is limited to Mexican American respondents from the southwestern states (Texas, New Mexico, Colorado, Arizona, and California). The HHANES employed a complex multistage sampling design that aimed at obtaining a representative sample of Mexican Americans in the southwest (as well as Cuban Americans in the Miami (Florida) area and Puerto Rican Americans in the New York City area) ages 6 months to 74 years. The sampling design employed assured a 97 percent representation of the Mexican origin population of the southwest as well as 84 percent of all persons of Mexican origin in the United States (for details on sampling procedures see Gonzalez).[20]

Our analysis is limited to persons ages 20 to 74. A total of 3,935 persons in this age group participated in the household interview, with 3,326 participating in the physical examination where data on body weight and height, blood pressure, cholesterol, alcohol consumption, and depression were collected.

Measures

Current smoking status was ascertained in all participants who indicated that they had smoked at least 100 cigarettes in their lifetime. Current smokers were asked how many cigarettes they smoked daily. Responses ranged from less than one to greater than 86 with the actual number recorded between these two extremes. The median number of cigarettes consumed in this sample was used to compare participants whose consumption was "moderate" (<10 cigarettes per day) and "immoderate" (≥10 cigarettes per day).

Measures of health behaviors and risk factors included *Heavy Coffee Consumers* (coded 1 for those consuming 4 or more cups per day, 0 for less than 4, collected during a three-month dietary recall interview); *Current Alcohol Consumer* (coded 1 for current alcohol consumer; 0 for abstainer); *Average Alcohol Consumption* (average number of drinks consumed weekly); *Body Mass Index* [weight (in kilograms) divided by the square of the height of the individual (in meters)[21]]; *Systolic* and *Diastolic Blood Pressure* (based on the average of two blood pressure assessments during the physicians's exami-

nation[22]) and serum *Cholesterol* (milligrams per deciliter of blood plasma).

Health indicators included in this analysis were Activity Limitation, Self-Rated Health, Physician's Assessment, and Depression. *Activity Limitation* was based on a series of questions regarding limitation in major activity (e.g. job, housework, etc.) because of an impairment or health problem. In addition to the above, persons 71 to 74 years of age were considered to have activity limitation if they needed the help of others with personal care needs or daily routine activities because of any impairment or health problem, (coded 1 for activity limitation, 0 for other). *Self-Rated Health* was based on a single item asking respondents to rate their health as excellent, very good, good, fair, or poor (coded 1 to 5). The *Physician's Assessment* also graded subjects on the same 1 to 5 scale for an overall assessment of health. *Depression* was measured by the Center for Epidemiologic Studies Depression (CES-D) Scale which has been widely used in community surveys and has been extensively validated,[23,24] including with Hispanic populations.[25,26] Internal consistency reliability for the scale with the current data was in excess of .85. Range of scores on the CES-D is 0–60 with higher scores indicative of greater symptomatology.

Analysis

All analyses were calculated separately for males and females in three age groups: 20–39; 40–59; 60–74 years. Due to small sample sizes examination of the smoking consumption groups (<10; 10+) were not undertaken in the 60–74 age group. Log linear and general linear modeling were used to compare mean and percent differences across smoking categories.[27] When age was significantly different across smoking status or level of consumption within these age and sex categories, age-adjusted means and percents were calculated. For continuously distributed variables this analytic approach paralleled that of multiple classification covariance analysis[28] while for dichotomous dependent variables it parallels binary multiple regression analysis.[29] Both approaches require that the covariant be homogeneous across categories of the independent variable. Significant interactions between the covariate and the factor indicate that age adjustment may produce misleading results. Therefore, interactions between age and smoking status and level of consumption were first run to confirm independence. (See Mendes de Leon

and Markides[26] for further details on application of this approach).

Analyses were performed with adjustments for sample weights and design effects. The latter were necessary because the HHANES employed a complex multistage sampling design. Sample weights were normalized by multiplying the number of subjects in each group employed in the analysis with each respondent's weight divided by the sum of the weights for the group. Design effects were estimated using the Taylor Approximation method of the SESUDAAN program and were used to adjust variances in the analyses.[30]

Results

The prevalence of smoking and level of cigarette consumption (<10; 10+) by age group and gender is reported in Table 1. Males were more likely to be smokers ($\chi2 = 89.17$, p<.001) and to smoke more cigarettes ($\chi^2 = 7.93$, p<.01) than females. Prevalence rates also varied by age group with the highest rates found in the middle aged group for both smoking status ($\chi^2 = 7.11$, p<.05) and amount of cigarette consumption ($\chi^2 = 9.11$, p<.05). The age group by gender status interactions were not significant indicating that the smokers did not disproportionately fall into specific age group and gender categories.

Table 2 presents frequencies and means for health behaviors, risk factors, and health indicators for young males (ages 20–39). Smokers were more likely to report current alcohol consumption, reported greater consumption of alcohol, were more likely to be heavy coffee consumers, and reported poorer self-rated health. Smokers consuming 10 or more cigarettes per day were more likely to be heavy coffee consumers and reported greater activity limitation than smokers consuming less than 10 cigarettes per day.

Table 3 presents frequencies and means for health behaviors, risk factors, and health indicators for young females. As with young males, female smokers were more likely to report current alcohol consumption and were heavier drinkers. Levels of depressive symptomatology were also significantly higher among smokers than non-smokers.

Females consuming 10 or more cigarettes per day, were significantly older than smokers consuming less than 10 cigarettes per day (29.82 versus 28.22). Therefore, after confirming no age by consumption status interactions, age-adjusted means were calculated. As can be seen in

TABLE 1—Prevalence of Smoking Status and Prevalence of Smokers Consuming 10 or More Cigarettes Per Day by Gender and Age Group

		Percent Smokers			Percent Smoking $\geq$10 Cigarettes/Day	
	N	Male	Female	N	Male	Female
Age Groups						
20–39	2163	42.5	24.2	704	51.5	46.6
40–60	1313	46.4	27.4	455	60.9	50.3
60–74	457	39.7	19.8	133	74.1	54.0

Note: Main effects for smoking status: Age: $\chi^2 = 7.11$; p<.05; Gender: $\chi^2 = 89.17$; p<.001; Interaction: $\chi^2 = .11$; p = n.s
Main effects for cigarette consumption: Age: $\chi^2 = 9.11$; p<.05; Gender: $\chi^2 = 7.93$, p<.01; Interaction: $\chi^2 = 2.02$, p = n.s

Table 3, there were no significant health behavior, risk factor, or health indicator differences between individuals in the two smoking categories.

Table 4 shows the middle-aged (40–59) male smokers were more likely to report greater levels of alcohol consumption, weighed less, reported poorer self-rated health, and had lower systolic and diastolic blood pressure. Smokers consuming 10 or more cigarettes per day had significantly lower diastolic blood pressure than smokers consuming less than 10 cigarettes per day.

Table 5 presents frequencies and means for health behaviors, risk factors, and health indicators for middle-aged females. Age adjustment of means was necessary for the smoking status analyses after determining that the mean age of the smoking group was significantly higher than the nonsmoking group (49.20 versus 48.00). There were no significant interactions between smoking status and age.

Smokers were more likely to be current alcohol consumers, heavy coffee consumers, weighed less, and had lower diastolic blood pressure. Smokers also reported greater depressive symptomatology than nonsmokers. Smokers consuming 10 or more cigarettes per day weighed less, reported better self-rated health and less activity limitation. Table 6 shows that older (60–74) male smokers were more likely to report current alcohol consumption, were more likely to be heavy coffee consumers, and weighed less. Older female smokers were more likely to report current alcohol consumption and were more likely to be heavy coffee consumers.

Discussion

The most consistent differences between smokers and nonsmokers and between those in the two smoking categories were with alcohol and coffee consumption—findings which are in agreement

TABLE 2—Comparison of Nonsmokers and Smokers and Amount of Cigarette Consumption Across Health Behaviors, Risk Factors, and Health Indicators Among Young Men (ages 20–39)

	Smoking Status		Amount of Smoking	
	Nonsmokers (N = 445–586)	Smokers (N = 319–436)	<10/Day (N = 148–212)	$\geq$10/Day (N = 170–221)
	Mean	Mean	Mean	Mean
Health Behaviors/Risk Factors				
% Heavy Coffee Consumers	3	6*	1	10***
% Current Alcohol Consumers	68	79**	81	78
Average Alcohol Consumption^ (Drinks/Week)	4.4	5.5**	5.4	5.7
Body Mass Index (kg/m²)	26.0	25.3	25.4	25.2
Systolic Blood Pressure (mmHg)	117.6	118.3	118.6	117.8
Diastolic Blood Pressure (mmHg)	76.3	75.8	75.6	76.0
Cholesterol (mg/dl)	194.9	197.2	193.3	200.4
Health Indicators				
% with Activity Limitation	9	9	5	13**
Self-Related Health	2.6	2.9***	3.0	2.8
Physician's Assessment	1.4	1.4	1.4	1.4
CES-D Depression	6.3	7.1	6.8	7.3

Note: *p<.05; **p<.01; ***p<.001
^Based on current consumers only (N = 319 nonsmokers; N = 264 smokers; N = 126 <10 cigarettes/per day; N = 137 10+ cigarettes/per day smokers).

with studies in other populations.[10] In general, smoking status was negatively associated with BMI, a finding also consistent with previous research.[14] Blood pressure was generally lower in smokers than in nonsmokers, although this association was significant only for middle-aged smoking men and women. More consistent associations between smoking status as well as the presence of a dose-response relationship have been reported in other studies.[12]

No significant differences were found for cholesterol levels across smoking groups. The average reported difference

in cholesterol levels in smokers and nonsmokers in other studies is approximately 3 percent.[11] In the present analysis, this difference was exceeded only in comparisons of those consuming 10 or more cigarettes per day with those smoking less than this amount in middle-aged women and young men.

Findings relating to physical and emotional health were equivocal, varying by age group and gender. There was limited support that health was poorer in younger, but not older males. In prospective analyses, Hirdes, et al.[18] found that smoking status was associated with future

TABLE 3—Comparison of Nonsmokers and Smokers and Amount of Cigarette Consumption Across Health Behaviors, Risk Factors, and Health Indicators Among Young Women (ages 20–39)

	Smoking Status		Amount of Smoking[++]	
	Nonsmokers (N = 733–868)	Smokers (N = 229–271)	<10/Day (N = 129–147)	≥10/Day (N = 100–124)
	Mean	Mean	Mean	Mean
Health Behaviors/Risk Factors				
% Heavy Coffee Consumers	2	4	3	6
% Current Alcohol Consumers	28	54***	52	56
Average Alcohol Consumption[^] (Drinks/Week)	2.8	3.9***	3.6	4.2
Body Mass Index (kg/m^2)	25.9	25.9	26.3	25.4
Systolic Blood Pressure (mmHg)	108.8	109.2	109.1	109.5
Diastolic Blood Pressure (mmHg)	70.6	70.1	70.1	70.3
Cholesterol (mg/dl)	190.9	189.0	188.8	190.0
Health Indicators				
% with Activity Limitation	11	12	15	10
Self-Related Health	2.9	2.9	2.8	3.0
Physician's Assessment	1.4	1.5	1.5	1.5
CES-D Depression	8.8	10.7*	10.8	10.5

Note: *p<.05; ***p<.001
[^]Based on current consumers only (N = 205 nonsmokers; N = 124 smokers; N = 67 <10 cigarettes/per day; N = 57 10+ cigarettes/per day.   [++]Age-adjusted means are reported.

TABLE 4—Comparison of Nonsmokers and Smokers and Amount of Cigarette Consumption Across Health Behaviors, Risk Factors, and Health Indicators Among Middle-Aged Men (ages 40–59)

	Smoking Status		Amount of Smoking	
	Nonsmokers (N = 247–304)	Smokers (N = 201–265)	<10/Day (N = 81–103)	≥10/Day (N = 118–159)
	Mean	Mean	Mean	Mean
Health Behaviors/Risk Factors				
% Heavy Coffee Consumers	5	9	5	12
% Current Alcohol Consumers	67	75	80	72
Average Alcohol Consumption[^] (Drinks/Week)	3.8	5.1**	5.6	4.7
Body Mass Index (kg/m^2)	27.7	26.0***	26.1	26.0
Systolic Blood Pressure (mmHg)	127.1	123.0*	125.7	121.5
Diastolic Blood Pressure (mmHg)	83.3	80.0**	82.6	78.4**
Cholesterol (mg/dl)	221.2	219.1	220.1	218.4
Health Indicators				
% with Activity Limitation	22	22	21	23
Self-Related Health	3.0	3.2*	3.2	3.1
Physician's Assessment	1.8	1.8	1.8	1.8
CES-D Depression	5.0	6.2	7.2	5.5

Note: *p <.05; **p<.01; ***p<.001
[^]Based on current consumers only (N = 163 nonsmokers; N = 157 smokers; N = 66 <10 cigarettes/per day; N = 89 10+ cigarettes/per day.

risk of disability although this association failed to reach statistical significance. Lack of a strong relationship between morbidity and cigarette consumption in this and other studies may reflect selective survival with the heaviest most vulnerable smokers dropping out of the cohort due to premature mortality.[17]

Our findings have implications for epidemiologic investigations of smoking. Associations between smoking and other health behaviors reinforce the need to control for the effect of these behaviors when examining the impact of smoking on health. Psychological status may also be important to control for in such epidemiologic investigations. Depression, found to be associated with smoking status among women in this study and in previous research,[31,32] is also a risk factor for mortality[33]—particularly among cigarette smokers.[34] Researchers may consider controlling for depression in investigations of smoking and health outcomes as well as exploring possible interactions between smoking and depression.[34,35]

Limitations of this study include potential nonresponse bias and reliance on self-report measures of cigarette consumption. Eighty-seven percent of Mexican Americans approached to participate in the HHANES completed the household interview while 76 percent completed the physician's examination.[36] It should be noted, however, that the weighting procedure incorporated in the present analysis includes adjustment for nonresponse.[36]

Although national estimates of self-reported cigarette consumption are correlated with cigarette sales in the United States (average r = .72),[37] specific analysis of self-report data from the HHANES suggest that underreporting of consumption may have occurred. Based on serum levels of cotinine, a principle metabolite of nicotine, Perez-Stable, et al,[38] estimated that 20–25 percent of those reporting 1–9 cigarettes used per day were actually underreporting cigarette consumption, while underreporting estimates for those reporting greater than 10 cigarettes per day ranged from 2–11 percent. These findings suggest that a proportion of subjects in the 1–9 cigarette consumption category in the present analysis may have been misclassified due to underreporting.

In general, this paper confirmed the modest associations found between cigarette smoking and health behaviors and risk factors found in other populations, although these associations did vary by age and gender. Furthermore, few significant associations between smoking and health

TABLE 5—Comparison of Nonsmokers and Smokers and Amount of Cigarette Consumption Across Health Behaviors, Risk Factors, and Health Indicators Among Middle-Aged Women (ages 40–59)

	Smoking Status[++]		Amount of Smoking	
	Nonsmokers (N = 447–546)	Smokers (N = 162–196)	<10/Day (N = 79–96)	≥10/Day (N = 79–97)
	Mean	Mean	Mean	Mean
Health Behaviors/Risk Factors				
% Heavy Coffee Consumers	5	9*	6	14
% Current Alcohol Consumers	21	44*	39	54
Average Alcohol Consumption^ (Drinks/Week)	2.4	3.7	3.0	4.4
Body Mass Index (kg/m²)	28.7	27.5*	29.0	25.9***
Systolic Blood Pressure (mmHg)	123.0	120.7	119.7	119.7
Diastolic Blood Pressure (mmHg)	77.6	74.8***	75.6	73.9
Cholesterol (mg/dl)	216.4	222.1	215.0	225.8
Health Indicators				
% with Activity Limitation	23	22	26	15*
Self-Related Health	3.3	3.3	3.4	3.0*
Physician's Assessment	1.9	1.8	1.8	1.8
CES-D Depression	8.2	12.8***	12.8	12.4

Note: *p<.05; **p<.01; ***p<.001
^Based on current consumers only (N = 96 nonsmokers; N = 74 smokers; N = 29 <10 cigarettes/per day; N = 44 10+ cigarettes/per day. [++]Age-adjusted means are reported.

TABLE 6—Comparison of Nonsmokers and Smokers Across Health Behaviors, Risk Factors, and Health Indicators Among Older Men and Women (ages 60–74)[++]

	Smoking Status: Men		Smoking Status: Women	
	Nonsmokers (N = 89–121)	Smokers (N = 62–82)	Nonsmokers (N = 145–202)	Smokers (N = 37–51)
	Mean	Mean	Mean	Mean
Health Behaviors/Risk Factors				
% Heavy Coffee Consumers	0	9***	0	9***
% Current Alcohol Consumers	43	63*	11	30**
Average Alcohol Consumption^ (Drinks/Week)	2.9	4.5	—	—
Body Mass Index (kg/m²)	26.9	25.5*	28.4	27.3
Systolic Blood Pressure (mmHg)	140.1	135.8	138.5	133.9
Diastolic Blood Pressure (mmHg)	80.2	78.2	77.6	74.6
Cholesterol (mg/dl)	214.2	213.6	234.1	235.2
Health Indicators				
% with Activity Limitation	42	30	37	41
Self-Related Health	3.5	3.4	3.7	3.5
Physician's Assessment	2.1	2.1	2.2	2.1
CES-D Depression	5.6	6.1	8.9	12.0

Note: *p<.05; **p<.01; ***p<.001
^Based on current consumers only (N = 42 nonsmokers; N = 40 smokers).
[++]Examination of differences in amount of cigarette consumption was not undertaken due to small sample size.

status were found. Associations between smoking status and depression were found for women, but not men. These findings suggest that smoking researchers examining Mexican American populations also need to control for relevant risk factors and health behaviors associated with smoking when examining relationships between smoking and health. □

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