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Exploring the association of homicides in northern Mexico and healthcare access for US residents

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Abstract

Background—Many legal residents in the United States (US)-Mexico border region cross from the US into Mexico for medical treatment and pharmaceuticals. We analyzed whether recent increases in homicides in Mexico are associated with reduced healthcare access for US border residents.

Methods—We used data on healthcare access, legal entries to the US from Mexico, and Mexican homicide rates (2002–2010). Poisson regression models estimated associations between homicide rates and total legal US entries. Multivariate difference-in-difference linear probability models evaluated associations between Mexican homicide rates and self-reported measures of healthcare access for US residents.

Results—Increased homicide rates were associated with decreased legal entries to the US from Mexico. Contrary to expectations, homicides did not have significant associations with healthcare access measures for legal residents in US border counties.

Conclusions—Despite a decrease in border crossings, increased violence in Mexico did not appear to negatively affect access for US border residents.

Keywords

Access to Health Care; Health Services Geographic Accessibility; US-Mexico border region; Crime

Background

Much of the population in the United States (US)-Mexico border region is medically vulnerable, with a high chronic disease burden, low physician supply, and high uninsurance and poverty rates.[1–4] Approximately half the population is Hispanic.[3] The large and rapid

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growth of this population has heightened the importance of addressing healthcare access issues.[2–4]

Multiple factors, including low-priced provider options and looser prescribing requirements in Mexico, dissatisfaction with US healthcare, and language and cultural preferences[5–10] cause US citizens and legal residents residing in the border region to cross into Mexico for medical treatment or to purchase pharmaceuticals. Between 11% and greater than 50% of the population in border regions cross from the US to Mexico to receive health care services.[5–8, 11–12] Crossing is more common among the uninsured, low-income households, the non-elderly, less acculturated immigrants, and those of Hispanic ethnicity.[1,5,11,13–14]

Recent developments in Mexico may affect patterns of border crossing, both generally and for healthcare. Starting in late 2006, efforts to combat drug trafficking resulted in a rapid increase in violence throughout Mexico.[15–16] Almost 100,000 homicides occurred from 2007 to 2011, with the majority attributed to drug-related violence.[17] Rates and trends vary along the border, with some areas experiencing substantial increases; for example, the homicide rate in Chihuahua, the Mexican state adjacent to El Paso, TX, increased 930% from 2005 to 2010, from 20 to 183 homicides per 100,000 population.[18–19]

We use population-representative survey data to examine whether increased violence in northern Mexico is associated with reductions in healthcare access for US border residents.

New Contribution to the Literature

Some evidence of reduced crossing for healthcare due to violence exists, but to our knowledge, only one other study has quantified the effect of the violence on border crossing or healthcare access.[20–23] Geissler et al (2014) found a positive association between homicide rates in Mexico and ambulatory care sensitive hospitalizations in border counties, a proxy for reduced access to care; no association was found between homicide rates and types of emergency department utilization in Arizona and California border counties.[23] A 50% decline in medical tourism by Americans to Mexico was estimated in 2010 due to fear and increased border wait times due to stricter security checks.[24] Shedlin et al (2012) found decreased ability to cross the border due to violence as well as increased wait times and border security served as barriers to HIV care in El Paso.[25] Homedes (2012) notes although border crossing for healthcare may be reduced, the uninsured may continue to seek medical services in Mexico, choosing providers closest to the border to minimize danger.[20] The supply of doctors in the Mexican border region has also been compromised by violence. In heavily affected Juarez and Tijuana, 30–50% of private clinics and pharmacies closed as of 2010.[20, 24]

Since having a usual source of care and access to care are correlated with improved use of preventive health services,[24–27] improved health status, and decreased mortality,[28] any decrease in cross-border care-seeking in response to increased violence could lead to poorer health for an already underserved population in the border region.

Conceptual Model

Our conceptual model (Figure 1) identifies characteristics that are theorized to influence border crossing for healthcare as well as directly influence healthcare access for US residents. We draw on the Behavioral Model for Vulnerable Populations to include characteristics from the predisposing, enabling, and need categories as they relate to health behaviors and health outcomes.[29] As violence increases, the perceived “price” of care in Mexico increases in pecuniary and non-pecuniary ways. The perception of increased personal risk during care seeking, increased border security and wait times, and a decreased supply of Mexican providers all increase the price of care in Mexico. Those US residents previously receiving care in Mexico may either a) pay the increased price and continue seeking care in Mexico, b) substitute care from a Mexican provider with a US provider, or c) forego care altogether. Since violence in Mexico will not directly affect healthcare access for US residents not seeking care in Mexico, the only way it affects these measures is through changes in border crossing.

To empirically test the model, we first assessed whether changes in homicide rates led to changes in total border crossing rates (Path 1 in Figure 1). We were unable to estimate Path 2 separately due to the lack of data, so we estimated the reduced form relationship between homicides and healthcare access measures (i.e, the joint effect of Paths 1 and 2).

Methods

Effect of Homicide Rate on Entries into the US from Mexico

Data and Measures

Dependent Variable: The aggregate number of people entering at each port per month was the measure for analyzing total border crossings, obtained from the US Bureau of Transportation Statistics (2002–2010).[30]

Independent Variables: The primary independent variable of interest was the homicide rate, H, of the Mexican municipality (similar to a county in the U.S.) adjacent to a port. We calculated monthly homicide rates as the number of homicides divided by the Mexican census population estimate, both from the INEGI (Instituto Nacional de Estadística y Geografía; National Institute of Statistics and Geography).[18–19] These data are collected and reported by the Mexican INEGI; although some homicides may not be reported, these statistics are considered the most accurate measure of the total homicide rate in Mexico available systematically.[16]

Individuals may update their view of the risk of border-crossing with some delay; there may be an additional delay in behavior change if the reasons for crossing are not discretionary in the short term (e.g., a person must cross to get from his home to his place of employment). We specify a vector of one- to six- month lags for all analyses, although we examined the sensitivity of the results to various model specifications.

Statistical Analysis: The number of crossings, y, for port j in month t was modeled using a Poisson model:

$$E[y_{jt}]=\exp(b_0+\mathrm{b}_1 H_{j,\mathrm{lag}(t)}+\mathrm{b}_2\mathrm{ExRate}_t+\mathrm{b2UnempRate}_{jt}+\mathrm{b}_2\mathrm{year}_t+m_t+\mu_j+m_t*\mu_j)$$

(Eq. 1)

We controlled for seasonality, secular trends, time-invariant port characteristics, and within-port seasonality. The exchange rate,[31] *ExRate,* and US county unemployment rates,[32] *UnempRate,* controlled for cross-border and local economic conditions. To obtain consistent estimates of standard errors to provide for valid inference, we employed robust standard errors.[33–34] Based on Wald tests for model specification, including six months of lagged homicide rates was preferred to including one month and three months of lagged homicide rates. We calculated the "combined effect" of a one-unit (1 homicide/100,000 population) increase in each of the lags included in the model; it is interpreted as the estimated increase due to a persistent (six month) increase in the homicide rate. Significance was assessed using a Wald test. We conducted sensitivity analyses for the number of months of lagged homicide rates to include, as well as the changes in the unobserved composition of the sample.

Effects of homicide rate and border residence on healthcare access

Data—Healthcare access measures for 2002 to 2010 are from the Behavioral Risk Factor Surveillance System (BRFSS), a cross-sectional national telephone health surveillance survey with individual survey data on demographics, healthcare access and utilization.[35–36] Sampling weights correct for sampling probability and non-response to make results representative of the non-institutionalized adult population. County characteristics were obtained from the Area Resource File (ARF)[37] and the US Census Bureau.[38]

The analytic sample was restricted to respondents aged 18 to 64 residing in a US border state – California, New Mexico, Arizona, or Texas. Data from border and non-border counties were included; non-border counties act as controls for trends in access unrelated to violence.

In analyses of different outcome measures and subgroup analyses, additional exclusion criteria were applied to certain analyses based on age, gender, and health status. Models examining receipt of a Pap smear were limited to women 18–64 with an intact uterus. Analyses for receipt of a mammogram were restricted to women aged 40–64. Questions regarding Pap smears and mammograms were asked for all eligible respondents in even years and a small subset of respondents in odd years. The subgroup with chronic conditions included respondents in odd years who reported they currently had asthma, had ever been diagnosed with diabetes, had ever had a heart attack or been diagnosed with angina or coronary heart disease, or had ever had a stroke.

Measures

For primary analyses of healthcare access, we examined the dichotomous response to "Do you have one (or more) person(s) you think of as your personal doctor(s) or health care provider(s)?" (yes/no). As secondary analyses, three other dichotomous outcomes were examined, including having a Pap smear in the past three years, having received a mammogram in the past two years, and whether the respondent needed to see a doctor but could not because of cost in the prior year.

The main independent variables were border county residence and homicide rates in the closest Mexican municipality. Forty-eight counties were identified as border counties, defined as counties in which any portion is within 100 km (62 miles) of the US-Mexico border.[2] We linked individual-level survey data with the homicide rate of the closest Mexican municipality, calculated using road distance from county centroid to the closest border crossing.[39] A total of 12 Mexican municipalities were considered adjacent to border crossings.

Statistical Analysis

We used a difference-in-difference approach, comparing high to low crime areas (continuous) and border to non-border counties. This approach in theory enables separation of the causal impact of violence from unrelated trends in access, assuming that there are no unobserved time-varying trends that are correlated with both homicides and healthcare access. We estimated linear probability models to predict the report of a personal healthcare provider, *p*:

$$p_{ict}=\beta_0+\beta_1\text{border}_c+\beta_2*H_c+\beta_3*H_c*\text{border}_c+\beta_4*X_i+\beta_5*C_{ct}+m_t+\text{year}_t+\varepsilon_{icm} \quad \text{(Eqn 2)}$$

Individual demographics, *X*, county characteristics (including an indicator for whether a county is a border county, *border*), *C*, and a vector of six lagged homicide rates, *H*, for each individual *i* in county *c* interviewed at time *t* were included. Six months of lagged homicide rates were included as separate variables to allow for varying effects of homicides over time. The effects of interest were the interaction terms of the homicide rate variables and border county residence ($H_c*border_c$). The association between homicide rates and healthcare access was interpreted using the combined effect described previously. Wald tests for model fit indicated six months of lagged homicide rates and interactions were preferred.

Interview year ($year_t$) and month fixed effects (m_t) controlled for secular trends and seasonality in healthcare access. County level physician supply controlled for local access.[40–41] A binary indicator for MSA status was included. Individual characteristics included categorical indicators of sex, age, race, state of residence, income, education, and health status (continuous) measured as number of days in the prior month that poor physical or mental health restricted usual activities. We incorporated the complex survey design using linearized standard errors and population weights.

We conducted subgroup analysis to examine heterogeneity of effects on the effect of homicides on the report of a personal healthcare provider by examining four subgroups of US residents: 1) the uninsured, 2) persons of Hispanic race, 3) individuals with chronic conditions, and 4) Texas residents. The uninsured or those of Hispanic race may be more sensitive to changes in access than other individuals, as these subgroups are more likely to seek care in Mexico. Respondents with chronic conditions need to see a doctor more frequently for ongoing treatment and monitoring, and thus may be more sensitive to changes in access in Mexico. We focused on Texas residents to ensure that neither state level policy trends (e.g., participation of public health departments) nor discrepancies in data among states were driving the results.

Additional models were estimated for the other outcomes of interest. We conducted sensitivity analyses regarding sample composition and empirical relationships between seeking care in Mexico and reporting a personal healthcare provider.

To test differences in means between residents in border and non-border counties, weighted regression tests were used for binary and continuous variables; chi-squared tests were used to test for differences in categorical variables. To test the statistical significance of the "combined effect" of lagged homicide rates on outcome variables in the regression models, we used Wald tests.

All statistical analyses were conducted in Stata 12.0 (StataCorp, College Station, TX). Results were considered statistically significant at an alpha of 0.05. The study was approved by the University of North Carolina at Chapel Hill Institutional Review Board.

Results

Border crossings

Poisson regressions show homicide rates in the Mexican municipalities adjacent to the US border areas were associated with a significant decrease in the number of US entries, controlling for time and person and provider characteristics (Table 1). A one unit increase in the one through six month lags of the homicide rates was associated with a 0.42% decrease in US entries, holding other factors in the model constant. This joint estimate from the model translates to the following interpretation: an increase from the median monthly homicide rate (0.92 homicides/100,000 population) to the 90th percentile (7.66 homicides/100,000 population), persistent over the six months prior, was associated with a 2.8% decrease in US entries.

Healthcare access

Sample Description—Compared to residents in non-border counties, individuals residing in border counties were less likely to report having a personal healthcare provider and less likely to have had a mammogram in the prior two years (Table 2). They were more likely to be uninsured, have a lower education level, have lower annual household income, be of Hispanic race, have lower physician supply, and to answer the BRFSS in Spanish. Populations in border and non-border counties were similar in self-reported health status.

Regression Results—Population weighted results for the estimation of Equation 2 (Table 3; column 2) show no association between homicide rates and having a personal care provider in border counties, and a small but statistically significant negative association in non-border counties. Holding other things in the model constant, being uninsured was associated with a 37.4 percentage point decrease in the probability of having a personal healthcare provider for both border and non-border residents; residing in a border county was associated with a 1.8 percentage point decrease in the probability of having a personal healthcare provider.

We examined three additional binary outcome variables (Table 4, Panel a). Homicide rates were not significantly associated with these binary healthcare access measures in border counties.

We conducted subgroup analyses for the primary outcome with four subgroups: the uninsured (Table 4, Panel b; column 1), Hispanics (Table 4, Panel b; column 2), those with chronic conditions (Table 4, Panel b; column 3), and Texas residents (Table 4, Panel b; column 4). We found a statistically significant negative impact of homicides in non-border counties for the uninsured; otherwise, homicide rates were not significantly associated with the probability of reporting a personal healthcare provider in either border or non-border counties.

Sensitivity Analyses—To address concerns about unmeasured changes in sample composition such as migration from Mexican border cities to US border counties, we conducted several checks. Country of birth was available for Texas respondents in 2007 and 2010 (n=15,681). In border counties, a significantly higher proportion of the population was Mexican-born in 2010 than in 2007 (40.5% vs. 34.3%; p=0.004); this is not the case in non-border counties (8.2% vs. 8.3%; p=0.87). To assess the correlation between this compositional change and violence, we regressed a binary indicator of Mexican born on race and six months lags of homicide rates; combined coefficients on homicide rate measures were not significant, providing evidence increased violence was not associated with changes in unmeasured sample composition.

As we cannot control for nativity for most respondents, we estimated the same model as in Table 3, column 2 including an indicator for Spanish survey administration, which was highly correlated with being Mexican born and found similar results. We repeated this regression controlling for Spanish questionnaire and being Mexican born. Results showed nativity did not have a separate influence on reporting a personal healthcare provider, with no substantive change in magnitude or direction of the combined coefficients for the homicide rate measure.

A small subset of respondents in Texas border counties in 2007 reported whether they had obtained any healthcare in Mexico in the prior year (n=2,460). We regressed reporting a personal healthcare provider on insurance status, gender, age, race, education, income, health status, physician supply, MSA, Spanish questionnaire, and a binary indicator of obtaining care in Mexico without population weights using robust standard errors. Seeking healthcare in Mexico was negatively associated with the probability of reporting a regular care provider (beta=−0.064, p=0.01). We ran the same regression with the outcome of inability to see a doctor due to cost and found a positive association with obtaining healthcare in Mexico (beta=0.114, p<0.01). We found no differential effect of obtaining healthcare in Mexico on reporting a personal healthcare provider between those born in Mexico and those born elsewhere.

Discussion

We found US border entries were negatively associated with homicide rates in the adjacent Mexican municipality, indicating a general effect of violence on border crossing. As no studies of border crossing have been conducted specifically for healthcare since 2008, we relied on BRFSS population-representative information for border states and found no significant association between homicide rates and selected measures of healthcare access in border counties. We conducted analyses for subgroups to determine heterogeneity of responses to increases in the homicide rates but did not find effects of homicide rates on healthcare access for any of these subgroups.

Since we do not have an indicator of where respondents' healthcare provider or services were located, we cannot determine the mechanism for this lack of association. Three possibilities for the lack of effect are: 1) individuals are not changing their behavior with regards to care seeking in Mexico, despite increases in violence; 2) individuals do not consider a provider in Mexico a personal healthcare provider, thus if access in Mexico is reduced or the individual substitutes a US provider such as a retail or urgent care clinic that the individual may not consider a "personal healthcare provider", such changes will not be reflected in survey data; and 3) individuals are migrating from Mexican to US border regions, changing the unmeasured composition of the sample.

Although we found evidence of behavior change associated with changing homicide rates, we do not know whether crossing for some activities (e.g. tourism) was more affected by homicide increases than for other activities (e.g. health care services). Additionally, although the decrease in legal entries associated with the increase in homicide rates was statistically significant, the effect is small. It may be the case that the change in border crossing due to violence was too small to have a measurable effect on healthcare access. For some outcome variables, the effect of homicide rate in non-border counties was negative and statistically significant. It is possible that residents of non-border counties who travel to Mexico for healthcare have reduced access due to the fact that their ties to Mexico based on other factors such as family connections are weaker than those in border areas.

To address the second possibility, we examined the probability of reporting a personal healthcare provider for the subset of individuals in border counties who reported obtaining healthcare in Mexico in the prior year. We found these individuals were less likely to report having a personal healthcare provider, which would be consistent with individuals seeking care in Mexico indicating they do not have a personal healthcare provider. In this case, our estimates would not fully capture the effect of homicide rates on changes in border crossing for healthcare. Additionally, we would be less able to separate the impacts of substitution of a Mexican provider with a US provider from that of foregoing care entirely.

Researchers estimate 230,000 Mexicans fled Juarez between 2009 and 2011 to escape violence, with many moving to the US near El Paso.[42] As acculturation status changes the likelihood of seeking care in Mexico,[13–14] unmeasured changes in sample composition may change the effects of observed characteristics over time. As the data have no markers of immigration status and inconsistent collection of information regarding region of birth, we conducted several sensitivity analyses to determine whether changes in sample composition affect our results. Using the subset of data from Texas in 2007 and 2010, we found an increase between 2007 and 2010 in the proportion of Mexican born individuals in border regions; this increase was not associated with homicide rate measures. We also did not find an independent effect of being Mexican-born on reporting a personal healthcare provider, and the negative relationship between reporting a personal healthcare provider and seeking healthcare in Mexico was not differentially affected by nativity. This information combines to show unmeasured changes in sample composition are not likely to have a substantial impact on the results.

Our analysis has several limitations. First, we do not have systematically collected information on why individuals crossed the border. Since we cannot determine empirically how large a subset of the total border crossings (measured by US entries) are for healthcare, this measure may be affected differently by violence than crossings for healthcare. Second, our measures of access, although widely used,[25,27,43–44] may not be sensitive enough to measure changes in access for this population and does not capture border crossing for pharmaceuticals, which is an important component of cross-border health care.[5] Third, any compensatory responses occurring on the US side of the border may limit our ability to measure the full impact of violence on changes in access. Homedes (2012) notes some Mexican physicians now living in the US may be illegally offering services in the US, and pharmaceuticals from Mexico are similarly being illegally sold in the US.[20] Additional changes to the US health system, including any potential increased presence of non-governmental organizations providing health services, expansion of retail clinics, increased healthcare supply, and increased availability of low-priced prescription drugs (e.g., $4 generic drug plans) may reduce the measured effects of violence on healthcare access. We control for physician supply variables, but these variables may not be robust measures to capture changes in healthcare supply as there may be additional changes in supply in that of nurse practitioners, physician assistants, and other non-physician healthcare professionals. Fourth, we rely on a binary measure of border county rather than a continuous measure of distance to the border. Differences in access, particularly between rural and urban populations,[45] may not be captured by this binary measure. We use the binary measure, however, as a distance measure is difficult to interpret conceptually due to differences in travel time and accessibility (e.g., crossing into the US at Tijuana may have substantially longer wait times than crossing at Reynosa).

Many border residents comprise a vulnerable population with significant risk factors including poverty, low education, and high rates of chronic health conditions.[1–4] We have shown limited (if any) changes in healthcare access associated with increased violence in Mexico. As much of the US border region population is reliant on care in Mexico, ongoing monitoring of changes in access as well as health outcomes is important as violence in the region continues to be widespread.

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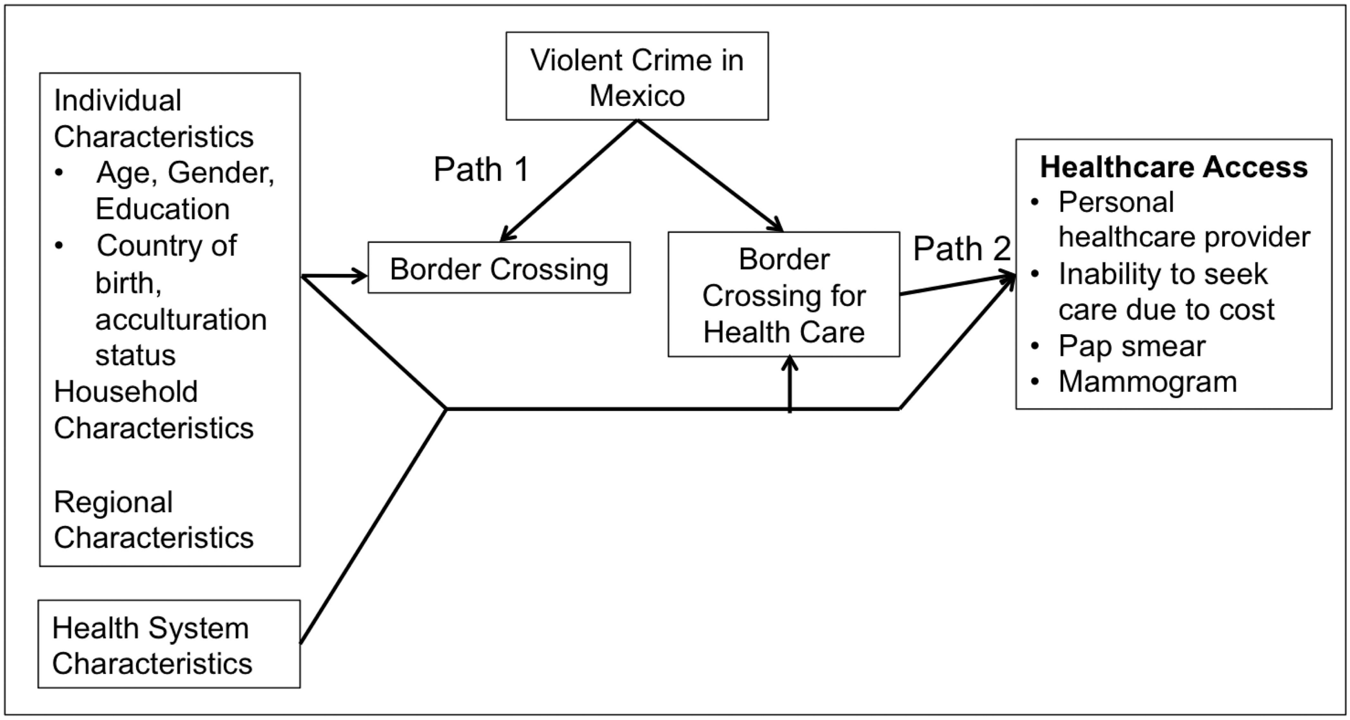

Figure 1.
Conceptual Model

Table 1

Poisson model predicting number of US entries from Mexico

	(1)	(2)	(3)
Combined Effect of Homicides	**−0.0042*** (0.0006)**	**−0.0026*** (0.0005)**	**−0.0035*** (0.0005)**
1-month lag of homicides	−0.00116 (0.00060)	−0.00264*** (0.00052)	−0.00148* (0.00059)
2-month lag of homicides	−0.00047 (0.00049)		−0.00095* (0.00047)
3-month lag of homicides	−0.00034 (0.00053)		−0.00102 (0.00054)
4-month lag of homicides	−0.00046 (0.00055)		
5-month lag of homicides	−0.00112* (0.00055)		
6-month lag of homicides	−0.00066 (0.00054)		
Year	−0.03934*** (0.00153)	−0.03974*** (0.00152)	−0.03945*** (0.00153)
US dollar-Mexican peso exchange rate	−0.00175 (0.00378)	−0.00249 (0.00379)	−0.00217 (0.00377)
Unemployment rate	−0.01221*** (0.00090)	−0.01245*** (0.00091)	−0.01231*** (0.00091)
Number of Observations	2691	2691	2691

Robust standard errors are in parentheses. Includes fixed effects for port, month, and port-month interactions. For ports that are adjacent to more than one Mexican municipality the mean homicide rate in these municipalities is used (with the exception of Hidalgo). For ports that are adjacent to more than one US county, the mean unemployment rate is used (with the exception of Hidalgo).

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$;

Table 2

BRFSS Summary Statistics for Analytic Sample

Variable	Weighted Analytic Sample (n=151,933) Mean (std. dev) or %	Population Weighted Estimates for Analytic Sample		
		Border Counties (n=38,693)	Non Border Counties (n=113,240)	p-value
Has one or more personal healthcare providers	70.0%	68.3%	70.5%	<0.001
Could not seek necessary care because of cost[1]	17.7	17.6	17.7	0.80
Mammogram in prior two years[2]	74.1	72.3	74.5	0.03
Pap smear in prior three years[3]	85.5	85.5	85.6	0.94
Monthly Homicides per 100,000 population in matched Mexican municipality	2.70 (5.55)	3.04 (12.19)	2.62 (3.10)	<0.001
Lives in Border County (1=Yes, 0=No)	19.7			
Male	51.2	50.6	51.3	0.18
Uninsured	21.6	24.0	21.0	<0.001
Year of Interview	2006.3 (2.55)	2006.4 (2.83)	2006.3 (2.51)	0.001
Race				<0.001
Non-Hispanic White	47.3	49.4	46.8	(joint)
Hispanic	36.9	41.1	35.8	
Non-white, non-Hispanic	15.8	9.5	17.4	
Education				<0.001
Did not complete high school	16.3	15.6	16.4	(joint)
High school graduate	23.0	23.7	22.8	
Some college	26.4	27.9	26.0	
College graduate	34.4	32.8	34.7	
State of residence				<0.001
Arizona	8.5	37.6	1.3	(joint)
California	60.3	44.4	64.2	
New Mexico	3.1	2.5	3.3	
Texas	28.1	15.5	31.2	
Age				0.30
18–24 years	14.1	14.0	14.2	(joint)
25–29 years	10.8	10.8	10.8	
30–34 years	13.1	13.8	12.9	
35–39 years	12.2	12.1	12.2	
40–44 years	13.0	12.8	13.1	
45–49 years	11.2	11.0	11.2	

Variable	Weighted Analytic Sample (n=151,933) Mean (std. dev) or %	Population Weighted Estimates for Analytic Sample		
		Border Counties (n=38,693)	Non Border Counties (n=113,240)	p-value
50–54 years	10.9	11.0	10.9	
55–59 years	8.2	7.9	8.3	
60–64 years	6.5	6.7	6.4	
Annual Household Income				<0.001
Under $15,000	14.2	13.6	14.3	(joint)
$15,000–$25,000	15.3	16.7	14.9	
$25,000–$35,000	10.4	10.4	10.4	
$35,000–$50,000	13.0	14.1	12.8	
$50,000 or more	47.1	45.2	47.5	
Number of days in poor physical or mental health in prior month	2.12 (6.04)	2.14 (6.97)	2.11 (5.88)	0.42
MDs per 1,000 population	2.44 (0.97)	2.02 (0.87)	2.54 (0.96)	<0.001
Metropolitan Statistical Area	87.6	90.8	86.9	<0.001
Spanish questionnaire (1=Yes, 0=No)[4]	16.8	18.1	16.5	<0.001
Chronic condition(s) (1=Yes, 0=No)[5]	16.0	16.7	15.9	0.15

Note: All analyses limited to BRFSS respondents in border states with complete information. Standard deviations for continuous variables, corrected for complex survey design, in parentheses.

[1]: n=143,156 overall; n=37,348 border county, n=105,808 non-border

[2]: n=31,941 overall; n=7,941 border county, n=24,000 non-border

[3]: n=39,174 overall; n=9,872 border county, n=29,302 non-border

[4]: n=136,043 overall; n=36,331 border county, n=99,712 non border

[5]: n=57,798 overall; n=15,577 border county, n=42,221 non-border

Table 3

Linear probability models predicting reporting having a personal healthcare provider

	Unweighted	Population weighted
Combined Effect of Homicides in Border Counties	−0.0000 (0.0002)	−0.0000 (0.0004)
Combined Effect of Homicides in Non-Border Counties	−0.0023*** (0.0003)	−0.0022** (0.0008)
Uninsured	−0.359*** (0.003)	−0.375*** (0.006)
Border County Residence	−0.000 (0.000)	0.002* (0.001)
1-Month Lag of Homicides	−0.015*** (0.003)	−0.019** (0.006)
Border County Residence * 1-Month Lag of Homicides	0.000 (0.000)	−0.002* (0.001)
2-Month Lag of Homicides	−0.000 (0.001)	−0.002 (0.001)
Border County Residence * 2-Month Lag of Homicides	−0.000 (0.001)	0.002 (0.001)
3-Month Lag of Homicides	−0.000 (0.001)	−0.001 (0.001)
Border County Residence * 3-Month Lag of Homicides	0.000 (0.001)	0.001 (0.001)
4-Month Lag of Homicides	−0.000 (0.001)	0.002* (0.001)
Border County Residence * 4-Month Lag of Homicides	0.001 (0.001)	−0.002 (0.001)
5-Month Lag of Homicides	−0.001 (0.001)	−0.004*** (0.001)
Border County Residence * 5-Month Lag of Homicides	0.001 (0.001)	0.004** (0.001)
6-Month Lag of Homicides	−0.001 (0.000)	0.000 (0.001)
Border County Residence * 6-Month Lag of Homicides	0.001 (0.001)	0.000 (0.001)
Male	−0.098*** (0.002)	−0.112*** (0.004)
Age group (reference = 18–24 years)		
25–29 years	0.004 (0.006)	−0.016 (0.010)
30–34 years	0.040*** (0.006)	0.026** (0.009)
35–39 years	0.074*** (0.006)	0.068*** (0.009)
40–44 years	0.108*** (0.006)	0.110*** (0.009)
45–49 years	0.131*** (0.006)	0.133*** (0.009)

	Unweighted	**Population weighted**
50–54 years	0.154*** (0.005)	0.160*** (0.009)
55–59 years	0.170*** (0.005)	0.179*** (0.009)
60–64 years	0.199*** (0.005)	0.204*** (0.009)
Race (reference group = non-Hispanic White)		
Hispanic	−0.009*** (0.003)	−0.020*** (0.005)
Other (non-White, non-Hispanic)	−0.006 (0.003)	0.007 (0.006)
State of Residence (reference group = California)		
Arizona	−0.006 (0.004)	0.021** (0.007)
Texas	0.019*** (0.003)	0.027*** (0.005)
New Mexico	0.023*** (0.003)	0.041*** (0.005)
Education Level (reference group = college graduate)		
Did not complete high school	−0.072*** (0.004)	−0.071*** (0.008)
High school graduate	−0.013*** (0.003)	−0.020*** (0.006)
Some college	0.006* (0.002)	0.006 (0.005)
Annual Household Income (reference group = >$50,000)		
<$15,000	−0.116*** (0.004)	−0.147*** (0.008)
$15,000–$25,000	−0.095*** (0.004)	−0.123*** (0.007)
$25,000–$35,000	−0.063*** (0.004)	−0.087*** (0.008)
$35,000–$50,000	−0.039*** (0.003)	−0.053*** (0.006)
Days in Prior Month in Poor Physical or Mental Health	0.004*** (0.000)	0.003*** (0.000)
County-Level MDs per 1000 Population	−0.002 (0.001)	−0.005* (0.002)
Metropolitan Statistical Area	−0.009** (0.003)	−0.016* (0.008)
Constant	0.799*** (0.008)	0.819*** (0.014)
R-Squared	0.225	0.261
Number of Observations	151,933	151,933

Model 1 is not population weighted and uses robust standard errors (in parentheses). Model 2 uses population weights and linearized standard errors (in parentheses). Controls for year and month of interview included (not shown).

*$p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$

Table 4

Linear probability models results for selected subgroups and different outcomes

Panel A: Four binary outcome measures

	Reports regular care provider(s) (yes=1)	Could not obtain needed care because of cost in prior year (yes=1)	Pap smear in prior three years (yes=1)	Mammo-gram in prior two years (yes=1)
Combined Effect of Homicide Rates in Border Counties	−0.0000 (0.0004)	−0.0002 (0.0003)	0.0011 (0.0006)	−0.0007 (0.0009)
Combined Effect of Homicide Rates in Non-Border Counties	−0.0022** (0.0008)	0.0003 (0.0007)	−0.0028 (0.0016)	−0.0036* (0.0016)
R-Squared	0.261	0.186	0.074	0.095
Number of Observations	151,933	143,156	39,174	31,941

Panel B: Selected subgroups for the outcome of reporting a regular care provider

	Uninsured	Hispanic Race	Has Chronic Condition	Texas Only
Combined Effect of Homicides in Border Counties	−0.0002 (0.0009)	0.0008 (0.0007)	0.0002 (0.0022)	−0.0017 (0.0014)
Combined Effect of Homicides in Non-Border Counties	−0.0051** (0.0019)	−0.0025 (0.0015)	−0.0039 (0.0036)	−0.0011 (0.0023)
R-Squared	0.093	0.273	0.253	0.265
Number of Observations	30,556	46,875	11,193	43,950

Linearized standard errors are in parentheses. Regression estimates population weighted. Panel A: Controls for year and month of interview, gender (as appropriate), state of residence, MDs per population, MSA, number of days in poor health, age category, race, education level, annual household income category included (not shown). Panel B: Controls for year and month of interview, gender, state of residence, border county residence, physicians per population, MSA, number of days in poor health, age category, race, education level, annual household income category included (not shown; as applicable to subgroup).

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$