Association Between Selected Unhealthy Lifestyle Factors, Body Mass Index, and Chronic Health Conditions Among Individuals 50 Years of Age or Older, by Race/Ethnicity

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Objective: To examine the association between selected unhealthy lifestyle factors, body mass index (BMI), and chronic conditions among individuals 50 years of age or older, by race/ethnicity.

Design: We analyzed 2001–2004 data from the Behavioral Risk Factor Surveillance System (BRFSS), a state-based system of annual random-digit-dialed telephone surveys.

Participants: Noninstitutionalized US adults aged 50 years or older with landline telephones.

Results: Of 442,167 BRFSS respondents who met our study criteria, 81.6% were non-Hispanic (NH) White, 8.4% were NH Black, 1.6% were NH Asian, 1.0% were NH American Indian, and 7.4% were Hispanic. Within each racial/ethnic group, weight status as measured by BMI was strongly associated with all five health conditions examined and particularly with diabetes, hypertension, and doctor-diagnosed arthritis. Among NH Whites and NH Blacks, those who were overweight or obese were significantly more likely than those of normal weight to have diabetes (NH Whites: adjusted odds ratio [AOR] = 1.94 and 5.25, respectively; NH Blacks: AOR = 1.87 and 3.36, respectively). Among obese NH Asians, NH American Indians, and Hispanics, the AORs for diabetes were 3.97, 4.15, and 2.67, respectively. The AORs for hypertension among those who were overweight and obese, respectively, were1.78 and 3.47 among NH Whites; 1.65 and 2.98 among NH Blacks, 1.91 and 7.14 among NH Asians, 2.00 and 2.65 among NH American Indians, and 1.48 and 3.20 among Hispanics.

Conclusions: Our study revealed a strong association between BMI and risk for chronic health conditions among individuals 50 years of age or older in all racial/ethnic categories. It is important to use messages that are culturally appropriate when planning or conducting health promotion campaigns for selected ethnic/racial groups. In addition, careful research to document health status and healthcare needs within each major ethnic group is needed. (*Ethn Dis*. 2008;18: 450–457)

Key Words: Health Behavior, Behavioral Risk Factor Surveillance System, Ethnic/racial Group

Introduction

Chronic diseases such as heart disease, hypertension, diabetes, and asthma are highly prevalent and are associated with an increased risk for disability among individuals of all racial/ethnic groups (albeit to varying degrees) in the United States.[1–2] Racial/ethnic disparities, however, have been found in the prevalence of various risk factors for chronic diseases, including smoking, obesity, and physical inactivity.[3] Studies have also shown race/ethnicity to be associated with the prevalence of unhealthful behaviors even after adjustments for covariates such as age, education, and income.[4–5] The burden of chronic disease in the United States is expected to continue to increase over the next several years due to the aging of the US population, an increased life expectancy, and the obesity epidemic.[6–7] For example, the number of persons living with two or more chronic conditions is projected to increase from 61 million in 2000 to 81 million in 2020 (a 33% increase).[6] Moreover, minimal progress has been made in reducing existing racial/ethnic disparities in the prevalence of chronic diseases and their attendant risk factors, as well as their progression to disability, over the past decade.[2,8] As a result, the elimination of racial/ethnic disparities in the prevalence of chronic diseases, in the prognoses of those affected by chronic diseases, and in access to care has assumed high priority among US health officials, as evidenced by many of the *Healthy People 2010* objectives.[9] In order to develop appropriately targeted health promotion and intervention activities, it is critical to examine the association between chronic conditions, modifiable lifestyle factors, and obesity by race/ethnicity. Thus, our objective in this study was to examine the association between three unhealthy lifestyle factors (smoking, alcohol consumption, and physical inactivity), body mass index (BMI), and five chronic health conditions (diabetes, asthma, hypertension, hypercholesterolemia, and arthritis), among individuals ≥50 years of age by race/ethnic group.

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Methods

The Behavioral Risk Factor Surveillance System (BRFSS) is a state-based surveillance system operated by state health departments with assistance from the Centers for Disease Control and Prevention. The BRFSS collects data on many of the behaviors and conditions that place adults (≥18 years of age) at risk for chronic disease. Trained interviewers collect data monthly using an independent probability sample of US households with telephones in which at least one adult resides. Data from all states are pooled to produce nationally

representative estimates. A detailed description of the survey methods is available elsewhere.[10] For this study, we combined data from the 2001 through 2004 BRFSS surveys in order to obtain a sufficient number of respondents ≥50 years of age for our analyses. The BRFSS sample size increased from 205,140 in 2001 to 296,971 in 2004 (a 44.8% increase); among adults ≥ 50 years of age, the sample size increased from 84,678 in 2001 to 146,794 in 2004 (a 73.4% increase).

Definitions

To examine the relationship between the three unhealthy lifestyle factors and BMI and the risk for five chronic health conditions, we first identified survey respondents who reported that they had diabetes, asthma, hypertension, hypercholesterolemia, or arthritis. Survey participants were considered to have diabetes if they answered ''yes'' to the question, ''Has a doctor ever told you that you have diabetes?'' Those who responded ''no'' and women who reported diabetes only during pregnancy were considered not to have diabetes. Persons with asthma were defined as respondents who answered ''yes'' to two questions: ''Have you ever been told by a doctor, nurse or other health professional that you had asthma?'' and ''Do you still have asthma?'' Respondents were considered hypertensive if they reported ever having been told by a healthcare professional that they had high blood pressure. Respondents were considered to have hypercholesterolemia if they reported ever having been told by a healthcare professional that their blood cholesterol level was high. Finally, persons with doctor-diagnosed arthritis were defined as respondents who answered ''yes'' to one of the following questions: In 2001, ''Have you ever been told by a doctor that you have arthritis?'' or, in 2003, ''Have you ever been told by a doctor that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?'' Diabetes and asthma data were available for each survey year. Hypertension, hypercholesterolemia, and arthritis data were available for 2001 and 2003.

Next, we assessed three unhealthful behaviors: cigarette smoking, heavy and/or binge drinking, and no leisure-time physical activity. Respondents who reported currently smoking and having smoked at least 100 cigarettes were classified as current smokers; those who reported having smoked at least 100 cigarettes but who were no longer smoking were classified as former smokers; and those who reported having smoked less than 100 cigarettes in their lifetime were considered to have never smoked.

Respondents were classified as nondrinkers if they reported having consumed no alcohol in the preceding 30 days; as moderate drinkers if they reported consuming ≥1 drink per month but ≤2 drinks per day on average (men) or ≥1 drink per month but ≤1 drink per day on average women); and as heavy drinkers if they reported consuming >2 drinks per day on average (men) or >1 drink per day on average (women). For both men and women, binge drinking was defined as the consumption of five or more drinks on at least one occasion in the previous month.

Respondents were classified as physically inactive if they reported not having participated in any leisure time physical activity or exercise during the previous 30 days.

Respondent's weight status was based on their BMI (weight [kg] divided by height [m^2]). They were classified as being either underweight (BMI <18.5), normal weight (BMI 18.5 to 24.9), overweight (BMI 25.0 to 29.9), or obese (BMI ≥30).

We then developed a composite variable of zero to 3 representing the sum of participants' unhealthy lifestyle factors (current smoking, heavy and/or binge drinking, physical inactivity, and abnormal weight [BMI <18.5 or ≥25]).

Two survey questions were used to assess race/ethnicity: 1) ''Are you Hispanic or Latino?'' and 2) ''Which one or more of the following would you say is your race: White, Black or African American, Asian, Native Hawaiian or other Pacific Islander, American Indian, Alaska Native, or Other?'' Respondents who reported that they were Hispanic or Latino were classified as Hispanic regardless of their answer to the second question. Respondents who did not classify themselves as Hispanic and either chose more than one race or identified their race as Native Hawaiian or other Pacific Islander or as ''Other'' were excluded from the analyses because the sample size would have been too small.

Statistical Analyses

We compared the age-adjusted distribution (adjusted based on the 2000 US standard population) of socioeconomic characteristics, healthcare coverage, unhealthy lifestyle factors, BMI, and chronic health conditions across racial/ethnic groups. We used logistic regression analysis to examine associations between unhealthy lifestyle factors and BMI with chronic health conditions treated as dichotomous variables. All analyses were adjusted for age (50–54, 55–59, 60–64, 65–69, 70–74, ≥75); education (<high school graduate, high school graduate, some college, >college graduate); marital status (married, previously married, never married); and healthcare coverage (yes, no). For all analyses, we considered differences with P values <.05 to be statistically significant.

We used SAS (SAS Institute, Cary, NC, 2001) and SUDAAN (Research Triangle Institute, Research Triangle Park, NC, 2001) in all analyses to account for the complex survey design. Each year of BRFSS data (ie, 2001–2004) was directly weighted to account for the probability of selection of a telephone number, the number of

adults in a household, and the number of telephones in a household. Finally, each year of data was poststratified to adjust for nonresponse and noncoverage of households without telephones, weighted to each state's adult population, and aggregated for the analysis. Three design variables, year, stratum, and primary sampling unit, were used to conduct the analysis.

Data were available for 460,803 BRFSS respondents 50 years of age or older. After excluding respondents with missing data on race/ethnicity (n= 4,993) or other covariates (n=3,678) or who were among a race not being analyzed (n=9,965), we were left with 442,167 respondents (168,714 men and 273,453 women) for our analyses.

RESULTS

Of the 442,167 respondents, 387,201 (81.6%) were non-Hispanic (NH) White, 28,464 (8.4%) were non-Hispanic (NH) Black, 4,925(1.6%) were non-Hispanic (NH) Asian, 5,488 (1.0%) were non-Hispanic (NH) American Indian, and 16,089 (7.4%) were Hispanic. Among members of these groups, NH Whites were most likely to be ≥65 years of age or older and least likely to never have been married; NH Asians were most likely to have a college education, to be married, and to be employed; NH Whites and NH Asians were most likely to have healthcare coverage; and Hispanics were most likely to have less than a high school education (Table 1).

Compared to NH Whites, NH Blacks were more likely to have diabetes, asthma, hypertension, and doctor-diagnosed arthritis; NH American Indians were more likely to have diabetes, asthma, and doctor-diagnosed arthritis. NH Whites were more likely than NH Blacks and Hispanics to have hypercholesterolemia. NH Asians were less likely than NH Whites to have asthma and doctor-diagnosed arthritis.

Compared with NH Whites, both NH Blacks and NH American Indians had a higher prevalence of smoking, physical inactivity, and obesity. Hispanics were also more likely to be physically inactive than NH Whites but less likely to be current or former smokers. NH Asians were less likely than NH Whites to smoke, drink heavily, or binge drink, and also less likely to be overweight or obese.

Body mass index

Within each racial/ethnic group, being overweight or obese was more strongly associated with risk for chronic disease than any of the other risk factors we examined and particularly with diabetes, hypertension, and arthritis. Among NH Whites and NH Blacks, those who were overweight or obese were significantly more likely than those of normal weight to have diabetes (NH Whites: adjusted odds ratio [AOR] = 1.94 and 5.25, respectively; NH Blacks: AOR = 1.87 and 3.36, respectively) (Table 2). NH Asians, NH American Indians, and Hispanics who were obese were also significantly more likely than those of normal weight to have diabetes (AORs 3.97, 4.15, and 2.67, respectively). On the other hand, NH Whites and NH Asians who were underweight were significantly less likely than those of normal weight to have diabetes (AOR = 0.70 and AOR = 0.15, respectively).

Among NH Whites and NH American Indians, those who were overweight or obese were significantly more likely than those of normal weight to have asthma (NH Whites: AOR = 1.14 and 1.93, respectively; NH American Indians: AOR = 1.67 and 2.24, respectively) (Table 3). Among NH Blacks and Hispanics, only those who were obese were significantly more likely to have asthma (AORs 1.92 and 2.31, respectively). Among NH Whites, those who were underweight were significantly more likely than those of normal weight to have asthma (AOR = 1.68) (Table 3).

In all racial/ethnic groups examined, adults who were overweight or obese were significantly more likely than those of normal weight to be hypertensive (NH Whites: AOR = 1.78 and 3.47, respectively; NH Blacks: AOR = 1.65 and 2.98, respectively; NH Asians: AOR = 1.91 and 7.14, respectively; NH American Indians: AOR = 2.00 and 2.65, respectively; and Hispanics: AOR = 1.48 and 3.20, respectively) (Table 4). Among NH Whites and NH Blacks, those who were overweight or obese were also significantly more likely than those of normal weight to have hypercholesterolemia (NH Whites: AOR = 1.42 and 1.70, respectively; NH Blacks: AOR = 1.65 and 1.96, respectively). Among American Indians, only those who were obese were at significantly increased risk for hypercholesterolemia (AOR = 1.73). Among NH Whites and Hispanics, those who were underweight were less likely than those of normal weight to have hypercholesterolemia (AOR = 0.69 and 0.27, respectively).

Among NH Whites and NH Blacks, those who were overweight or obese were significantly more likely than those of normal weight to have arthritis (NH Whites: AOR = 1.36 and 2.28, respectively; NH Blacks: AOR = 1.44 and 2.64, respectively). Among NH American Indians and Hispanics, only those who were obese were at significantly increased risk for doctor-diagnosed arthritis (AOR = 2.04 and 2.10, respectively).

Health Risk Behaviors

Among NH Whites and NH Blacks, we found significant, although modest, inverse associations between current smoking and diabetes (AOR = 0.81 and 0.77, respectively) and hypertension (AOR = 0.78 and 0.80, respectively) (Tables 2 and 4), whereas NH Whites and Hispanics who currently smoked were more likely than those who never smoked to have asthma (Table 3) (AOR = 1.22 and

Table 1. Characteristics of adults ≥ 50 years of age by race/ethnicity, Behavioral Risk Factor Surveillance System, 2001–2004

Characteristic*	Non-Hispanic White (*n*=387,201) % (SE)	Non-Hispanic Black (*n*=28,464) % (SE)	Non-Hispanic Asian (*n*=4,925) % (SE)	Non-Hispanic American Indian (*n*=5,488) % (SE)	Hispanic (*n*=16,089) % (SE)
Age, years					
50–64	54.2 (0.1)	61.8 (0.5)†	69.6 (1.8)†	65.3 (1.6)†	65.6 (0.8)†
≥65	45.8 (0.1)	38.3 (0.5)†	30.4 (1.8)†	34.7 (1.6)†	34.4 (0.8)†
Sex					
Male	45.5 (0.1)	40.1 (0.5)†	50.4 (2.0)†	50.0 (1.8)†	43.7 (0.9)
Female	54.6 (0.1)	59.9 (0.5)†	49.6 (2.0)†	50.0 (1.8)†	56.3 (0.9)
Education					
<High school grad	10.4 (0.1)	27.7 (0.5)†	4.6 (0.6)†	26.0 (1.6)†	43.1 (0.9)†
High school grad	32.9 (0.1)	32.1 (0.5)	17.9 (1.6)†	31.4 (1.6)	26.1 (0.7)†
Some college	25.5 (0.1)	22.1 (0.4)†	16.1 (1.6)†	26.3 (1.5)	16.7 (0.6)†
≥College grad	31.3 (0.1)	18.1 (0.4)†	61.5 (2.0)†	16.3 (1.2)†	14.1 (0.5)†
Marital status					
Married	66.9 (0.1)	43.6 (0.5)†	73.1 (1.8)†	54.7 (1.7)†	61.0 (0.8)†
Previously married	28.5 (0.1)	47.7 (0.5)†	20.5 (1.7)†	39.2 (1.7)†	32.9 (0.8)†
Never married	4.6 (0.1)	8.8 (0.3)†	6.5 (1.1)	6.0 (0.9)	6.1 (0.4)†
Employment status					
Employed	41.4 (0.1)	35.0 (0.4)†	51.1 (1.8)†	34.0 (1.3)†	37.8 (0.7)†
Unemployed	2.6 (0.04)	4.8 (0.2)†	5.1 (1.1)†	3.4 (0.5)	4.9 (0.4)†
Homemaker/student	7.7 (0.1)	3.9 (0.2)†	3.7 (0.4)†	4.2 (0.5)†	11.3 (0.5)†
Retired	43.2 (0.1)	43.0 (0.4)	38.8 (1.8)†	42.3 (1.6)	35.1 (0.7)†
Unable to work	5.1 (0.1)	13.3 (0.3)†	1.2 (0.3)†	16.0 (1.4)†	10.8 (0.6)†
No healthcare coverage	5.7 (0.1)	12.7 (0.4)†	7.6 (1.1)	12.2 (0.8)†	18.1 (0.6)†
Health risk behaviors					
Current smoker	15.5 (0.1)	19.9 (0.4)†	8.0 (0.9)†	27.4 (1.6)†	13.2 (0.6)†
Former smoker	38.8 (0.1)	30.1 (0.5)†	22.2 (1.6)†	36.9 (1.7)	30.3 (0.8)†
Heavy and/or binge drinker	8.5 (0.1)	6.3 (0.3)†	4.3 (0.8)†	8.6 (1.0)	8.0 (0.5)
Physically inactive	27.1 (0.1)	39.0 (0.5)†	24.8 (1.8)	37.1 (1.7)†	40.2 (0.9)†
Weight status					
Underweight	1.5 (0.03)	1.0 (0.1)†	2.9 (0.7)†	2.9 (0.8)	1.3 (0.2)
Normal weight	35.5 (0.1)	25.1 (0.5)†	55.4 (2.1)†	29.8 (1.6)†	29.2 (0.8)†
Overweight	40.3 (0.1)	38.0 (0.5)†	35.6 (2.0)†	38.0 (1.7)	41.8 (0.9)
Obese	22.7 (0.1)	35.8 (0.5)†	6.1 (0.9)†	29.2 (1.7)†	27.7 (0.8)
No. of unhealthy lifestyle factors‡					
0	21.5 (0.1)	11.3 (0.4)†	39.1 (2.0)†	12.0 (1.0)†	15.9 (0.7)†
1	47.6 (0.1)	46.8 (0.6)	43.9 (2.1)	44.5 (1.8)	45.0 (0.9)†
≥2	30.9 (0.1)	41.9 (0.6)†	17.0 (1.5)†	43.5 (1.8)†	39.1 (0.9)†
Health conditions					
Diabetes	12.0 (0.1)	23.9 (0.5)†	14.2 (1.5)	22.9 (1.6)†	20.1 (0.7)†
Asthma	7.4 (0.1)	8.7 (0.3)†	4.9 (0.8)†	12.0 (1.1)†	7.0 (0.4)
Hypertension§	44.2 (0.2)	63.6 (0.7)†	40.3 (2.6)	47.4 (2.7)	42.5 (1.2)
Hypercholesterolemia§	42.5 (0.2)	38.7 (0.8)†	39.6 (2.7)	40.0 (2.6)	34.8 (1.2)†
Doctor-diagnosed arthritis§	45.9 (0.2)	50.0 (0.8)†	25.2 (2.4)†	53.0 (2.7)†	41.4 (1.2)†

N = unweighted sample size; % = weighted percentage; SE = standard error.

* Characteristics (except age) were age-adjusted to the 2000 US standard population.

† $P<.05$ for comparison to non-Hispanic whites.

‡ Unhealthy lifestyle factors consisted of current smoking, heavy or binge drinking, physical inactivity, and being underweight (body mass index [BMI] <18.5 kg/m^2) or overweight (BMI ≥25 kg/m^2).

§ Data available for 2001 and 2003 only.

1.54, respectively) and arthritis (AOR = 1.07 and 1.46, respectively). NH Whites and NH Blacks who formerly smoked were more likely than those who never smoked to have each of the five chronic health conditions examined; Hispanics who formerly smoked were more likely to have asthma (Table 3) and hypercholesterolemia; and NH Asians who currently smoked or formerly smoked were more likely than those who never smoked to have diabetes (AOR = 2.84 and 1.88, respectively) (Table 2).

In each racial/ethnic group, those who were physically inactive were either more likely than those who were active to have each of the five health conditions examined, or the associations were not significant. However, those who consumed alcohol were either less likely

Table 2. Associations between selected unhealthy lifestyle factors and diabetes among adults ≥50 years of age by race/ethnicity, Behavioral Risk Factor Surveillance System, 2001–2004

Category*	Non-Hispanic White AOR (95% CI)	Non-Hispanic Black AOR (95% CI)	Non-Hispanic Asian AOR (95% CI)	Non-Hispanic American Indian AOR (95% CI)	Hispanic AOR (95% CI)
Smoking status					
Current smoker	0.81 (0.77–0.85)	0.77 (0.67–0.90)	2.84 (1.31–6.15)	0.86 (0.54–1.36)	0.82 (0.63–1.06)
Former smoker	1.12 (1.08–1.16)	1.25 (1.11–1.41)	1.88 (1.15–3.07)	1.38 (0.93–2.07)	1.16 (0.95–1.41)
Never smoked	1.00	1.00	1.00	1.00	1.00
Alcohol consumption					
Heavy and/or binge drinker	0.30 (0.27–0.32)	0.32 (0.25–0.42)	0.62 (0.15–2.49)	0.29 (0.13–0.64)	0.47 (0.32–0.68)
Moderate drinker	0.56 (0.54–0.58)	0.71 (0.64–0.79)	0.56 (0.37–0.85)	0.51 (0.34–0.75)	0.63 (0.52–0.75)
Nondrinker	1.00	1.00	1.00	1.00	1.00
Physically active					
Yes	1.00	1.00	1.00	1.00	1.00
No	1.68 (1.61–1.74)	1.23 (1.11–1.36)	1.79 (1.08–2.94)	1.15 (0.83–1.60)	1.03 (0.86–1.24)
Weight status					
Underweight	0.70 (0.57–0.85)	0.73 (0.39–1.36)	0.15 (0.06–0.39)	1.56 (0.35–7.01)	0.94 (0.46–1.92)
Normal	1.00	1.00	1.00	1.00	1.00
Overweight	1.94 (1.85–2.04)	1.87 (1.60–2.18)	1.17 (0.72–1.90)	1.58 (0.95–2.64)	1.23 (0.94–1.61)
Obese	5.25 (5.00–5.52)	3.36 (2.90–3.89)	3.97 (1.99–7.94)	4.15 (2.49–6.90)	2.67 (2.06–3.47)
No. of unhealthy lifestyle factors†					
0	1.00	1.00	1.00	1.00	1.00
1	2.35 (2.22–2.50)	1.76 (1.45–2.15)	1.72 (1.04–2.84)	3.86 (2.33–6.40)	1.33 (0.96–1.84)
≥2	3.13 (2.94–3.33)	2.04 (1.67–2.50)	2.79 (1.52–5.13)	3.75 (2.26–6.20)	1.31 (0.94–1.82)

AOR = adjusted odds ratio; CI = confidence interval.
* Adjusted for age, sex, education, marital status, and healthcare coverage.
† Unhealthy lifestyle factors include current smoking, heavy and/or binge drinking, physical inactivity, and body mass index <18.5 kg/m^2 or ≥25 kg/m^2.

Table 3. Associations between selected unhealthy lifestyle factors and asthma among adults ≥50 years of age, by race/ethnicity, Behavioral Risk Factor Surveillance System, 2001–2004

Category*	Non-Hispanic White AOR (95% CI)	Non-Hispanic Black AOR (95% CI)	Non-Hispanic Asian AOR (95% CI)	Non-Hispanic American Indian AOR (95% CI)	Hispanic AOR (95% CI)
Smoking status					
Current smoker	1.22 (1.16–1.30)	1.14 (0.94–1.37)	0.63 (0.16–2.49)	1.46 (0.83–2.56)	1.54 (1.11–2.15)
Former smoker	1.44 (1.37–1.50)	1.60 (1.34–1.91)	1.09 (0.48–2.49)	1.33 (0.81–2.19)	1.69 (1.27–2.25)
Never smoked	1.00	1.00	1.00	1.00	1.00
Alcohol consumption					
Heavy and/or binge drinker	0.66 (0.60–0.72)	0.92 (0.66–1.28)	1.20 (0.23–6.25)	0.48 (0.22–1.04)	0.78 (0.48–1.27)
Moderate drinker	0.80 (0.77–0.83)	0.95 (0.81–1.12)	1.16 (0.60–2.25)	0.91 (0.59–1.40)	0.75 (0.58–0.97)
Nondrinker	1.00	1.00	1.00	1.00	1.00
Physically active					
Yes	1.00	1.00	1.00	1.00	1.00
No	1.52 (1.46–1.59)	1.48 (1.27–1.71)	1.27 (0.59–2.74)	1.81 (1.23–2.68)	1.39 (1.07–1.81)
Weight status					
Underweight	1.68 (1.43–1.97)	1.12 (0.61–2.07)	0.53 (0.09–3.12)	0.74 (0.21–2.58)	1.45 (0.71–2.95)
Normal	1.00	1.00	1.00	1.00	1.00
Overweight	1.14 (1.08–1.20)	1.15 (0.94–1.42)	0.93 (0.43–2.03)	1.67 (1.03–2.72)	1.05 (0.75–1.48)
Obese	1.93 (1.83–2.04)	1.92 (1.58–2.34)	0.45 (0.17–1.23)	2.24 (1.35–3.71)	2.31 (1.66–3.21)
No. of unhealthy lifestyle factors†					
0	1.00	1.00	1.00	1.00	1.00
1	1.37 (1.29–1.46)	1.31 (0.97–1.76)	0.88 (0.42–1.82)	1.63 (0.82–3.26)	1.67 (1.11–2.51)
≥2	1.73 (1.62–1.84)	1.80 (1.35–2.41)	0.97 (0.37–2.51)	3.04 (1.51–6.13)	2.27 (1.52–3.38)

AOR = adjusted odds ratio; CI = confidence interval.
* Adjusted for age, sex, education, marital status, and health care coverage.
† Unhealthy lifestyle factors include current smoking, heavy and/or binge drinking, physical inactivity, and body mass index <18.5 kg/m^2 or ≥25 kg/m^2.

Table 4. Associations between selected lifestyle factors and hypertension among adults ≥50 years of age by race/ethnicity, Behavioral Risk Factor Surveillance System, 2001 and 2003

Category*	Non-Hispanic White AOR (95% CI)	Non-Hispanic Black AOR (95% CI)	Non-Hispanic Asian AOR (95% CI)	Non-Hispanic American Indian AOR (95% CI)	Hispanic AOR (95% CI)
Smoking status					
Current smoker	0.78 (0.75–0.82)	0.80 (0.67–0.95)	0.59 (0.27–1.30)	0.98 (0.60–1.61)	0.96 (0.73–1.28)
Former smoker	1.04 (1.01–1.08)	1.32 (1.13–1.54)	0.93 (0.53–1.63)	0.75 (0.46–1.20)	1.11 (0.88–1.39)
Never smoked	1.00	1.00	1.00	1.00	1.00
Alcohol consumption					
Heavy and/or binge drinker	0.88 (0.82–0.94)	0.71 (0.54–0.95)	0.33 (0.15–0.72)	0.89 (0.42–1.88)	0.92 (0.61–1.38)
Moderate drinker	0.84 (0.81–0.88)	0.84 (0.74–0.97)	1.03 (0.67–1.58)	0.73 (0.48–1.10)	0.81 (0.66–1.00)
Non-drinker	1.00	1.00	1.00	1.00	1.00
Physically active					
Yes	1.00	1.00	1.00	1.00	1.00
No	1.28 (1.23–1.33)	1.24 (1.08–1.42)	1.24 (0.78–1.97)	1.56 (1.05–2.34)	1.29 (1.05–1.58)
Body mass index					
Underweight	0.91 (0.79–1.04)	0.83 (0.50–1.38)	0.36 (0.11–1.16)	3.26 (1.00–10.66)	1.41 (0.50–3.95)
Normal	1.00	1.00	1.00	1.00	1.00
Overweight	1.78 (1.71–1.85)	1.65 (1.40–1.96)	1.91 (1.19–3.06)	2.00 (1.24–3.22)	1.48 (1.15–1.90)
Obese	3.47 (3.31–3.64)	2.98 (2.48–3.58)	7.14 (3.30–15.46)	2.65 (1.50–4.66)	3.20 (2.43–4.20)
No. of unhealthy lifestyle factors†					
0	1.00	1.00	1.00	1.00	1.00
1	1.91 (1.83–2.00)	1.55 (1.24–1.93)	1.50 (0.94–2.41)	1.67 (0.93–2.99)	1.50 (1.11–2.01)
≥2	2.20 (2.09–2.31)	1.83 (1.46–2.28)	1.35 (0.74–2.49)	2.38 (1.34–4.21)	2.32 (1.69–3.17)

AOR = adjusted odds ratio; CI = confidence interval.

* Adjusted for age, sex, education, marital status, and health care coverage.

† Unhealthy lifestyle factors include current smoking, heavy and/or binge drinking, physical inactivity, and body mass index <18.5 kg/m^2 or ≥25 kg/m^2.

than those who never drank to have each of these conditions or the associations were insignificant.

Generally, the risk for each of the five health conditions was positively associated with the number of unhealthy lifestyle factors that respondents had. In each racial/ethnic group, the most common combinations of unhealthy lifestyle factors were physical inactivity and an unhealthy weight followed by current smoking and an unhealthy weight.

DISCUSSION

Our study, unlike other studies, used data from a state-based survey to examine the association between unhealthy lifestyle factors, health conditions, and BMI among US racial/ethnic groups ≥ 50 years of age. Overall, we found that Asians had a lower prevalence of chronic conditions than any other racial/ethnic group of individuals ≥50 years of age. This seemed to be, in part, due to their healthier lifestyle: compared to other racial/ethnic groups, Asians generally had a lower prevalence of the health risk behaviors examined—heavy and/or binge drinking, smoking, physical inactivity, and overweight or obesity. Moreover, Asians (and NH Whites) had a higher prevalence of healthcare coverage compared to other racial/ethnic groups. All racial/ethnic groups seemed to have a higher prevalence of one or more chronic conditions attributable to a higher prevalence of one or more risk behaviors. Moreover, within all races/ethnicities, we found a strong association between the prevalence of physical inactivity and the number of unhealthy lifestyle factors and the prevalence of the five chronic conditions examined; as well as between BMI status and the prevalence of these conditions.

Our results are consistent with previous studies which focused on selected race/ethnic groups showing an association between obesity and serious adverse health consequences, including an increased risk for hypertension, diabetes, and other chronic conditions.[10–15] In other similar studies, researchers analyzing data from the Canadian National Population Health Survey showed BMI to be associated with heart disease, stroke, hypertension, diabetes, and arthritis,[16] as did those analyzing data from the BRFSS and the National Health and Nutrition Examination Survey (NHANES).[7,12] Research results from a 10-year followup of the Nurses' Health Study and the Health Professionals Follow-up Study similarly

…those who consumed alcohol were either less likely than those who never drank to have each of these conditions or the associations were insignificant.

Overall, we found that Asians had a lower prevalence of chronic conditions than any other racial/ethnic group of individuals ≥50 years of age.

showed that BMI was significantly associated with the risk of developing diabetes, hypertension, heart disease, and stroke.[17] In addition to generally confirming these previous findings, we also showed that BMI was associated with hypertension, diabetes, and arthritis among members of all major US racial/ethnic groups ≥50 years of age.

Our findings also showed a strong association between smoking and one or more chronic conditions among members of all racial/ethnic groups. NH Whites and Blacks who formerly smoked were more likely than those who had never smoked to have all five of the health conditions examined. NH Whites and Hispanics who currently smoke were more likely than those who had never smoked to have asthma and doctor-diagnosed arthritis. There was a modest, inverse relationship between current smoking and diabetes and hypertension among NH Whites and Blacks. Selective survival may be a partial explanation for this finding: Smoking is a major cause of morbidity and mortality,[1] resulting in a surviving population of people who were more resilient to adverse effects of smoking. It is also feasible that some of the persons classified as current smokers, started smoking late in life or smoke infrequently and have not yet experienced the adverse health effects attributable to smoking.[1] We were unable to explore these findings further due to the cross-sectional nature of our study and survey limitations. Notably, of the five racial/ethnic groups examined, Asians were the only population to have a significantly increased likelihood of diabetes among those who were current smokers compared to those who never smoked (AOR = 2.84, CI = 1.32–6.15). Health promotion programs specifically targeted toward Asian populations may be needed to increase their awareness of the adverse effects of smoking, particularly among those with diabetes.

In addition, our findings showed an inverse relationship between alcohol consumption and chronic conditions for many of the racial/ethnic groups examined. For example, we found that compared to NH Whites, NH Blacks, and Hispanics who were nondrinkers, those who were heavy and/or binge drinkers or moderate drinkers were less likely to have diabetes. This finding may be partially explained by research conducted by Ahmed, Karter, and Liu.[18] These researchers found that, compared to the general US population, persons with diabetes in the insured population have lower levels of alcohol consumption. Similarly, in each racial/ethnic group we examined, persons with diabetes were more likely to be nondrinkers compared to the entire population, as well as to those who did not have the disease. In addition, data have shown that older people are less likely to engage in risky drinking behaviors.[1] This may be due to a variety of reasons: declining health, increased prescription drug use that prevents concurrent alcohol use, and receipt of medical advice to drink in moderation (or quit), or if a nondrinker, not to start drinking.[19–21] Furthermore, because of the possibility of selective survival, it is plausible that persons ≥50 years of age who still engage in risky drinking behaviors are more resilient to its adverse effects.[22] While there is evidence that there may be some health benefits (ie, cardiovascular, psychological, cognitive functioning) associated with moderate alcohol consumption, there is also the risk of increased injury, stroke, lower adherence with self-care behaviors, interaction with medications, breast cancer, and the potential for a shift to heavier drinking.[18,20–22] Additional research is needed to examine the relationship between alcohol consumption and chronic disease.

We also found a high prevalence of physical inactivity among members of all racial/ethnic groups. Physical inactivity is a strong risk factor for cardiovascular disease and is also strongly associated with overall mortality rates. In our study, physical inactivity was associated with diabetes, hypertension, and arthritis. These findings were expected given that physical activity has been shown to improve plasma and lipid profiles, reduce body weight, lower blood pressure, improve cardiac function, and reduce insulin resistance.[23]

Our study is subject to at least four limitations. First, because the BRFSS does not collect information from people who are institutionalized (eg, residents of nursing homes and correctional facilities) or from people without landline telephones, the survey population may not be representative of the US population of people ≥50 years of age. Second, because BRFSS data are based on self-reports of survey participants whose responses are subject to recall bias, the prevalence of certain behaviors and chronic conditions may be underestimated. Third, because we examined the relationship between unhealthy lifestyle factors and each chronic disease independently (ie, we did not adjust for additional comorbidities), residual confounding may have occurred. Finally, small sample size may have limited our ability to detect significant associations between certain health risk behaviors and chronic conditions by race/ethnicity.

Despite these limitations, our results provide evidence that BMI is strongly associated with diabetes, hypertension, and arthritis among older adults of all racial/ethnic backgrounds. Although we found significant racial/ethnic disparities in the prevalence of chronic diseases and unhealthy lifestyle factors, we also

found that overweight and obesity were associated with an increased risk for chronic diseases among all adults ≥ 50 years of age, regardless of their race or ethnicity. Furthermore, we found that for each racial/ethnic group examined, the most common combination of unhealthy lifestyle factors was the absence of physical activity and an unhealthy weight. Given that certain health behaviors tend to cluster together,[24] the opportunity exists to efficiently address these adverse health risk factors with evidence-based interventions that are culturally sensitive.

The findings from our study indicate a need for culturally appropriate prevention programs for selected ethnic/racial groups of older adults. Such programs need to accommodate the culturally based habits of particular groups, as well as target behaviors of greatest concern for each. In addition, because differences in how health promotion programs should be adapted to the needs of particular audiences may be related to racial/ethnic differences in how people perceive their health status, research concerning the health status and healthcare needs of all major racial/ethnic groups in the United States is needed.

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