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Cervical Cancer Screening in the US–Mexico Border Region: A Binational Analysis

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Abstract

Cervical cancer mortality is high along the US–Mexico border. We describe the prevalence of a recent Papanicolaou screening test (Pap) among US and Mexican border women. We analyzed 2006 cross-sectional data from Mexico's National Survey of Health and Nutrition and the US Behavioral Risk Factor Surveillance System. Women aged 20–77 years in 44 US border counties (n = 1,724) and 80 Mexican border *municipios* (n = 1,454) were studied. We computed weighted proportions for a Pap within the past year by age, education, employment, marital status, health insurance, health status, risk behaviors, and ethnicity and adjusted prevalence ratios (APR) for the US, Mexico, and the region overall. Sixty-five percent (95 %CI 60.3–68.6) of US women and 32 % (95 %CI 28.7–35.2) of Mexican women had a recent Pap. US residence (APR = 2.01, 95 %CI 1.74–2.33), marriage (APR = 1.31, 95 %CI 1.17–1.47) and insurance (APR = 1.38, 95 %CI 1.22–1.56) were positively associated with a Pap test. Among US women, insurance and marriage were

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associated (APR = 1.21, 95 %CI 1.05–1.38 and 1.33, 95 %CI 1.10–1.61, respectively), and women aged 20–34 years were about 25 % more likely to have received a test than older women. Insurance and marriage were also positively associated with Pap testing among Mexican women (APR = 1.39, 95 %CI 1.17–1.64 and 1.50; 95 %CI 1.23–1.82, respectively), as were lower levels of education (≤8th grade or 9th–12th grade versus some college) (APR = 1.74; 95 %CI 1.21–2.52 and 1.60; 95 %CI 1.03–2.49, respectively). Marriage and insurance were associated with a recent Pap test on both sides of the border. Binational insurance coverage increases and/or cost reductions might bolster testing among unmarried and uninsured women, leading to earlier cervical cancer diagnosis and potentially lower mortality.

Keywords

Cervical cancer screening; Pap test; US Mexican border region; BRFSS; ENSANut

Introduction

Women living in the United States-Mexico border region face unique health risks and barriers to adequate health care [1]. The border region extends 2,000 miles from the Pacific coast to the Gulf of Mexico, and includes parts of 4 US states (including 44 counties) and 6 Mexican states (including 80 *municipios*) that lie within 100 km (62 miles) north or south of the US–Mexico border [1, 2]. There are more than 14.2 million inhabitants in the border region, nearly equally divided between Mexico and the US [1, 2]. According to 2000 US census data, nearly half of the population in the US portion of the border region is of Hispanic origin [2]. A greater proportion of inhabitants of the US border region live below the federal poverty level compared to the rest of the US, and women are significantly more likely to be living in poverty than men [1]. United States border residents also have lower levels of education [2] than the national average and they are also less likely to have health insurance [1]. In contrast, the 14 most populated Mexican *municipios* on the border are among the most developed in Mexico, according to their scores on the Human Development Index (HDI), which combines information on gross domestic product per capita, health and education. However, despite higher overall HDI scores brought about by growth in the maquiladora industry in these areas, other indicators of health and well-being, such as quality of housing and access to municipal services, indicate a more complex socioeconomic pattern [2].

The US–Mexico Border Health Commission identified several health priorities for the border region in the *Healthy Border 2010* program [2]. One objective was to reduce the cervical cancer death rate by 20 % in Mexico and 30 % in the US between 2000 and 2010. With an age-adjusted incidence rate of 9.7 per 100,000 women from 1998 to 2003, the US border region exhibits a higher incidence of cervical cancer than non-border counties in border states (9.3 per 100,000, all counties combined) or non-border states overall (8.7 per 100,000) [3]. Although the incidence of the most common cancers in the US is typically lower among Hispanics than non-Hispanic whites [4], the incidence of cervical cancer among Hispanic women in the US border region is nearly twice that of non-Hispanic women [3]. Annual incidence of cervical cancer in Mexico was 19.2 per 100,000 women in 2008

[5]. Cervical cancer incidence data for the Mexican border region are not available. In 2000, mortality rates due to cervical cancer in the border region were 9.4 per 100,000 women in Mexico and 3.7 per 100,000 women in the US [2]. The cervical cancer mortality rate among women living in the US border region decreased from 3.7 per 100,000 in 2000 to 2.7 per 100,000 women in 2005 [1, 6]. Comparable data for the Mexico border region are not available.

Cytology screening by Papanicolaou test (Pap) is the most common method of cervical cancer screening [8]. On both sides of the border, cervical cancer survival is impacted by screening delays or a lack of screening, which leads to both the development of cervical cancer as well as later diagnosis and treatment [2]. The 5-year relative survival for US women diagnosed with localized cervical cancer is 90.9 %, compared to 56.9 % for those with regional metastases and only 16.5 % for those with distant metastases [7]. Low rates of screening and poor adherence to recommended diagnostic follow-up after an abnormal Pap test are thought to contribute to the higher mortality among Hispanic women [9]. It has been estimated that as many as 80 % of deaths from cervical cancer could be prevented by regular Pap screening coupled with adequate patient follow-up for treatment [10].

The 2003 American College of Obstetricians and Gynecologists (ACOG) guidelines recommended screening begin 3 years after initiation of sexual intercourse, but no later than 21 years of age, followed by annual screening through age 29 years. For women age 30 and older, with 3 consecutive negative Pap tests, screening every 2–3 years was recommended [8]. Official recommendations for cervical cancer screening in Mexico were most recently updated in 1998 based upon recommendations of the National Advisory Committee of Standardization of Disease Prevention and Control. The Mexican Secretary of Health recommends screening begin at initiation of sexual activity and occur every 3 years thereafter for women ages 25–64 years who have had two consecutive annual negative cervical cytology test results[11].

In 2006, approximately 63.2 % of US women reported having had a Pap test within the past year [12] compared to 36.1 % of Mexican women [13]. In the US, Hispanic women aged 18–64 years are less likely to undergo cervical cancer screening than non-Hispanic white or non-Hispanic black women [14], and women living in the US border region report lower rates of recent screening than other US women [15]. Other studies in the border region examined somewhat different populations, but showed similar findings [16, 17]. Castrucci et al. [17] found that 95 % of women delivering infants in hospitals in Cameron County, Texas but only 58 % of women delivering in Matamoros, Mexico reported receiving a Pap test within the last 3 years. Another study exploring cervical cancer screening rates among women 40 years or older in the contiguous communities of Douglas, Arizona, and Agua Prieta in Sonora, Mexico, showed that 22.0 % of US residents compared to only 9.3 % of Mexican residents reported a recent Pap test [16].

The primary objectives of our analysis are (1) to describe the prevalence of Pap testing in the year prior to interview in 2006 among women aged 20–70 years living in the US–Mexico border region, (2) to examine differences in the prevalence of Pap testing between women living in the US and Mexican sections of the region, and (3) to identify

sociodemographic factors that may be associated with having received a recent Pap test among women living in the US border counties, Mexican border *municipios*, and entire US–Mexico border region.

Methods

Data sources

We used data collected during 2006 from two separate surveys—the Behavioral Risk Factor Surveillance System (BRFSS) and the Mexican National Survey of Health and Nutrition (ENSANut)—to study prevalence of receipt of a recent Pap test in US border counties and Mexican border *municipios*.

BRFSS is an annual telephone sample survey of non-institutionalized adults 18 years or older living in the US BRFSS is conducted by the states and US territories in collaboration with the Centers for Disease Control and Prevention. Respondents are identified through a stratified probability sampling design that allows for the estimation of state-specific data on risk behaviors, preventative health practices, health status, and selected chronic diseases [18]. Details regarding sampling methodology, data collection, and question validity and reliability are available elsewhere [12]. In 2006, BRFSS included 355,710 interviews with adult men and women, of whom 23,956 resided in the 4 US border states of Texas, New Mexico, Arizona, and California, representing approximately 49.4 million people, or 21.7 % (95 %CI 21.5–22.0) of the US population of non-institutionalized adults 18 years of age or older. The response rate ranged from 59 to 68 % in the four border states in 2006. Within these states, 4,805 interviews with adults residing in the 44 border counties were conducted, representing a population of 5.2 million, closely approximating the border adult population (5.1 million adults aged 18 or older) [19].

ENSANut is a national household sample survey of all Mexican states conducted by the National Institute of Public Health and is administered every 6 years through in-person interviews. The purpose of ENSANut is to obtain data on prevalence of selected chronic and infectious diseases and associated risk factors, health and nutritional status of children and adults, perception of quality and access to health care in the Mexican population, and household characteristics. ENSANut uses a multi-stage, stratified random sampling design to select households. Within each household, respondents are randomly selected to complete one or more of five surveys, depending upon family composition: household, health services user, adult (ages 20 and above), child (ages 0–9), and adolescent (ages 10–19) [20]. Further details are available elsewhere [21]. In 2006, ENSANut included interviews with 45,241 adults (men and women), of which 8,109 resided in the border states of Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon, and Tamaulipas, representing approximately 10.8 million adult residents. There were 3,114 adult responses in the 80 border *municipios* of Mexico, representing a border adult population of 4.1 million, approximately 94 % of Mexico's adult (ages 20 and older) border population (4.4 million adults ages 20 and older) [22]. The response rates for ENSANut ranged from 88 to 97 % in the 6 border states [20].

Study Sample and Variables

We used the age, sex, and state variables in the national BRFSS dataset to identify eligible women ages 20–70 living in the US border states (Arizona, California, New Mexico, and Texas). To identify which US women resided in border counties, we used the Federal Information Processing Standard codes [23], which are included in the BRFSS dataset. Similarly, in the ENSANut dataset, we identified eligible Mexican women who were ages 20–70 and resided in the Mexican border counties, or *municipios* of Mexican border states (Baja California, Sonora, Chihuahua, Coahuila, Nuevo Leon and Tamaulipas) by using the variables for age, sex, state, and *municipio* [24]. We excluded all women who reported a prior hysterectomy or had missing or unknown values for this variable in either dataset (n = 653, BRFSS, and n = 135, ENSANut). In addition, we omitted all cases with missing data on other variables of interest. This resulted in exclusion of 80/1,804 (4.4 %) eligible women from the BRFSS sample and 15/1,469 (1.0 %) from the ENSANut sample, for a final analytic sample of 1,724 US border women and 1,454 Mexican border women.

We examined the representativeness of each border sub-sample by comparing weighted age distributions of women in BRFSS and ENSANut to 2006 US [19] and Mexican [22] population estimates, respectively. No significant differences were found between BRFSS and the 2006 US population estimates; however, significant differences were observed between ENSANut and the 2006 Mexican population estimates. Therefore, we re-weighted the ENSANut survey data to correct any potential bias arising from the under-representation of women aged 20–24 years (population: 15.6 %; ENSANut: 12.5 %, 95 %CI 10.7–14.7 %) and over-representation of women aged 35–39 years (population: 13.3 %; ENSANut: 15.6 %, 95 %CI 13.7–17.9 %).

Our outcome of interest was history of a Pap test within the past 12 months, since this measure was included on both surveys. Based on existing literature, we chose covariates for analysis that have been shown to influence Pap screening. The sociodemographic covariates, included age (20–34, 35–44, 45–54, and 55–70 years); marital status (married/unmarried); education (less than 8th grade/never attended school, some high school [grades 9–11], high school graduate [grade 12]/General Educational Development (GED), and college or higher); and employment (employed/unemployed). In addition, we examined health care and risk behavior covariates, including possession of health care coverage (yes/no); perceived health status (excellent/*muy bueno*, very good or good/*bueno*, fair/*regular*, and poor/*malo* and *muy malo*), smoking (at least 100 lifetime cigarettes); and recent binge drinking (4 or more drinks on ≥1 occasion in the past 30 days). In the BRFSS dataset, we also considered ethnicity (Hispanic/non-Hispanic).

Analysis

>Separate analyses were conducted using US BRFSS data alone, Mexican ENSANut data alone, and the two datasets combined. For women residing in the US border counties and women residing in the Mexican border *municipios*, we first examined the proportion and 95 % confidence interval (CI) of each covariate of interest and the prevalence and 95 % CIs of receiving a Pap test in the last 12 months by each covariate in each dataset. We assessed differences in prevalence using Chi-square tests. We then included all covariates

simultaneously in the model for each dataset. We conducted multivariable logistic regression analyses to examine the relationships between each covariate and receipt of a Pap test, controlling for all other covariates. We calculated adjusted prevalence ratios (APR) based on predicted marginals from the logistic regression model, because having a Pap test is not a rare outcome and calculations of odds ratios may overestimate prevalence risk [25]. A *P* value of 0.05 was used as the significance level for hypothesis testing.

For the combined analysis of the entire US–Mexico border region, we used the original sample weights for BRFSS and the new calculated weights for ENSANut, pooled the data from the two surveys considering the data from each as a different super stratum of the US–Mexico border population, and then applied design-based methods for estimating a prevalence and its associated factors from complex survey data [26, 27]. For variance estimation, we used a Taylor linearization method [28] that incorporates the survey weights, stratification, and primary sampling units to account for the complex survey designs of both surveys, as implemented in the SAS-callable SUDAAN version 10.0 statistical software [29].

Results

Nearly half of women in the border region overall reported receiving a Pap test within the past 12 months (Table 1). This proportion was higher among women residing on the US side of the border (64.5 %) as compared to the Mexico side (31.9 %). In the US border counties, the majority of women were of Hispanic ethnicity and health care coverage was more prevalent among these women (69.4 %) compared to women who lived in the Mexican border *municipios* (57.7 %). Women living in the border *municipios* had much lower levels of education, on average, and were less likely to be married than women living in the US border counties.

In the US–Mexico border region overall, prevalence of a recent Pap test was higher among women who were married, employed, or had health care coverage than among women without these characteristics; in addition, prevalence varied with level of education and general health status (Table 2). These findings differed somewhat according to whether women resided on the US or Mexican side of the border. In US border counties, Pap test use was significantly higher among women who were married (69.5 %) or had health care coverage (70.0 %), compared with their unmarried or uninsured counterparts. In the Mexican border *municipios*, Pap test use was more common among women who were married (39.9 %), had an 8th grade education or less (34.2 %), had health care coverage (37.0 %) or were non-smokers (33.4 %). Prevalence of a recent Pap also differed by general health status and age among women from the Mexican border *municipios;* women ages 20–34 years had the lowest prevalence (27.3 %).

In the border region overall, US residence, being married, and having health care coverage were positively associated with Pap testing (Table 3). In the US border counties, women in older age groups (≥35 years were less likely than younger women (20–34 years) to have had a recent test. In addition, married women (APR = 1.21; 95 %CI 1.05–1.38) and women with health insurance (APR = 1.33, 95 %CI 1.10–1.61) were more likely than unmarried and

uninsured women to have been recently tested. In the Mexican border *municipios*, married women (APR = 1.50, 95 %CI 1.23–1.82) and women with health insurance (APR = 1.39, 95 %CI 1.17–1.64) were also more likely to have had a Pap test. However, unlike US women, Mexican women with an 8th grade education or less (APR = 1.74; 95 %CI 1.21–2.52) or 9th–12th grade education (APR = 1.60, 95 %CI 1.03–2.49) were more likely to have had a Pap test than those with at least some college education.

Discussion

In both the US and Mexico, we found the prevalence of recent Pap testing among women living in the border region (64.5 and 31.9 %, respectively) to be comparable to that among their US and Mexican counterparts (63.2 and 36.1 %). As a result, higher mortality rates in the border region might be explained by higher incidence of cervical cancer, later stages of diagnosis of cervical cancer, delayed follow up of abnormal test results [3, 30] and/or other factors not measured here. A 2001 study of the prevalence of Human Papilloma Virus (HPV) among women living in the border region found that age-adjusted rates of infection with oncogenic HPV types were similarly high in the US and in Mexico (12.9 and 11.4 %, respectively) and that most of the same variants were involved [31]. The 2001 study suggests that in addition to the factors cited above, HPV variant may also be a factor contributing to the increased rates of mortality among women living on the border [31]. In the border region in 2006, US residence, being married, and having health insurance were positively associated with recent Pap testing. Older age was negatively associated with a recent Pap in the US border counties but not in the Mexican border *municipios*.

Our results support and strengthen previous findings of binational disparities reported for Pap testing among women aged ≥40 years and living in the border communities of Agua Prieta, Mexico, and Douglas, Arizona, [16], as well as for lifetime Pap testing among women giving birth in the US–Mexico border communities of Matamoros, Mexico, and Cameron County, Texas [17]. These disparities may be partially explained by differences in cervical cancer screening guidelines that existed in both countries in 2006. Although policy guidelines in both countries recommended initiation of testing at the onset of sexual activity, Mexican guidelines have specified that routine screening begin at age 25 years and be conducted every 3 years thereafter [11], while US guidelines recommended that screening start no later than age 21 years, occur annually until age 29 years and be repeated thereafter every 2–3 years for low risk women [8]. Furthermore, in the US, Pap testing has been a routine part of prenatal care since the early 1980s, whereas Mexico has had no similar practice policy in place [32]. These differences may explain why younger women (ages 20–34) in US border counties were more likely than older women (ages 35 and older) to have been tested for cervical cancer. Although prevalence of a Pap test was somewhat higher in older versus younger age groups in the Mexican *municipios*, the difference was not statistically significant for any age group separately.

Previous studies of US border residents have associated lack of a Pap test with being unmarried and lacking health insurance [15, 33, 34]. Our study expands on these findings to also include women on the Mexican side of the border. On both sides of the border, married women may have greater access to health care than unmarried women (through increased

financial security or their husbands' employment benefits) and as a consequence may be more likely to be seen by a physician or to have a regular health care provider. Furthermore, more frequent contact with the medical care establishment provides more opportunities to be offered or request a Pap test.

This study makes an important contribution to women's health in the border region because, to our knowledge, it is the first to make use of data that are representative of the entire US–Mexico border population. We were able to combine BRFSS and ENSANut data to estimate the prevalence of cervical cancer screening and associated factors in women living throughout the US–Mexico border region. These two surveys were conducted in different countries using different methodologies, but have similar purposes and target sections of a single binational US–Mexico border population [12, 21]. Both surveys have comparable core questions and associated response categories regarding household and individual demographic characteristics, health screening, family planning, chronic disease, and health risk behaviors. The ability to combine data from the surveys to examine Pap testing and associated factors suggests that additional analyses to explore other priority health issues in the region can also be conducted with these data.

A limitation of this study is the timeliness of the data. Because ENSANut is conducted only every 6 years and was last conducted in 2006, representative data for the entire region collected more recently than 2006 are not available. We also were limited in the way we could define our outcome as BRFSS collects several measures of Pap test prevalence (previous year, previous 3 years, and lifetime), and ENSA-Nut collects information about cervical cancer screening only within the last year. Our inability to study the prevalence of Pap testing by these other measures may have prevented us from better understanding how national level screening guidelines may contribute to the disparity between the U.S and Mexico border sub-populations. In future analyses of Pap testing patterns in this population, it will be important to investigate whether new 2009 US guidelines have had an impact on the prevalence of testing in the US or Mexican sub-populations, given that both groups are known to cross the border to obtain a variety of health services [35, 36]. The 2009 guidelines delay initiation of screening until age 21, biannual screening until age 30 and screening every 2–3 years for women with 3 consecutive negative cytology tests after age 30 [37], making screening less frequent than previously recommended and more similar to Mexican recommendations.

Lack of health insurance coverage is associated with lower rates of screening in our data. To the extent that insurance coverage facilitates access to timely and comprehensive health services, including cervical cancer screening [38], low rates of coverage in the border region may be partially responsible for low rates of screening. Until access to preventive health services is increased for women in the border region, high cervical cancer mortality may continue to occur in this population. Previous literature indicates that underuse of Pap screening services among US Hispanic and Mexican women may arise from limited awareness, knowledge, and use of medical services [15, 39–42]. Lazcano-Ponce et al. [41] and Aguilar-Perez et al. [42] found that women who have had a Pap test are more knowledgeable about the test and more frequently access medical services than women who have not had a Pap test. Efforts to increase cervical cancer screening awareness among

unmarried and uninsured women throughout the US–Mexico border region may help this population take advantage of existing screening opportunities and increase early diagnosis of cervical cancer (e.g., such as during prenatal care). Considering that 2.7 and 9.4 per 100,000 women ages 25 and older in the US counties and Mexican *municipios*, respectively, die from cervical cancer each year [2], that 2.2 million US and 1.8 million Mexican women in this age group reside in the border region [19, 22], and that 80 % of cervical cancer mortality could be avoided through early detection and treatment [10], we estimate that as many as 192 cervical cancer deaths per year could be prevented in the region through appropriate screening and follow-up. Also, the 2009 US ACOG recommendations [37] are similar to Mexican guidelines and may help increase Pap tests among older women living in the US. Adopting a binational approach to monitoring and addressing cervical cancer screening disparities by targeting older, uninsured, and unmarried women could lead to reductions in cervical cancer mortality in the US–Mexico border region.

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Table 1

Sociodemographic, health care, and risk behavior characteristics of women aged 20–70 years living in US border counties, Mexican border *municipios*, and U.S-Mexico border region overall, 2006 (all percentages are weighted)

Characteristic	US Border counties (n = 1,716)		Mexican Border *Municipios* (n = 1,454)		US–Mexico border region (n = 3,178[a])	
	%	95 % CI	%	95 % CI	%	95 % CI
Had Pap test within the past 12 months	64.5	(60.3–68.6)	31.9	(28.7–35.2)	47.9	(45.0–50.9)
Age (years)						
20–34	38.6	(34.2–43.1)	50.0	(46.7–53.2)	44.3	(41.6–47.1)
35–44	26.2	(22.7–30.1)	24.8	(22.3–27.6)	25.5	(23.3–27.8)
45–54	20.2	(16.9–23.9)	14.1	(12.1–16.3)	17.1	(15.1–19.2)
55–70	15.0	(12.6–17.8)	11.1	(9.3–13.2)	13.1	(11.5–14.8)
Hispanic ethnicity	56.1	(51.8–60.3)	–	–	–	–
Married	61.7	(57.4–65.9)	48.8	(45.2–52.5)	55.2	(52.3–58.0)
Education						
≤ 8th grade	9.7	(7.4–12.7)	70.9	(66.5–74.9)	40.9	(37.5–44.3)
9–12 grade (no degree)	9.5	(7.3–12.4)	10.1	(8.2–12.3)	9.8	(8.3–11.5)
HS graduate or GED[b]	19.5	(16.3–23.2)	6.8	(5.4–8.5)	13.1	(11.3–15.1)
Some college+	61.2	(56.9–65.4)	12.2	(9.7–15.3)	36.2	(33.2–39.4)
Unemployed	41.7	(37.4–46.1)	62.0	(58.5–65.4)	52.1	(49.2–54.9)
General health[c]						
Excellent/*Muy bueno*	21.0	(17.9–24.6)	7.3	(5.8–9.2)	14.1	(12.3–16.1)
Very good + Good/*Bueno*	60.9	(56.6–65.1)	62.3	(59.3–65.2)	61.6	(59.0–64.1)
Fair/*Regular*	14.4	(11.5–18.0)	26.7	(23.9–29.7)	20.6	(18.5–22.9)
Poor/*Malo* + *Muy malo*	3.6	(2.2–5.9)	3.7	(2.7–5.2)	3.7	(2.7–4.9)
Has Health Care Coverage	69.4	(65.1–73.5)	57.7	(53.7–60.3)	63.1	(60.4–65.7)
Ever smoked	24.3	(21.0–28.1)	22.4	(19.8–25.3)	23.4	(21.2–25.7)
Recent Binge drinking[d]	10.2	(7.8–13.1)	7.8	(6.1–9.8)	8.9	(7.5–10.7)

[a] Includes eight observations that were excluded from the US border counties analysis because Hispanic ethnicity was missing (Don't know or Not sure or Refused)

[b] General Equivalency Diploma

[c]The original Behavioral Risk Factor Surveillance System (BRFSS) and Mexican National Survey of Health and Nutrition (ENSANut) variables were recoded from 5- to 4-level measures. Standard and italicized text indicates levels in the original BRFSS and ENSANut variables, respectively, that were included in each level of the new, recoded variable

[d]Drinking 4 or more drinks on at least 1 occasion in past 30 days

Table 2

Prevalence and 95 % confidence intervals for women aged 20 to 70 years living in the US–Mexico border region who received a Pap test in the past year by selected sociodemographic, health care, and risk behavior characteristics (BRFSS and ENSANut 2006, all percentages are weighted)

Covariates	Had Pap test within the last year								
	US border counties (n = 1,716)			Mexican border *Municipios* (n = 1,454)			US–Mexico border region (n = 3,178)[a]		
	%	95 % CI	*P* value[b]	%	95 % CI	*P* value[b]	%	95 % CI	*P* value[b]
Age, years			0.16			0.05			0.49
20–34	70.4	(62.7–77.1)		27.3	(22.9–32.1)		45.7	(41.0–50.4)	
35–44	61.3	(53.3–68.8)		35.5	(30.1–41.3)		48.5	(43.5–53.6)	
45–54	61.7	(51.8–70.7)		39.2	(32.9–47.0)		52.1	(45.7–58.5)	
55–70	59.1	(50.2–67.4)		35.1	(27.6–43.6)		48.7	(42.4–55.1)	
Hispanic ethnicity			0.08						
Yes	61.3	(55.2–67.1)		–	–	–	–	–	
No	68.7	(62.8–74.1)		–	–	–	–	–	
Marital status			<0.01			<0.01			<0.01
Married	69.5	(64.4–74.2)		39.9	(35.3–44.6)		56.2	(52.5–59.8)	
Not married	56.6	(49.2–63.6)		24.2	(20.6–28.2)		37.8	(33.7–42.0)	
Education			0.32			0.01			<0.01
≤ 8th grade	53.3	(39.5–66.6)		34.2	(30.5–38.1)		36.4	(32.7–40.4)	
9–12 grade (no degree)	61.9	(47.7–74.4)		30.9	(23.5–39.4)		45.7	(37.7–53.9)	
HS graduate or GED	66.5	(57.2–74.7)		30.5	(21.2–41.7)		56.9	(49.1–64.3)	
Some college+	66.1	(60.5–71.3)		19.8	(14.1–27.2)		58.2	(53.3–63.0)	
Employment status			0.22			0.85			<0.01
Employed	66.8	(61.2–71.9)		31.6	(27.4–36.1)		52.6	(48.5–56.6)	
Unemployed	61.5	(54.7–67.8)		32.1	(28.2–36.2)		43.7	(39.9–47.5)	
General Health[c]			0.052			0.03			<0.01
Excellent/*Muy bueno*	74.4	(66.1–81.3)		35.5	(25.7–46.7)		64.1	(57.1–70.5)	
Very Good + Good/*Bueno*	60.9	(55.3–66.3)		28.9	(25.2–32.8)		44.4	(40.9–48.1)	
Fair/*Regular*	64.2	(52.9–74.2)		38.2	(32.5–44.1)		47.1	(41.2–53.0)	
Poor/*Malo* + *Muy malo*	69.5	(43.6–87.0)		29.7	(18.2–44.7)		48.6	(34.6–62.8)	
Has Health Care Coverage			<0.01			<0.01			<0.01

Covariates	Had Pap test within the last year								
	US border counties (n = 1,716)			Mexican border *Municipios* (n = 1,454)			US–Mexico border region (n = 3,178)[a]		
	%	95 % CI	*P* value[b]	%	95 % CI	*P* value[b]	%	95 % CI	*P* value[b]
Yes	70.0	(65.3–74.4)		37.0	(33.0–41.2)		54.8	(51.4–58.2)	
No	52.1	(43.7–60.4)		25.1	(21.4–29.1)		36.1	(31.8–40.6)	
Ever Smoked			0.56			0.03			0.19
Yes	62.5	(54.3–70.0)		26.6	(21.8–32.1)		44.9	(39.8–50.2)	
No	65.2	(60.2–69.9)		33.4	(29.8–37.2)		48.8	(45.5–52.2)	
Recent Binge Drinking[d]			0.90			0.19			0.83
Yes	63.8	(50.5–75.3)		25.4	(17.1–35.9)		47.0	(37.8–56.4)	
No	64.6	(60.1–68.9)		32.4	(29.1–35.9)		48.0	(45.0–51.1)	

BRFSS behavioral risk factor surveillance system, *ENSANut* Mexican national survey of health and nutrition, *GED* general equivalency diploma

[a] Includes eight observations that were excluded from the US border counties analysis because Hispanic ethnicity was missing (Don't know or Not sure or Refused)

[b] Chi-square *P* value

[c] The original BRFSS and ENSANut variables were recoded from 5- to 4-level measures. Standard and italicized text indicates levels in the original BRFSS and ENSANut variables, respectively, that were included in each level of the new, recoded variable

[d] Drinking 4 or more drinks on at least 1 occasion in past 30 days

Table 3

Factors associated with receipt of a Pap test in the past year among women aged 20–70 years living in the US and Mexico border region, 2006 (multivariable models were used to mutually adjust results for all covariates)

Predictor/explanatory variables	US border counties (n = 1,716)		Mexico border *Municipios* (n = 1,454)		US–Mexico border region (n = 3,178)[a]	
	Adjusted prevalence ratio	95 % CI	Adjusted prevalence ratio	95 % CI	Adjusted prevalence ratio	95 % CI
Side of the border (ref: Mexico)						
United States					2.01	(1.74–2.33)
Age, years (ref: age 20–34)						
35–44	0.83	(0.72–0.97)	1.19	(0.96–1.47)	0.95	(0.84–1.08)
45–54	0.80	(0.66–0.95)	1.26	(0.97–1.62)	0.94	(0.81–1.10)
55–70	0.80	(0.67–0.96)	1.12	(0.82–1.53)	0.91	(0.77–1.06)
Hispanic (ref: not-Hispanic)	0.95	(0.81–1.11)	–	–	–	
Married (ref: not-Married)	1.21	(1.05–1.38)	1.50	(1.23–1.82)	1.31	(1.17–1.47)
Education (ref: Some college +)						
≤ 8th grade	0.94	(0.71–1.25)	1.74	(1.21–2.52)	1.16	(1.00–1.35)
9th–12th grade	1.08	(0.88–1.33)	1.60	(1.03–2.49)	1.11	(0.92–1.35)
HS graduate/GED	1.11	(0.95–1.30)	1.50	(0.94–2.38)	1.12	(0.95–1.32)
Unemployed (ref: employed)	0.92	(0.81–1.05)	0.90	(0.77–1.06)	0.94	(0.85–1.04)
General health status (ref: Poor/*Malo* + *Muy malo*)[b]						
Excellent/*Muy bueno*	0.93	(0.71–1.21)	1.40	(0.78–2.53)	1.10	(0.83–1.48)
Very good + Good/*Bueno*	0.79	(0.61–1.00)	1.07	(0.62–1.85)	0.89	(0.68–1.18)
Fair/*Regular*	0.92	(0.71–1.20)	1.32	(0.77–2.28)	1.04	(0.79–1.38)
Health insurance (ref: no coverage)	1.33	(1.10–1.61)	1.39	(1.17–1.64)	1.38	(1.22–1.56)
Smoking (ref: non-smoker)	0.99	(0.86–1.14)	0.83	(0.68–1.00)	0.94	(0.83–1.06)
Binge drinking[c] (ref: no binge drinking)	0.98	(0.79–1.21)	0.95	(0.65–1.37)	0.99	(0.82–1.20)

GED general equivalency diploma

[a] Includes eight observations that were excluded from the US border counties analysis because Hispanic ethnicity was missing (Don't know or Not sure or Refused)

[b] The original Behavioral Risk Factor Surveillance System (BRFSS) and Mexican National Survey of Health and Nutrition (ENSANut) variables were recoded from 5- to 4-level measures. Standard and italicized text indicates levels in the original BRFSS and ENSANut variables, respectively, that were included in each level of the new, recoded variable

[c] Drinking 4 or more drinks on at least 1 occasion in the past 30 days