RISK BEHAVIORS BY ETHNICITY AND TEXAS-MEXICO BORDER RESIDENCE

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Objective: To determine whether residence on the Texas-Mexico border would modify the effect of ethnic differences on risk behaviors.

Design: We performed an analysis of 1999–2003 cross-sectional data from the Texas Behavioral Risk Factor Surveillance System (BRFSS).

Setting: Fifteen Texas-Mexico border counties compared with 239 Texas non-border counties.

Participants: 521 White and 1722 Hispanic residents of Texas-Mexico border counties and 16,904 White and 4933 Hispanic residents of Texas non-border counties.

Main Outcome Measures: Health risk behaviors including overweight, obesity, physical inactivity, fruit or vegetable consumption, heavy drinking, binge drinking, and smoking.

Results: Hispanic women and men were more likely to be overweight, obese, and physically inactive, and less likely to consume fewer than five fruits or vegetables per day than Whites regardless of residence. Ethnic differences in heavy and binge drinking differed by residence and sex. After adjustment for age, educational level, annual household income, perceived general health, and diabetes, most behaviors that were higher or lower remained significant among non-border residents but were no longer significant among border residents.

Conclusions: The only evidence of effect modification was binge drinking among males and most associations were weaker among border residents than among non-border residents. (*Ethn Dis*. 2006;16:514–520)

Key Words: Ethnicity, Risk Behaviors, Texas-Mexico Border

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INTRODUCTION

The prevalence of conditions and behaviors that place persons at risk of chronic disease differs by ethnicity. Myers et al[1] conducted a review of existing literature in 1995 of behavioral risk factors by ethnic group in comparison with White non-Hispanics, henceforth referred to as White. As indicated in the review, substantial evidence of obesity was found among female African Americans, Hispanics, Native Americans, and Pacific Islanders. Among African-American females and males >40 years of age, Asians/Pacific Islanders, and Hispanic females, some evidence of no regular exercise was seen. With regard to poor diet, defined as excess intake of dietary fat and inadequate intake of dietary fiber, strong evidence was seen among female African Americans, and some evidence was seen among Asians/Pacific Islanders, Hispanics, and Native Americans. Strong evidence of heavy drinking, defined as consuming more than two alcoholic drinks per day, was seen among African Americans and Native Americans, and some evidence was seen among Southeast Asian males and Hispanic males. Strong evidence of higher smoking rates was seen among African American males >40 years of age, immigrant Asian/Pacific Islander males, Hispanic males, and Native American males; however, strong evidence of lower smoking rates was seen among Hispanic females. Using data from the 2001–2002 Behavioral Risk Factor Surveillance System (BRFSS), Denny et al[2] reported that American Indians/Alaska Natives had higher prevalence of obesity, physical inactivity, and smoking than Whites.

Winkleby et al[3] posited that lower socioeconomic status may explain ethnic disparities in risk behaviors. In subsequent studies with data from the National Health and Nutrition Examination Survey III, Winkleby et al found higher prevalence of obesity and physical inactivity in African American and Hispanic women[4] and smoking in African American men[5] compared to Whites <65 years of age after adjustment for age and educational level or family income. Winkleby and Cubbin[6] assessed changes in health behaviors from 1990 to 2000 by ethnicity, sex, and age by using national BRFSS data. After adjusting 2000 data for educational attainment and annual household income, they found ethnic differences in various age groups (18–24 years, 25–44 years, 54–64 years, 64–74 years) for obesity, sedentary behavior, low vegetable or fruit intake, and smoking.

Few previous studies have investigated the proximity to the US-Mexico border as a community-level measure of socioeconomic status. The US-Mexico border region is one of the poorest in the United States. In 2000, it was the location of 6 of the 10 metropolitan areas with the lowest per capita income, and the three poorest metropolitan areas were located on the Texas-Mexico border.[7] Using BRFSS data, Coughlin et al[8] found that Hispanic women in US-Mexico border counties were less likely to have had a recent mammogram or Pap test than White women in

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border counties and Hispanic and White women in non-border counties. In a study of elderly Mexican Americans, Patel et al[9] reported that the effect of neighborhood disadvantage on poorer self-rated health was two to three times higher among persons living within 50 miles of the US-Mexico border than among other persons. The purpose of the present study was to determine whether residence on the Texas-Mexico border would modify the effect of ethnic differences on risk behaviors. We used data from the BRFSS conducted statewide in Texas to investigate our hypothesis that ethnic differences would be more striking among border residents than among non-border residents.

METHODS

Each year ≈5000–6000 Texas residents complete the cross-sectional statewide BRFSS.[10] Random digit dialing is used to select adults ≥18 years of age who live in a private household to complete a telephone interview. Questions are taken from the Centers for Disease Control and Prevention BRFSS and cover risk behaviors that contribute to morbidity and mortality.[11] The BRFSS does not break down Hispanic ethnicity into its component parts, but 76% of Hispanics in Texas are of Mexican origin.[12] For most risk behaviors, we used the combined 1999–2003 Texas BRFSS consisting of ≈5613 adults annually reflecting ≈15.2 million persons residing in the 254 counties in the state. We excluded persons of ethnicities other than White or Hispanic (n=3,688) and those with missing information on place of residence (n=298) resulting in 24,080 adults for this analysis. Border residence was for the 15 counties contiguous with the Mexico border, and non-border residence was for the remaining 239 counties. Response rates to the Texas BRFSS were 36.2% in 1999, 33.5% in 2000, 39.7% in 2001, 46.2% in 2002, and 41.2% in 2003.

Self-reported weight and height were used to calculate body mass index (BMI=weight in kilograms/height in meters squared). Overweight was defined as a BMI ≥25 kg/m^2, and obese was defined as BMI ≥30 kg/m^2 (obese is a subset of overweight). Physical inactivity was no leisure-time physical activity in the past month. To calculate fruit or vegetable consumption, respondents were asked how many servings of six different fruits and vegetables (fruit juices, fruit, green salad, potatoes, carrots, and other vegetables) they usually consumed per day, week, month or year; consumption of fewer than five servings per day was considered a risk factor. Heavy drinking was defined differently for men and women: averaging two or more alcoholic beverages on a daily basis for men and averaging one or more alcoholic beverage on a daily basis for women during the past month.[11] Binge drinking was having five or more alcoholic beverages on one or more occasions in the past month. Smoking was defined as having smoked ≥100 cigarettes and currently smoking.

Probability sample weights were applied to the sample to reflect the population of non-border and border residents for each year of the survey. Weights were derived by multiplying factors accounting for the probability of selection within strata (subsets of area code/prefix combinations), the number of adults in the household, and the number of phones in the household by a post-stratification weight reflecting the age and sex distribution of Texas' adult population (age ≥18 years). The post-stratification weight adjusts for non-coverage and non-response. Data were analyzed by using Survey Data Analysis (SUDAAN) to account for sampling within strata and multiple years of data.[13] Unconditional logistic regression was used to assess the association between ethnicity and risk behaviors while controlling for confounding.[14] An interaction term between ethnicity and border residence was included in logistic regression models, and likelihood ratio tests were performed to examine effect modification. Although the only behavior to exhibit effect modification was binge drinking among males (P value for interaction=.03), we present analyses stratified by border residence for ease of interpretation. We added all theoretically relevant variables as defined in Table 1 as potential confounders, including age, educational level, annual household income, perceived general health, and diabetes. These variables were selected because they address socioeconomic status, perceived health status, and morbidity, which may impact risk behaviors. We also stratified by sex since the effect of ethnicity on risk behaviors appears to differ by sex.

RESULTS

The distribution of potential confounding factors by ethnicity, residence, and sex is presented in Table 1. In comparison to Whites, Hispanics tended to be younger, to be less educated, to have a lower annual household income, and to rate their general health as poor or fair regardless of residence or sex. The prevalence of diabetes was higher among Hispanic than White non-border females, while the reverse was true among border males.

Table 2 shows the prevalence of risk behaviors by ethnicity, residence, and

Table 1. Distribution of potential confounding factors among non-border and border Whites and Hispanics by sex

	WOMEN			
	Non-Border		Border	
	White (*n*=10,046)	Hispanic (*n*=2979)	White (*n*=306)	Hispanic (*n*=1131)
Variable	Weighted %	Weighted %	Weighted %	Weighted %
Age group (years)				
18–24	9.9	20.4	5.2	15.1
25–44	35.6	51.0	29.3	44.7
45–64	32.2	22.0	29.8	29.7
≥65	22.3	6.6	35.7	10.5
Educational level				
<High school	9.0	45.2	9.0	44.2
High school graduate	28.2	25.8	22.8	25.1
Some college	30.7	18.1	33.2	18.8
College graduate	32.1	10.9	35.0	11.9
Annual household income				
<$15,000	10.5	24.4	13.1	33.9
$15,000–$24,999	16.0	33.0	15.1	30.7
$25,000–$44,999	33.7	27.5	37.4	26.2
$45,000–$74,999	17.5	8.6	20.1	5.7
≥$75,000	22.3	6.5	14.3	3.5
Poor or fair perceived general health	15.8	32.1	19.4	34.6
Diabetes	5.9	8.0	8.3	8.1
	MEN			
	Non-Border		Border	
	White (*n*=6858)	Hispanic (*n*=1954)	White (*n*=215)	Hispanic (*n*=591)
Variable	Weighted %	Weighted %	Weighted %	Weighted %
Age group (years)				
18–24	11.4	22.7	10.6	20.0
25–44	38.2	54.0	28.1	46.0
45–64	33.8	20.1	30.0	24.7
≥65	16.6	3.2	31.3	9.3
Educational level				
<High school	7.7	44.5	4.9	34.0
High school graduate	25.2	28.0	23.9	32.2
Some college	27.2	17.2	31.6	21.5
College graduate	39.9	10.3	39.6	12.3
Annual household income				
<$15,000	5.6	20.4	6.8	30.3
$15,000–$24,999	12.8	33.3	16.6	30.5
$25,000–$44,999	33.0	31.5	37.0	26.8
$45,000–$74,999	20.3	8.0	16.1	7.8
≥$75,000	28.3	6.8	23.5	4.6
Poor or fair perceived general health	13.6	27.8	11.5	25.1
Diabetes	6.8	6.4	9.7	7.0

sex. Hispanics of both sexes and residences were more likely to be overweight, obese, physically inactive, and consume fewer than five fruits or vegetables per day than Whites. Hispanic females were less likely to engage in heavy drinking and smoking than White females, little difference was seen in the prevalence of binge drinking comparing Hispanic and White females regardless of residence. In comparison with White males, Hispanic males were more likely to drink heavily, to binge drink, and to smoke than Whites, regardless of residence.

Table 3 presents the unadjusted and adjusted odds ratios (OR) and 95% confidence intervals (CI) for risk beha-

Table 2. Prevalence of risk behaviors among non-border and border Whites and Hispanics by sex

	WOMEN			
	Non-Border		Border	
	White	Hispanic	White	Hispanic
Behavior	Weighted %	Weighted %	Weighted %	Weighted %
Overweight	46.3	63.1	50.3	65.4
Obese	19.1	29.9	21.8	31.5
Physically inactive	24.9	42.0	24.4	38.6
Consumed <5 fruits or vegetables per day	71.8	74.1	67.6	73.8
Heavy drinking	5.5	3.0	2.8	2.3
Binge drinking	8.6	9.0	5.9	5.9
Smoking	22.4	12.6	19.8	11.5
	MEN			
	Non-Border		Border	
	White	Hispanic	White	Hispanic
Behavior	Weighted %	Weighted %	Weighted %	Weighted %
Overweight	68.4	70.2	72.2	72.7
Obese	23.0	27.4	18.3	27.8
Physically inactive	20.5	38.3	15.0	25.6
Consumed <5 fruits or vegetables per day	81.3	82.8	80.4	84.9
Heavy drinking	7.5	9.3	6.2	7.7
Binge drinking	24.0	35.3	25.4	30.7
Smoking	25.1	29.2	19.8	25.6

Table 3. Odds ratios for risk behaviors among non-border and border Hispanics relative to Whites by sex

	WOMEN			
	Non-Border		Border	
Behavior	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Overweight	1.98 (1.73–2.27)	1.79 (1.48–2.17)	1.86 (1.32–2.62)	1.36 (.89–2.09)
Obese	1.81 (1.57–2.08)	1.48 (1.29–1.70)	1.65 (1.24–2.20)	1.15 (.72–1.86)
Physically inactive	2.19 (1.77–2.71)	1.35 (1.14–1.58)	1.95 (1.73–2.19)	1.44 (.89–2.33)
Consumed <5 fruits or vegetables per day	1.12 (.87–1.45)	.77 (.63–.94)	1.35 (.72–2.54)	.82 (.39–1.72)
Heavy drinking	.54 (.41–.70)	.60 (.39–.94)	.81 (.19–3.48)	1.41 (.23–8.68)
Binge drinking	1.05 (.82–1.35)	.83 (.70–.99)	1.01 (.47–2.18)	.62 (.25–1.57)
Smoking	.50 (.39–.64)	.26 (.18–.38)	.53 (.30–.93)	.30 (.15-.62)
	MEN			
	Non-Border		Border	
Behavior	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)	Unadjusted OR (95% CI)	Adjusted OR* (95% CI)
Overweight	1.09 (.82–1.45)	1.36 (1.02–1.81)	1.03 (.68–1.55)	1.20 (.70–2.08)
Obese	1.26 (.98–1.63)	1.26 (.94–1.68)	1.72 (1.05–2.81)	1.43 (.84–2.45)
Physically inactive	2.41 (2.13–2.71)	1.33 (1.10–1.60)	1.95 (1.43–2.66)	.97 (.47–2.02)
Consumed <5 fruits or vegetables per day	1.10 (.90–1.36)	.81 (.68–.97)	1.36 (.77–2.42)	.83 (.46–1.51)
Heavy drinking	1.27 (.94–1.73)	.97 (.66–1.44)	1.27 (.67–2.42)	1.06 (.70–1.62)
Binge drinking	1.73 (1.39–2.14)	1.21 (.99–1.49)	1.30 (.86–1.97)	.90 (.49–1.63)
Smoking	1.23 (1.05–1.45)	.57 (.49–.67)	1.39 (.59–3.25)	.78 (.28–2.18)

OR=odds ratio; CI=confidence interval.

* Adjusted for age, educational level, annual household income, perceived general health, and diabetes.

viors associated with ethnicity and residence among women and men, respectively. Adjustment weakened most associations, strengthened some associations (smoking in women and overweight in men), and reversed some associations (consumption of fewer than five fruits or vegetables per day, heavy drinking in border women, binge drinking in border men, and smoking in men). With the exception of physical inactivity in border males, Hispanics of each sex were more likely than Whites to be overweight, obese, and physically inactive. In contrast, Hispanics were less likely than Whites to consume fewer than five fruits or vegetables per day and to smoke. After adjustment these findings were significant among non-border residents but not among border residents. The findings for heavy and binge drinking were mixed by residence and sex. Although the *P* value for interaction was not significant for heavy drinking among females ($P=.49$), the odds ratios are on either side of the null-value of 1.0 indicating Hispanic women who did not live on the border were less likely to drink heavily than White women, while Hispanic women who did live on the border were more likely to drink heavily than White women. The opposite pattern was seen for binge drinking in men (*P* value for interaction=.03) with non-border Hispanics more likely to binge drink than Whites and border Hispanics less likely to drink than Whites. Hispanic women were less likely to binge drink than White women regardless of residence, and little difference in heavy drinking was seen by ethnicity or residence among men.

DISCUSSION

Our findings of higher rates of overweight and obesity among Hispanics of both sexes than among Whites regardless of border residence are comparable to results from several studies. The Stanford Five-City Project reported higher mean values of BMI among Mexican Americans overall,[15] the San Antonio Heart Study reported higher mean values of BMI among Mexican Americans of both sexes,[16] and an analysis of the NHANES III reported higher mean values of BMI among Mexican American females[4] than their White counterparts. The New York City BRFSS defined overweight as >110% ideal Metropolitan relative weight and obesity as >120% of ideal weight.[17] They found elevations in overweight and obesity among Hispanic females relative to White females but not among males. In an analysis of changes in health behaviors between 1990 and 2000 that used national BRFSS data, Winkleby and Cubbin[6] found higher prevalences of obesity among Hispanics than among Whites; however, the differences appeared to be narrowing between 1990 and 2000. With the exception of obesity among men, our study found smaller differences among border than non-border residents for overweight and obesity, which may reflect a narrowing of the White-Hispanic gap on the border that is not evident in the non-border region.

We saw higher levels of physical inactivity among Hispanics relative to Whites, limited to non-border males, which is similar to the findings of most other studies. A modified BRFSS telephone survey conducted in San Francisco reported significantly higher levels of no leisure-time physical activity among Latinos of both sexes compared to Whites.[18] Burchfiel et al[19] completed personal interviews as part of the San Luis Valley Diabetes Study and reported higher levels of physical inactivity, defined as work-related, among Hispanics of both sexes compared to Whites in Colorado. In the New York City BRFSS, Hispanics had higher levels of physical inactivity, defined as exercise fewer than three times per week, than Whites.[17] No significant ethnic differences in physical inactivity were seen, which incorporated work and leisure-time, in the Stanford Five-City Project.[15] An analysis of NHANES III that focused on women reported that Hispanic women were more likely to do no leisure-time physical activity than White women.[4] In a comparison of no leisure-time physical activity that used national BRFSS data for 2000, Hispanics were more likely to be sedentary than Whites for all persons except those age 65–74 years.[6] Like other studies, we were unable to incorporate work-related activity into our measure of physical inactivity, which tends to underestimate total amount of physical activity because Hispanics' employment is more likely to be physically active than Whites' employment.

The higher consumption of fruits or vegetables among Hispanics compared to Whites in our study differs from most, but not all, studies of ethnic differences of fruit or vegetable consumption. A comparison of the Hispanic Health and Nutrition Examination Survey (HHANES) with NHANES II showed that Mexican American women consumed fewer servings of fruits or vegetables than White women.[20] Shea et al[21] completed telephone interviews modeled after the BRFSS in New York City and reported lower consumption of vegetables among Latinos than among Whites. Otero-Sabogal et al[22] conducted telephone interviews in the San Francisco Bay Area Study and found that Latinos were more likely to eat fewer than three servings of fruits or vegetables on the previous day than Whites. Using personal interview data from the Stanford Five-City Project, Winkleby et al[23] reported no difference in fruit or vegetable consumption by ethnicity. Winkleby and Cubbin[6] used national BRFSS data in 2000 to assess low fruit or vegetable intake, defined as less than three servings per day, and found, with the exception of the 45- to 64-year-old age group, Hispanics had lower levels of low fruit or vegetable intake than

Whites.[6] Our findings, like those of Winkleby and Cubbin,[6] may reflect the greater contribution of socioeconomic status than that of ethnicity for fruit or vegetable intake, since adjustment for socioeconomic status reversed the unadjusted positive associations.

The ethnic differences we saw for drinking differed by residence and sex. Hispanic females who lived on the border were more likely to drink heavily than White females, while Hispanic females who did not live on the border were less likely to drink heavily than White females. Binge drinking was lower among Hispanic women than White women regardless of residence. Little difference in ethnicity for heavy drinking was seen among men. Hispanic men who lived on the border were less likely to binge drink than White men, but Hispanic men who did not live on the border were more likely to binge drink. Results of other studies of ethnic differences in drinking have been mixed. Otero-Sabogal et al[22] reported lower rates of any drinking in the past month and higher rates of binge drinking among Latinos overall than among Whites in the San Francisco Bay Area Study. The San Francisco BRFSS found lower rates of any drinking in Latinos than Whites of both sexes but no difference in binge drinking.[18] In a nationally representative survey that used personal interviews, Caetano and Clark[24] reported higher rates of binge drinking among Hispanic men than among White men. No significant differences in drinking were seen between Mexican Americans and Whites in the Stanford Five-City Project.[15] Guendelman and Abrams[20] reported much lower levels of drinking among Mexican American women in HHANES than among White women in NHANES II. In a study conducted on the US-Mexico border that used personal interviews, Holck et al[25] reported that Mexican American women were more likely to abstain from alcohol than White women. The differing effect of residence on heavy drinking in females and on binge drinking in males in our study may be a function of socioeconomic status since adjustment for socioeconomic status reversed the negative association among females and the positive association among males.

We found a lower likelihood of current smoking among Hispanics compared with Whites regardless of border residence. This finding is in agreement with most studies of this topic.[4,6,15,17,18,20,23] One exception is the San Francisco Bay Area Study, which reported no ethnic differences for current smoking but did find that Latinos were more likely to be never-smokers than Whites.[22] Another exception is the San Luis Valley Diabetes Study, which reported a non-significantly higher prevalence of current smoking among Hispanic females than among White females.[19] In our study, Hispanic men were more likely to smoke than White men before adjusting for socioeconomic status, which indicates that smoking among males may be related more to socioeconomic status than to ethnicity.

This study was not without limitations. Incomplete telephone coverage (2000 Texas Whites 98%; Hispanics 94%),[26] and low response rates may have introduced selection bias, especially if persons less likely to engage in risk behaviors were more likely to respond to the survey. We were unable to determine whether response rates differed by ethnicity or border residence, which would have resulted in substantial bias. Risk behaviors are based on self-report and are prone to misclassification. An additional limitation of our study is the failure of the BRFSS to break down Hispanic ethnicity into its component parts. Although most Hispanics in the Texas BRFSS are Mexican American, other Hispanic groups with differing risk profiles are included. Small numbers of border residents limited study power to assess effect modification. Analysis at the county level may be a limitation since socioeconomic status of census tracts within counties tends to vary substantially. Future research of this issue should examine census tracts or distance from the border as a community-level measure of socioeconomic status.

To our knowledge, this is the first study to assess ethnic differences in health behaviors with proximity to the US-Mexico border as a community-level measure of socioeconomic status. We hypothesized that ethnic differences would be more striking among border residents than among non-border residents because of the extreme poverty of the Texas-Mexico border region. This was not the case, and most associations were weaker for border residents than for non-border residents. The one behavior that exhibited effect modification, binge drinking among males, showed a negative association among border residents and a positive association among non-border residents. Possible explanations for these findings are: 1) Whites on the border are of lower socioeconomic status than non-border Whites, which may influence risk behaviors; or 2) Whites on the border engage in risky health behaviors more often than non-border Whites. The average median household income for 1999 among Whites for the 15 border counties ($36,563) was similar to that among Whites for the remaining 239 counties ($37,246), which was not the case for Hispanics (border $21,442, non-border $26,640).[26] Acculturation may be defined as a non-dominant group adopting the cultural attitudes, values, and behaviors of a dominant group. The dominant group on the Texas-Mexico border is Hispanic and accounts for 85% of residents of the 15 Texas counties bordering Mexico in 2000.[12] Thus, Whites living on the border may have adopted the risk behaviors of the dominant Mexican culture. Future studies of ethnic differences should assess adoption of the

Mexican culture by Whites living in predominantly Hispanic areas. Results of this study would argue against targeting specific ethnic groups for behavioral risk factor interventions in favor of universal interventions that can be adapted to be culturally appropriate for all people.

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