INTRODUCTION

The United States–Mexico border region extends for 3,141 km, stretching from the Gulf of Mexico to the Pacific Ocean. The 1983 La Paz Agreement, which was signed between the governments of Mexico and the United States with the goal of protecting, improving, and conserving the environment along the border (1), defines this area as the land within 100 km on either side of the international boundary.
The border area includes 48 U.S. counties in 4 states\(^1\) and 94 Mexican municipalities in 6 states\(^2\), including 15 pairs of sister cities.\(^3\)

In order to manage its program designed to improve health along the border, the U.S.-Mexico Border Health Commission (USMBHC) (\(^2\)) limited the border area to the 44 U.S. counties and 80 Mexican municipalities that have most of their population within the 100-km limit (see Figure 1). This constitutes a total population of approximately 14.94 million people (7.45 million males and 7.49 million females), about 7.44 million (3.68 million males and 3.76 million females) in the U.S. (\(^3\)) and 7.50 million (3.77 million males and 3.73 million females) in Mexico (\(^4\)) (see age and sex distribution

---

1 Arizona, California, New Mexico, and Texas.
2 Baja California, Coahuila, Chihuahua, Nuevo León, Sonora, and Tamaulipas.
3 San Diego/Tijuana (California/Baja California), Calexico/Mexicali (California/Baja California), Yuma/San Luis Rio Colorado (Arizona/Sonora), Nogales/Nogales (Arizona/Sonora), Naco/Naco (Arizona/Sonora), Douglas/Agua Prieta (Arizona/Sonora), Columbus/Puerto Palomas (New Mexico/Chihuahua), El Paso/Ciudad Juárez (Texas/Chihuahua), Presidio/Ojinaga (Texas/Chihuahua), Del Rio/Ciudad Acuña (Texas/Coahuila), Eagle Pass/Piedras Negras (Texas/Coahuila), Laredo/New Laredo (Texas/Tamaulipas), McAllen/Reynosa (Texas/Tamaulipas), Weslaco/Rio Bravo (Texas/Tamaulipas), and Brownsville/Matamoros (Texas/Tamaulipas).
of the border population in Figure 2). Between 2000 and 2010 the U.S. border population increased by about 12% and the Mexican border population increased by about 18%.

About 84% of the U.S.-Mexico border population is urban. Mexico’s three largest urban municipalities—Ciudad Juárez in Chihuahua, and Tijuana and Mexicali in Baja California—account for almost half of the total Mexican border population. Over 80% of the U.S. border population is concentrated in six counties: San Diego in California; Pima in Arizona; and Cameron, El Paso, Hidalgo, and Webb in Texas. San Diego alone, the wealthiest of the U.S. border counties, represents about 40% of the U.S. border population. About half of the U.S. border population is Hispanic, primarily of Mexican ancestry (5, 6).

The U.S.-Mexico border area represents a binational geo-political system based on strong social, economic, cultural, and environmental connections governed by different policies, customs, and laws. Important dimensions of this binational system include commerce, tourism, sister-city familial ties, Mexico’s assembly plants or maquiladoras (plants that import components for processing or assembly by Mexican labor and then export the finished products), ecological services, a shared heritage, social partnerships, and immigration.

The area has experienced continuous growth since the 1940s associated with the 1942–1947 Bracero Program (laborers contracted in Mexico to work in the U.S. agricultural sector), the Border Industrialization Program initiated in 1965, and the North American Free Trade Agreement (NAFTA) signed in 1993. Projected population growth rates in the border region exceed anticipated national average growth rates for each country. If current trends continue, the border population is expected to increase to about 20 million people by 2020 (7).

Trade has also increased significantly, particularly since the NAFTA agreement came into force. For example, in 2008, cross-border land trade between the U.S. and Mexico totaled over US$ 293 billion, about three times the amount recorded in 1995; 13,300 commercial trucks crossed the border daily, up 70% from 1995 (8). However, the region is experiencing several challenges, including the situation of violence on the Mexican side of the border, the deceleration of the maquiladora industry, and reduced northbound illegal immigration stemming from both the slowdown in the U.S. economy and enhanced U.S. border immigration enforcement efforts. These factors may slow development and affect cross-border trade and travel. Personal legal border crossings from Mexico to the U.S. decreased from 313.8 million in 2006 to 229.7 million in 2010 (9). In addition, the number of personal legal border crossings from Mexico to the U.S. decreased from 313.8 million in 2006 to 229.7 million in 2010 (9).

**Source:** United States Census Bureau (2009); Mexico National Institute for Statistics and Geography, Population and Housing Census (2010)

---

**FIGURE 2. Population structure, by age and sex, a United States border population in 2009 and Mexican border population in 2010.**

![Population structure diagram](image)


a Each age group’s percentage represents its proportion of the total for each sex.
apprehensions of unauthorized Mexican migrants in the U.S. decreased from 1.17 million in 2005 to 0.45 million in 2010 (10).

The population on both sides of the border is relatively young because of high fertility and a continuous migratory flow (the population that migrates north to the U.S. tends to be younger and healthier). About 30% of the Mexican border population and 24% of the U.S. border population is under 15 years of age. In 2007, the total fertility rates in the Mexican border states ranged from 2.0 children per woman in Nuevo León to 2.2 in the states of Sonora, Chihuahua, and Coahuila, on a par with Mexico’s national rate of 2.1. The total fertility rates in the U.S. border states in 2007 ranged from 2.2 in California to 2.4 in Texas and Arizona, higher than the U.S. national rate of 2.1. The proportion of population over 60 years old is about 17% (55% females) on the U.S. side of the border and 7% (51% females) on the Mexican side (4, 11).

Life expectancy at birth for U.S. border states in 2009 ranged from 77.1 years in New Mexico (74.5 for males and 79.7 for females) to 81.0 years in California (78.6 for males and 83.2 for females), compared to 78.8 years for the U.S. (76.0 for males and 81.2 for females). For the Mexican border states, life expectancy at birth in 2009 ranged from 76.3 years in Tamaulipas (74.0 for males and 78.7 for females) to 77.1 years (74.9 for males and 79.2 for females) in Baja California, compared to 75.3 years for Mexico (72.9 for males and 77.6 for females) (12, 13, 14, 15, 16).

The native indigenous population along the Mexican border area in 2005 totaled approximately 130,000 people, located primarily in Baja California, Tamaulipas, Chihuahua, and Sonora (17). The estimated Native American population during 2005–2009 along the U.S. border area was approximately 80,000 people, located primarily in California and Arizona (5). Five native indigenous groups have a permanent land base that extends to both sides of the border: the Kikapu peoples in Coahuila, known as the Kickapoo in Texas and Arizona; the Kumiai peoples in Baja California, known as the Kumeyaay in California; and the Papago, Cucapá, and Yaqui peoples in Sonora, known as the Tohono O’odham, Cocopah, and Pascua Yaqui, respectively, in Arizona.

The African-American population along the U.S. border area in 2005–2009 comprised approximately 3.2% of the U.S. border population (3), located primarily in San Diego, California; Tucson, Arizona; and El Paso, Texas.

This chapter examines health determinants and health conditions along the border region. In general, the issues are described at the state level, with some specific examples given at the county/municipality level. For several conditions, direct comparisons between the U.S. and Mexican sides of the border cannot be made because the available information is not readily comparable.

**HEALTH DETERMINANTS AND INEQUALITIES**

In 2009, the per capita gross domestic product (GDP) for the Mexican border states ranged from US$ 7,501 in Baja California to US$ 13,481 in Nuevo León, compared to US$ 8,143 for Mexico as a whole. The per capita GDP for the U.S. border states ranged from US$ 39,123 in New Mexico to US$ 50,871 in California, compared to US$ 45,989 for the nation. The U.S. border region includes both one of the wealthiest and one of the poorest cities in the U.S.: in 2009, the per capita GDP of San Diego, California, was US$ 51,035 whereas the per capita GDP of McAllen, Texas, was US$ 15,818 (18, 19, 20, 21).

The unemployment rate in the U.S. border states for 2005–2009, measured as the population 16 years old or older who are in the labor force, was 6.8% in Texas, New Mexico, and Arizona, and 7.9% in California, compared to 7.2% for the nation. At the local level, the differences were more significant. San Diego, California, had an unemployment rate of 6.7% whereas in McAllen, Texas, it was 9.2%. For the Mexican border states, the unemployment rate in 2010, measured as the labor force for the population 14 years old or older, ranged from 5.9% in Baja California to 8.7% in Chihuahua, higher than the 5.2% rate for the nation. It should be noted that in Mexico there is a significant level of underemployment that has not been reported. Unemployment...
rates for the two nations are not readily comparable \((18, 19, 20, 21)\).

The education level of U.S. border residents is lower than the national U.S. average, but there are regional differences. For example, in 2009, in San Diego, California, 6.8% of the population between 25 and 64 years old had an education level below the ninth grade and 22.1% had completed a four-year university degree. In contrast, in Brownsville, Texas, 27.6% had an education level below the ninth grade and only 10% had a university degree. In the U.S. as a whole, 6.4% had an education level below the ninth grade and 17.4% had a university degree. The education level on the Mexican side of the border is more homogeneous. In 2010, between 25% and 30% of the border population had completed primary school (up to sixth grade) and about 10% had a professional degree, similar to Mexico’s national average of 32% and 10.7%, respectively \((4, 18, 20, 21)\).

**THE ENVIRONMENT AND HUMAN SECURITY**

**Access to Clean Water and Sanitation**

Water is a limited resource in several parts of the border region. Population growth along with economic development places increasing stress on water quantity and quality. The International Boundary and Water Commission (IBWC) is a bi-national governmental organization charged with identifying and solving boundary and surface water issues arising along the border between the U.S. and Mexico. In particular, IBWC is responsible for preserving, protecting, and delivering the waters of the Colorado and Rio Grande rivers. The IBWC is not authorized to work on transnational, groundwater issues.

Access to drinking water and sanitation services has improved significantly in urban areas on the Mexican side of the border, but it is still one of the most significant physical environmental determinants of health in the rural areas of both sides of the border. In 2010, access to piped drinking water services in the Mexican border cities ranged from 78% of the households in Nogales, Sonora, to over 95% of the households in Tijuana and Mexicali in Baja California; San Luis Río Colorado, Naco, and Agua Prieta in Sonora; and Acuña and Piedras Negras in Chihuahua. Access to sewer services ranged from 84% in Reynosa and Río Bravo in Tamaulipas to over 95% in Naco, Nogales, and Agua Prieta in Sonora; Acuña and Piedras Negras in Chihuahua; and Ojinaga in Chihuahua \((4)\). Sewer services may represent wastewater collected but not treated prior to discharge.

In U.S. border cities, over 98% of the households have access to piped drinking water and treated wastewater services \((3)\). However, access to these services is still a challenge in rural border colonias. Colonias are mostly unincorporated housing developments located primarily along the New Mexico and Texas borders; they are characterized by high poverty rates and may lack basic community infrastructure. In 2010 in the six most populous Texas border counties with colonias, there were 519 colonias housing approximately 126,000 residents who lacked some basic services and an additional 400 colonias with approximately 50,000 residents who lacked all basic services \((22)\).

**Solid Waste**

Millions of scrap tires have accumulated in 46 known tire piles throughout the border region. As the result of a strong market for used tires, millions of tires from the U.S. are imported to Mexico for reuse. Scrap tire piles create breeding grounds for mosquitoes, rodents, and other vectors of disease. In addition, tire pile fires are difficult to extinguish and can emit noxious fumes for months. From 2004 through 2009, almost 6.9 million scrap tires were removed from 12 areas on the Mexican side of the border region as part of the U.S.-Mexico Border 2012 Environmental Program. The majority of these tires were used as fuel in cement kilns. Pilot road paving projects and other innovative, experimental reuse projects were also implemented \((23, 24)\).
**AIR POLLUTION**

The most common and harmful air pollutants in the border region include suspended particulate matter (PM\(_{10}\), or particulate matter that is 10 \(\mu\) in diameter or less, and PM\(_{2.5}\), particulate matter 2.5 \(\mu\) in diameter or less) and ground-level ozone. For example, San Diego exceeded the U.S. ozone standard for 24 days in 2008 and Imperial Valley, California, exceeded the standard for 15 days in 2006. In addition, Imperial Valley exceeded the U.S. PM\(_{10}\) standard for 20 days in 2007, Nogales (Arizona and Sonora) exceeded the standard for 45 days in 2006, and Ciudad Juárez/El Paso exceeded it for 48 days in 2006. A number of measures, such as stricter standards on motor vehicle emissions, cleaner fuels, vehicle anti-idling programs, and road paving, have been implemented in the border region to reduce the sources of ozone and particulate matter (23).

**PESTICIDES**

California and Arizona have significant agricultural industries in their border areas and maintain reporting systems that track pesticide use. According to the California Department of Pesticide Regulation (25), the amount of pesticides applied in California border counties dropped by 32% from 2006 through 2009, from about 3.1 million kg to 2.1 million kg. Dry winters and springs and a shift from broad-based pesticides to newer, more targeted products account for part of the decline. On the other hand, the amount of pesticides applied in Arizona border counties increased by 36% from 2005 through 2009, from about 635,000 kg to 862,000 kg. Between 2006 and 2008, the California border counties reported 161 definitive or probable illness/injury incidents related to pesticide exposure, of which only 54 incidents involved pesticides intended for use in agricultural production. The data suggest that most cases of pesticide exposure occur in the household setting and primarily involved household pesticides (26).

A major concern on both sides of the border is the use of polvo de avión or methyl parathion as a household pesticide. This product is licensed for industrial agricultural application, but is illegally packaged and sold to residents for household use. In 2007, a research group of the University of Texas Health Science Center at Houston (School of Public Health) reported that in a survey conducted in the Lower Valley of El Paso County, Texas, about 90% of participants used pesticides in their homes. Of these, about 10% admitted using illegal products (27).

**ROAD SAFETY**

Road traffic accidents constitute a major public health concern in the border region—they are the leading cause of death for school-aged children in Mexico (28) and for people between the ages of 5 and 34 years in the United States (29). In 2009, traffic-related mortality rates in Mexican border states ranged from 8.1 deaths per 100,000 population in Baja California to 26.2 in Sonora, compared to 14.0 for the nation. In the U.S. border states, traffic-related mortality rates ranged from 8.3 in California to 18.0 in New Mexico compared to 11.0 for the nation (30). According to the U.S. National Highway Traffic Safety Administration (31), the U.S. border states reported a consistent decrease in traffic-related mortality rates during 2005–2009. Long-term declining trends in the U.S. have been associated with behavioral and vehicle safety programs and the issuance of federal motor vehicle safety standards, such as the Texas Teens in the Driver’s Seat program. The declining trend since 2007 has coincided with the slowdown of the U.S. economy (31), and areas that experienced greater increases in unemployment rates recorded higher decreases in fatalities.

**VIOLENCE**

The increase of violence in Mexico, mainly in the northern cities, has been associated with the implementation of national policies to crack down on organized crime and drug trafficking. In the six largest
border cities, with an approximate population of 5.3 million inhabitants, the number of homicides related to organized crime increased from 390 (7.3 deaths per 100,000 population) in 2007 to 3,585 (67.5) in 2010 (32). In the respective U.S. sister cities with a population of 5.5 million inhabitants, the phenomenon was the opposite, with a decrease in the number of total homicides from 192 (3.5 per 100,000 population) in 2007 to 156 (2.8) in 2009. The reasons for this decline are unclear. The most dramatic difference in the number of homicides was between Ciudad Juárez, Chihuahua, with a mortality rate of 167 deaths per 100,000 population, and its sister city of El Paso, Texas, with a rate of 2 in 2009 (33, 34, 35, 36). In response to the situation in Ciudad Juárez, the federal government launched a violence prevention program in 2010 called “Todos Somos Juárez, Reconstruyamos la Ciudad” (“We Are All Juárez; Let’s Rebuild Our City”) with an investment of over US$ 300 million and over 160 social interventions (32).

One of the most significant phenomena of social violence occurring on the Mexican side of the border has been the increase in feminicide, defined as the killing of women and girls. A study conducted from 2006 to 2008 showed that feminicides in Ciudad Juárez, Chihuahua, increased from 19 in 2006 to 111 in 2008. To address this phenomenon, the Government has implemented national legislative measures such as the Law on the Right of Women to a Life Free of Violence in Chihuahua and the General Law of Women’s Access to a Life Free of Violence aimed at reducing systematic female homicides (37).

**Disasters**

The most significant natural disasters that affected the border region during 2006–2010 were a flood, a major hurricane, and an earthquake. The 2008 flooding in Presidio, Texas/Ojinaga, Chihuahua, was unprecedented. Floodwaters inundated Ojinaga’s wastewater treatment plant, sending sewage into the Rio Grande.

In July 2008, Hurricane Dolly hit the coast of the Gulf of Mexico and affected the U.S. counties of Starr, Cameron, and Hidalgo in Texas and the Mexican municipalities of Matamoros, Valle Hermoso, Rio Bravo, Reynosa, Díaz Ordaz, Camargo, and Miguel Aleman in Tamaulipas. The hurricane caused flooding, power outages, evacuation of about 20,000 people, two deaths on the Mexican side of the border, and estimated losses of US$ 1.2 billion on the U.S. side (38, 39, 40).

In April 2010, the Mexicali Valley experienced an earthquake measuring 7.2 on the Richter scale. Mexicali in Baja California and El Centro in California were the most affected cities. The earthquake was felt as far away as San Luis Río Colorado in Sonora. Despite the magnitude of the event, there were only two deaths and relatively few injuries. The damage reported included the disruption of the Mexicali-Tijuana highway, structural collapse of public buildings and private homes, partial evacuation of 17 hospitals on both sides of the border, disruption of utilities, and gas leaks (41).

**Climate Change**

The U.S. Global Change Research Program (42) reported in 2008 that the average temperature in the southwestern region of the U.S. has increased about 0.8 °C from a 1960–1979 baseline and estimated further increases in average temperatures by 2090 ranging from 3.2 °C to 5.6 °C above the baseline. Rising temperatures decrease upstream mountain snowpack and precipitation and increase the evaporation rate of available water. This affects the water sources for rivers and reservoirs in the region and, as a consequence, the availability of water for human consumption. Increases in temperatures were also reported in the northern Mexico border region. Assuming a scenario of average economic growth for Mexico, average temperatures would increase between 1.5 °C and 3.0 °C and precipitation would decline between 3.5% and 15% countrywide between 2010 and 2100, with the greatest impacts being seen in the northern border region. Water supplies in this region are already stressed and are projected to become increasingly scarce in the next 50 years (43).
HEALTH CONDITIONS AND TRENDS

HEALTH PROBLEMS OF SPECIFIC POPULATION GROUPS

Maternal and Reproductive Health

Maternal mortality rates for the U.S. border states in 2008 ranged from 8.1 maternal deaths per 100,000 live births (8 deaths) in Arizona to 22.2 (90 deaths) in Texas, compared to 12.7 (548 deaths) for the nation in 2007. In Arizona, the rate may not be statistically reliable because of the low number of deaths. Texas had the highest rate of maternal deaths consistently from 2005 to 2008. Among African-American women living in U.S. border states, maternal mortality was about twice the national rate. For the Mexican border states, maternal mortality rates in 2008 ranged from 30.1 (24 deaths) in Nuevo León to 62.9 (40 deaths) in Chihuahua, compared to 59.7 (1,167 deaths) for the nation. Chihuahua consistently recorded the highest rate among the border states from 2005 to 2008 (12, 44, 45, 46).

Early prenatal care (percentage of live births whose mothers received prenatal care in the first trimester) for the U.S. border states in 2008 was 52.0% in New Mexico, 58.4% in Texas, 79.4% in Arizona, and 80.7% in California, compared to 71% for the nation. A review of border counties in California showed that early prenatal care in San Diego (2006–2010 median household income of US$ 63,069) was comparable to the level provided throughout the state (82%), whereas in Imperial County (median household income of US$ 38,685) it was about 53%. Prenatal care visits (number of visits for pregnant women) for the Mexican border states in 2004–2009 ranged from 7.3 visits per pregnancy in Sonora to 8.5 in Baja California and Nuevo León. More than 95% of infants in all six Mexican border states received at least one prenatal care visit (47, 48, 49, 50, 51).

Teen pregnancy and childbearing is a significant issue in the U.S.-Mexico border region (52, 53). During 2006–2008, teen birth rates were about 50% higher than the national average for the U.S. (42 live births per 1,000 females age 15–19 years) in three of the four border states: Arizona (60), Texas (63), and New Mexico (65). For the same 2006–2008 period in Mexico, teen birth rates were 11% higher than the national average (70 live births per 1,000 females age 15–19 years) in three of the six border states: Chihuahua (76), Baja California (77), and Coahuila (77).

Child Health (0–4-year-olds, except for two U.S. states that do not report on 1–4-year-olds, only on 1–14-year-olds)

In 2008, infant (children under 1 year of age) mortality rates for the U.S. border states ranged from 5.1 infant deaths per 1,000 live births in California and New Mexico to 6.3 in Arizona, lower than the 6.6 infant mortality rate for the country as a whole. With the exception of 2002 and 2005, infant mortality rates have remained statistically the same or decreased significantly each successive year from 1958 through 2008. The leading causes of infant death in U.S. border states were congenital malformations, deformations, and chromosomal abnormalities; disorders related to short gestation and low birthweight; sudden infant death syndrome; maternal complications of pregnancy; newborns affected by complications of placenta, cord, and membrane; and unintentional injuries. In all four states the infant mortality rates for African Americans were the highest of all racial/ethnic groups, ranging from 6.7 in New Mexico to 17.7 in Arizona (14, 45, 54, 55).

Infant mortality rates for the Mexican border states in 2008 were about double those of the U.S. border states but lower than the national average for Mexico. They ranged from 10.6 infant deaths per 1,000 live births in Nuevo León to 13.4 in Chihuahua, compared to 15.2 for the nation. These rates were about 20%–25% lower than they were in 2000. The leading causes of infant death were certain conditions originating in the perinatal period; congenital malformations, deformations, and chromosomal abnormalities; accidents; pneumonia and influenza; intestinal infectious diseases; acute respiratory infections; and septicemia (28, 56).

Mortality rates of children 1–4 years of age for U.S. border states in 2008 were 21.3 deaths per
100,000 population (23.4 for males and 19.1 for females) in California and 36.8 (47.2 for males and 26.2 for females) in New Mexico, compared to 28.6 (31.3 for males and 25.7 for females) for the nation in 2007. For California, this represents a decrease of about 20%–25% from the rate in 2000. Texas and Arizona reported data for children 1–14 years of age, and mortality rates in 2008 were 19.7 deaths per 100,000 population of this age group (21.9 for males and 17.5 for females) in Texas and 19.7 (22.3 for males and 17.0 for females) in Arizona. The leading causes of death for both age groups and sexes were unintentional injuries, malignant neoplasms, congenital malformations, and assault (homicide) (45, 55, 57, 58).

In 2008, deaths among male children 0–4 years of age in the Mexican border states ranged from 4.0% of the total number of deaths in Coahuila to 6.3% in Tamaulipas, lower than the 6.6% for the nation. Deaths among female children 0–4 years of age ranged from 3.9% of the total number of deaths in Coahuila to 8.4% in Baja California, compared to 6.5% for the nation. The leading causes of death for both genders were unintentional injuries, congenital malformations, malignant neoplasms, intestinal infectious diseases, and septicemia (59, 60).

Indigenous Peoples

Available health data specific for indigenous groups are limited. In 2009, a study of Native American residents of Arizona showed that this population ranked poorly on maternal and reproductive health measures. On average, indigenous populations are 19.5 years younger than white non-Hispanics. They also had high mortality from alcohol-induced causes (62.1/100,000 population age-adjusted to 2000 standard), diabetes (54.2), influenza and pneumonia (42.7), motor vehicle accidents (36.9), and from other unintentional injuries (92.6). However, they ranked better than average on mortality rates for several chronic diseases (Alzheimer’s disease, lung cancer, breast cancer, prostate cancer, colorectal cancer, chronic lower respiratory diseases, and coronary heart disease), tobacco use, and incidence of genital herpes among women giving birth (61).

Mortality

In 2008, age-adjusted mortality rates in the four U.S. border states ranged from 650.1 deaths per 100,000 (764.4 for males and 556.4 for females, 2000 U.S. standard population) in California to 907.9 (982.7 for males and 832.7 for females) in New Mexico, compared to 758.7 (901.0 for males and 643.7 for females) for the nation. These rates are about 10%–15% lower than 2002 rates. Crude mortality rates ranged from 612.0 deaths per 100,000 population in California to 740.4 in New Mexico, lower than the 813.3 for the nation. Mortality rates were the highest for African Americans, ranging from 710.7 in Arizona to 979.3 in Texas (12, 14, 55, 62).

In 2008, age-adjusted mortality rates in the six Mexican border states ranged from 620 deaths per 100,000 (760 for males and 500 for females, World Health Organization world standard population) in Tamaulipas to 810 (990 for males and 620 for females) in Chihuahua, compared to 650 (770 for males and 530 for females) for the nation. For several states, the rates have increased from previous years. For example, between 2005 and 2008 age-adjusted mortality rates in Chihuahua increased from 750 to 810. Crude mortality rates ranged from 460 deaths per 100,000 population in Baja California to 630 in Chihuahua, compared to 510 for the nation (63). Table 1 describes the 10 leading causes of death for the Mexican border states in 2008 and U.S. border states in 2007.

Morbidity

Communicable Diseases

Vector-borne Diseases

In 2010, 1,021 cases of West Nile virus infection were reported in the U.S.; 38% of these cases were in the four U.S. border states: Arizona (167 cases and 15 deaths), California (111 cases and 6 deaths), New Mexico (25 cases and 1 death), and Texas (89 cases and 6 deaths). El Paso reported 30% (27 cases) of the cases in Texas. The 28 deaths in border states
represent nearly half (49%) of the total deaths from West Nile virus infections reported in the U.S. in 2010. From 2006 to 2010, the number of reported West Nile Virus cases and deaths in the U.S. border states decreased by about half (64, 65). In the Mexican border states only one West Nile virus case, in Nuevo León in 2010, was reported. However, the number of cases reported on the U.S. side of the border, with markedly similar ecology, suggests that West Nile virus may be a health concern along both sides of the border (66).

Nuevo León, Sonora, and Tamaulipas are the Mexican border states with the highest risk for dengue fever. In 2010, Nuevo León reported 12,464 cases of dengue fever and 141 of dengue hemorrhagic fever, Sonora reported 3,588 and 191 cases, respectively, and Tamaulipas reported 1,361 and 186 cases, respectively (66). The last reported continental dengue activity on the U.S. side of the border was in south Texas in 2005, when a local case of dengue hemorrhagic fever was reported in Brownsville, Texas. The number of cases in the U.S. may be underreported, however (67, 68). Beginning in 2009, all dengue infections diagnosed in the U.S. have been reportable to the U.S. Centers for Disease Control and Prevention. Most Mexican border states have sizable dengue control programs, but the U.S. has more limited and inconsistent programs to that end.

Rocky Mountain spotted fever (RMSF), caused by Rickettsia rickettsii, is a tick-borne disease with epidemic potential that has been reported in U.S.-Mexico border areas. During 2010, 1,682 cases of RMSF were reported in the United States. Arizona reported 41 cases during this time period (69), all associated with tribal lands and transmission from Rhipicephalus sanguineus, the brown dog tick (70). The disease has also been reported along the Mexican side of the border. During 2009–2010, over 1,000 cases of RMSF were reported in Mexicali, Mexico. The Mexicali outbreak was also linked to transmission by Rhipicephalus sanguineus, and spread through infected ticks by stray and free-roaming dogs (71). Subsequent surveillance efforts have suggested that sporadic RMSF cases, likely associated with the brown dog tick, are widespread throughout many Mexican border states.

**Vaccine-preventable Diseases**

Childhood immunization programs have been a success in both countries and in the border area

---

**TABLE 1. Ten leading causes of death, United States and Mexican border states, 2007 and 2008.**

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Mortality per 100,000 population</th>
<th>Cause of death</th>
<th>Mortality per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Diseases of the heart</td>
<td>162.5–168.8</td>
<td>1. Diseases of the heart</td>
<td>78.0–112.2</td>
</tr>
<tr>
<td>2. Malignant neoplasms</td>
<td>150.5–164.4</td>
<td>2. Malignant neoplasm</td>
<td>52.9–76.5</td>
</tr>
<tr>
<td>3. Unintentional injuries</td>
<td>31.8–67.5</td>
<td>3. Diabetes mellitus</td>
<td>45.0–87.4</td>
</tr>
<tr>
<td>4. Cerebrovascular diseases</td>
<td>34.8–41.0</td>
<td>4. Homicides</td>
<td>7.6–75.2</td>
</tr>
<tr>
<td>5. Chronic lower respiratory diseases</td>
<td>33.9–44.9</td>
<td>5. Unintentional injuries</td>
<td>25.9–55.0</td>
</tr>
<tr>
<td>7. Alzheimer’s disease</td>
<td>16.3–32.4</td>
<td>7. Chronic liver disease and cirrhosis</td>
<td>17.6–29.8</td>
</tr>
<tr>
<td>8. Influenza and pneumonia</td>
<td>13.5–17.9</td>
<td>8. Influenza and pneumonia</td>
<td>8.2–15.8</td>
</tr>
<tr>
<td>9. Chronic liver disease and cirrhosis</td>
<td>10.6–18.9</td>
<td>9. Conditions originating in the perinatal period</td>
<td>7.4–16.3</td>
</tr>
</tbody>
</table>

itself. Immunization coverage in 2009 with a complete vaccine series in the U.S. border states (four doses of diphtheria, tetanus, and pertussis [DtaP] vaccine; three of polio; one of measles, mumps, and rubella [MMR]; three doses of Haemophilus influenzae type b vaccine; three of hepatitis B; and one dose of varicella vaccine by a child’s second birthday) ranged from 84.2% in New Mexico to 87.9% in California. It should be noted that some border counties had significantly lower coverage. For example, the coverage in Imperial County, California, and Doña Ana County, New Mexico, was 65% and 57%, respectively. The coverage improves to over 95% by the fifth birthday because of compulsory vaccination laws for school entry. Coverage of fully immunized children 1–4 years old in the six Mexican border states by the end of the second quarter of 2009 ranged from 93.9% in Chihuahua to 99.4% in Tamaulipas (72, 73, 74).

In 2007, the incidence of acute hepatitis A and hepatitis B in the U.S. border states was 1.6 and 1.1 cases per 100,000 population, respectively, in California; 2.4 and 1.3 in Arizona; 0.6 and 0.7 in New Mexico; and 1.1 and 3.1 in Texas. For 2006–2010, the six Mexican border states reported 13,553 cases of hepatitis A and 557 cases of hepatitis B, with Sonora having the highest number of hepatitis A cases (4,329 cases, 162 cases per 100,000 population) and Tamaulipas having the highest number of hepatitis B cases (132 cases, 4 cases per 100,000 population) (4, 75, 76).

**HIV/AIDS and Other Sexually-transmitted Infections**

In 2009, along the U.S. side of the border, Arizona reported a total of 676 (587 males and 89 females) newly reported cases of HIV/AIDS, with an incidence rate of 10.2 cases per 100,000 population and a death rate of 1.6 deaths per 100,000 population (77). Texas reported a total of 4,230 (3,289 males and 941 females) newly reported cases of HIV infection, with an incidence rate of 17.1 (26.5 for males and 7.6 for females). African Americans had the highest incidence rates of HIV infection (62.7) in Texas. In addition, males had a higher incidence rate of AIDS (15.6/100,000) than females (5.0) and African Americans had the highest rate (36.8) (78). In 2008, New Mexico reported 1,458 new cases of HIV and 4,356 new cases of AIDS (88% males) (79). California reported 29,939 new cases of HIV and 138,013 of AIDS (89% males) (80).

In 2007, reported new cases of HIV in the Mexican border states ranged from 12 in Coahuila to 91 in Tamaulipas; reported new cases of that same year ranged from 5 in Coahuila to 85 in Baja California, with a mortality rate between 3.1 deaths per 100,000 population in Coahuila to 9.5 in Baja California (81).

In 2010, the incidence rates of congenital syphilis reported in the Mexican border northern states were among the highest in the nation. Rates were the highest in Baja California (0.3 per 1,000 population under 1 year) and Sonora (0.21), compared to 0.03 for the nation (82) In the U.S. border states in 2010, congenital syphilis ranged from 0.0 cases per 100,000 live births in New Mexico to 25.3 in Texas, compared to 8.7 for the nation (83).

**Tuberculosis**

Tuberculosis (TB) continues to be a concern along the border. For the U.S. border states, in 2009, California reported the highest incidence rate in the region (6.7 cases per 100,000 population), followed by Texas (6.1), Arizona (3.5), and New Mexico (2.4). California had the highest incidence rate in the continental U.S. and the highest number of cases (2,470) in the nation. However, the rate was about 13% lower than the 2005 state rate. The decrease has been less among foreign-born persons, who comprise about 60% of all reported cases (84, 85).

The six Mexican border states reported TB incidence rates higher than the national average of 13.5 cases per 100,000 population in 2007. Baja California reported the highest incidence rate (38.3) and the highest number of cases (1,147) in the border area and the nation, followed by Tamaulipas (32.4 and 1,011), Sonora (26.1 and 644), Chihuahua (18.4 and 612), Nuevo León (18.1 and 783), and Coahuila (16.7 and 430). With the exception of Sonora, these rates were significantly lower than the
2002 rates. In Sonora, the incidence rate increased about 18% between 2002 and 2007 (86).

**Emerging Diseases**

The first two H1N1 influenza sentinel cases in the border area were detected and confirmed in San Diego and Imperial Valley, California (87). California reported 596 fatal H1N1 influenza cases between April 2009 and August 2010. In 2009, Mexico reported 2,074 confirmed cases in Baja California (54.77/100,000 population), 1,142 in Chihuahua (34.23), 398 in Coahuila (15.63), 3,902 in Nuevo León (90.76), 2,377 in Sonora (105.55), and 2,281 in Tamaulipas (71.28) (66, 88).

**Chronic, Noncommunicable Diseases**

**Cardiovascular Diseases**

In 2008, the crude mortality rates due to heart disease in the Mexican border states ranged from 78.0 deaths per 100,000 population in Baja California to 112.2 in Sonora and Chihuahua, compared to 86.9 for the nation. The main contributor to heart disease mortality was mortality from ischemic heart disease (28). For the U.S. border states in 2007, the crude mortality rates due to heart disease ranged from 162.5 deaths per 100,000 population in Arizona to 168.8 in California, lower than the 204.3 for the nation. These rates were about 15% to 18% lower than the 2003 rates (89).

**Malignant Neoplasms**

Malignant neoplasms continue to be either the second or third leading cause of death in all four U.S. and all six Mexican border states. For the U.S. border states in 2007, the age-adjusted incidence rates for the top five cancer sites were: prostate (37.8–47.6 deaths per 100,000 U.S. standard population), female breast (20.1–22.6), prostate (19.1–24.5), colon and rectum (14.5–16.4), and pancreas (9.4–10.4) (90, 91). For the Mexican border states of Chihuahua and Sonora, in 2008 the mortality rates for the top three cancer sites were: lung and bronchus (11.1 and 13.0 deaths per 100,000 population), female breast (6.8 and 6.9), and colon and rectum (4.9 and 5.7) (28).

**Diabetes**

For the Mexican border states in 2009, the rate of new cases of type 2 diabetes mellitus ranged from 346 cases per 100,000 population in Sonora to 621 in Coahuila, compared to 397 for the nation. Only Sonora had an incidence rate below the national average (76). For the U.S. border states in 2009, the age-adjusted rate of new cases of diabetes ranged from 860 in California and New Mexico to 1,010 in Arizona, compared to 840 for the nation. Between 2000 and 2009, the number of adults diagnosed with diabetes since 1994 increased 49.5% in Arizona, 43% in Texas, 37% in New Mexico, and 32% in California. Native Americans, African Americans, and Hispanics have higher rates after adjusting for population age differences. For example, the 2009 death rate from diabetes for Native Americans in Arizona was about 245% higher than the state rate for total population (61, 92, 93).

**Nutritional Diseases**

**Obesity**

In 2010, the age-adjusted percentage of adults who were obese (body mass index $\geq 30$) in the U.S. border states ranged from 24% in California to 31% in Texas, compared to 33.8% for the nation. In 2009, the prevalence of obesity among low-income children aged 2 to 4 years was 10%–15% in Arizona and New Mexico and 15%–20% in California and Texas, compared to about 15% for the nation (94, 95).
A survey conducted in 2006 (95) indicated that the prevalence of abdominal obesity in adults in the Mexican border states ranged from 76.9% in Baja California to 82.9% in Tamaulipas (the highest of the nation). Excessive weight gain, obesity, and abdominal obesity have increased among adults compared to a 2000 national study. Among the many possible explanations cited for the increases were factors related to urbanization, increased access to unhealthy foods, and lack of opportunities for physical activity.

**Mental Disorders**

The rate of suicide deaths has declined in the United States–Mexico border region over the past decade, but remains relatively high in certain states and communities. In 2007, New Mexico had the highest rate of suicides among U.S. border states (20.4 deaths per 100,000 population), followed by Arizona (16.0), Texas (10.2), and California (9.9), compared to 11.3 for the nation, rendering suicide the 10th leading cause of death in this geographical region. Almost four times as many males as females died by suicide in the U.S. and it was the third leading cause of death for young people ages 15 to 24 (89, 96). For the Mexican border states, in 2008 Sonora had the highest rate of suicides (7.6 deaths per 100,000 population), followed by Chihuahua (6.9), Coahuila (5.8), Nuevo León (5.6), Tamaulipas (4.5), and Baja California (4.1), compared to 4.4 for the nation, corresponding to about 23% of the suicides for the nation. About 80%–90% of suicides were males in Mexican border states (63, 97).

**Risk and Protection Factors**

**Alcoholism**

In 2008, the prevalence of heavy drinking in men (defined as having more than five drinks per occasion) in the Mexican border states ranged from 23.6% in Baja California to 47.5% in Nuevo León, compared to 39.1% for the nation. The prevalence of heavy drinking in women (having more than four drinks per occasion) ranged from 9.6% in Coahuila to 14.1% in Chihuahua, compared to 15.1% for the nation (98). For the U.S. border states, the prevalence of heavy drinking in men (defined as consuming an average of more than two drinks per day) ranged from 5.2% in New Mexico to 6.9% in California, compared to 5.7% for the nation. The prevalence of heavy drinking consumption in women (consuming an average of more than one drink per day) ranged from 3.5% in New Mexico to 4.9% in California, compared to 4.2% for the nation (99, 100, 101).

**HEALTH POLICIES, THE HEALTH SYSTEM, AND SOCIAL PROTECTION**

**Health Systems and Services**

In the United States, the health care system is characterized by a demand model and health care is delivered through a fee-for-service system. Health services are provided primarily by nonprofit institutions and private entities. Native Americans also receive services through the public Indian Health Service. In 2008–2009, private health insurance coverage ranged from 44% in New Mexico to 53% in California. Public health insurance such as Medicare (for an individual over 65 years of age who has been a U.S. citizen or permanent legal resident for five years) covered 9%–12% of the population and Medicaid (for low-income and disabled U.S. citizens or permanent legal residents) covered 15%–19% of the population. The uninsured population in the border states was higher than for the nation as a whole, from 19% in California to 26% in Texas, compared to 17% for the nation. The uninsured population in the three most populous border counties of Texas was 33% (102, 103); with this high percentage of population lacking health insurance, Texas faces a significant challenge of uncompensated health care. In 2008, Texas hospitals reported US$ 13.6 billion in uncompensated care charges (104). The federal Patient Protection and Affordable Care Act of March 2010 put in place a comprehensive health insurance reform to expand health insurance coverage (105).

In Mexico, health is considered a constitutional right, but there is no universal health care coverage.
Public and private institutions provide health care services. In 2009, the uninsured population in the Mexican border states ranged from 20% in Nuevo León to 28% in Baja California, lower than the 34% for the nation. An insurance system known as “Seguro Popular” became available in 2002 to provide health service coverage, through voluntary enrollment, for persons who are not affiliated to the country’s social security scheme (106). Between 2002 and 2009, more than 500,000 families from border municipalities and over 2 million families from the border states enrolled in this system (107).

The U.S. and Mexican health care systems have various programs and projects in place to promote health services along the border. For example, the Binational Health Week and Border Binational Health Week promote public health care, outreach, and immunization services every October, reaching vulnerable groups along the border. The Ventanillas de Salud (health stations) program provides on-site health advice and outreach at Mexican Consulates in the U.S. to low-income and Hispanic migrant families unfamiliar with the U.S. health system. It was launched in San Diego and Los Angeles in 2002 and has expanded to include all 50 consular offices in the U.S. (108).

**Human Resources**

The number of professionally active physicians per 10,000 civilian population for the U.S. border states in 2008 ranged from 21.5 in Texas to 26.2 in California, lower than the 27.7 for the nation. In Texas, most border counties are federally designated as medically underserved areas (having too few primary health care providers). In 2007, the number of professionally active dentists per 10,000 civilian population ranged from 4.6 in Texas and New Mexico to 7.6 in California, compared to 6.0 for the nation. In 2010, the number of registered nurses per 10,000 population ranged from 64.4 in California to 70.1 in Texas, compared to 86.0 for the nation (102). The number of physicians per 10,000 population for the Mexican border states in 2009 ranged from 14.6 in Baja California to 20.2 in Sonora, compared to 16.9 for the nation (107).

Maintaining the health workforce in the border region faces a number of challenges, including a lack of medical and public health higher education institutions. There are 19 schools offering medical education and 12 schools offering graduate degrees in public health in the U.S. border states and 19 medical schools and 15 public health programs in the Mexican border states. New investments in health education have been made in the U.S. border counties since 2006. For example, a new master in public health program was started at the University of Texas in El Paso in 2008 and a medical school was created in El Paso, Texas in 2009 (109). It has been equally challenging to attract a health workforce within the border region.

For the U.S. border states in 2009, the number of hospital beds ranged from 1.9 per 1,000 population in California (0.4 in state/local government facilities, 1.2 in nonprofit facilities, and 0.3 in for-profit facilities) to 2.5 in Texas (0.4 in state/local government facilities, 1.1 in nonprofit facilities, and 1.0 in for-profit facilities), compared to 2.6 for the nation (0.4 in state/local government facilities, 1.8 in nonprofit facilities, and 0.4 in for-profit facilities). Hospital admissions ranged from 91 per 1,000 population in New Mexico to 107 in Arizona, compared to 116 for the nation, and hospital emergency room visits ranged from 286 per 1,000 population in California to 413 in New Mexico, compared to 415 for the nation (102). In the Mexican border states in 2009, the number of beds in facilities of the National Health System (excluding facilities of the Secretary of National Defense) ranged from 0.6 per 1,000 population in Baja California to 1.0 in Sonora, compared to 0.7 for the nation (107).

**Knowledge, Technology, Information, and Human Resource Management**

**Evidence-based Practice and Information Access**

Since 2008, the U.S. Health Resources and Services Administration has been working closely with academic institutions, health sciences libraries, and
the U.S. National Library of Medicine to assess the need and implementation of evidence-based practice approaches that contribute to strengthening health systems and improving health care in the border region (110). As a result, Frontera Collaboration (“Border Collaboration”) was created to bring together members of the Border Virtual Health Library and the National Network of Libraries of Medicine in the U.S. border states to improve the evidence-based practice skills and information access of health professionals working in rural clinics and community health centers (111).

**Health Information Technology**

In the U.S., substantial progress has been made toward the establishment of the National Health Information Infrastructure, particularly in setting standards to harmonize information systems and enhance interoperability. Since 2003, the U.S. Department of Health and Human Services has allocated over US$ 40.6 million to northern and southern border states for this purpose. Combined allocations for Arizona, California, New Mexico, and Texas exceed US$ 30.5 million for the U.S. Border State Early Warning Infectious Disease Surveillance Project (EWIDS) (112). In the U.S.-Mexico border area, EWIDS and the Border Infectious Disease Surveillance Program collaboration demonstrated its relevancy during the 2009 H1N1 influenza pandemic through exchange of surveillance findings, distribution of laboratory supplies, availability of highly trained technical staff, and training of public health personnel.

**Health and International Cooperation**

There are several transnational agreements, alliances, and partnerships along the U.S.-Mexico border. The most notable are the U.S.-Mexico Border Health Commission (86); the Binational Health Councils; the International Boundary and Water Commission (IBWC); the Border Environment Cooperation Commission (BECC) and its sister institution, the North American Development Bank (NADB) (113); the Border 2012 Environmental Program (114); the Border Governor’s Conference (115); the Border Legislative Conference (116); the Coalition of Border Mayors; and PAHO/WHO’s U.S.-Mexico Border Office.

The U.S.-Mexico Border Health Commission was created as a binational health commission in July 2000 and was charged with providing leadership to optimize health and quality of life along the border. Commission membership includes the Minister of Health of Mexico and the U.S. Secretary of Health, the chief health officers of the 10 border states, and prominent health professionals from both nations. During 2006–2010 the Commission held several research forums (117), established expert panels, sponsored activities each year for the National Infant Immunization Week and Vaccination Week in the Americas, supported a tuberculosis working group, and established a tuberculosis consortium. Each year the Commission has sponsored activities for the Binational Border Health Week, including workshops and seminars on topics such as health diplomacy, tobacco policy, and diabetes prevention (86).

The Binational Health Councils (BHC) were originally established as local chapters of the U.S.-Mexico Border Health Association, which stopped operations in 2010. There are 16 Councils, consisting of volunteer members from local health services and community organizations from both sides of the border. In June 2008, the Councils defined border-wide health priority areas for 2009–2011. Most Councils identified TB and issues associated with diabetes, obesity, and nutrition among their priorities. At least half of the Councils identified dengue fever; the Early Warning Infectious Disease Surveillance program; issues relating to mental health, substance abuse, and domestic violence; and HIV/AIDS and other sexually-transmitted infections as issues of leading concern (118).

The Border Environment Cooperation Commission and the North American Development Bank were created as interdependent institutions in 1993 under a side agreement to NAFTA. Both
entities were intended to improve environmental conditions along the U.S.-Mexico. They work with communities and project sponsors to develop, finance, and build sustainable projects that address human health and environmental needs. Between 1995 and 2010 the Border Environment Cooperation Commission certified 175 projects—93 in Mexico and 82 in the U.S.—with an estimated total cost of US$ 3.924 billion. These projects provided access to safe and sanitary water infrastructure, increased wastewater management efficiency, enhanced proper waste disposal, and improved air quality related to paving to approximately 7.2 million border residents (113).

SYNTHESIS AND PROSPECTS

This chapter shows that differences in economic development persist between both sides of the U.S. Mexico border region and that significant differences persist along the U.S. side of the border. Water supplies in the area are already stressed and are projected to become increasingly scarce in the next 50 years due to climate change. In general, health conditions have improved since 2005. However, since 2008, there has been an increase of violence along the Mexican side of the border, associated primarily with the implementation of national policies to crack down on organized crime and drug trafficking. In addition, the low immunization coverage, limited access to health care services, limited primary care providers along the U.S. side of the border, precarious health of indigenous populations, public health emergencies, and high rates of certain health conditions such as childhood obesity, diabetes, teen pregnancy, and tuberculosis along both sides of the border continue to be of great concern.

Increasing investments in physical infrastructure as a result of security concerns in the U.S.-Mexico border area may benefit health and development in the region. In addition, the health care reform in the U.S. and the increasing investment in the Seguro Popular system in Mexico are expected to increase access to health care along the border. Strategies such as Healthy Border 2012, an initiative of the U.S.-Mexico Border Health Commission (119) and the Border 2020 Environmental Program (120), administered by Mexico’s Secretariat for the Environment and Natural Resources (SEMARNAT) and the U.S. Environmental Protection Agency (EPA), will set important benchmarks to improve health and quality of life along the border. Finally, increasing investments in health education, including the establishment of new medical and public health schools in the area, will provide much needed opportunities for young professionals to stay and work in the border region.

REFERENCES

1. United States of America and United Mexican States. La Paz Agreement: agreement between the United States of America and the United Mexican States on cooperation for the protection and improvement of the environment in the border area. La Paz, Baja California, México; 1983.


5. United States, Census Bureau. 2005–2009 American Community Survey 5-year estimates


22. Office of Texas Secretary of State. The Colonia Initiatives Program. Tracking the progress of state-funded projects that benefit colonias. Final report in response to Senate Bill 99 by Senator Judith Zaffirini and Representative Ryan Guillen. 82nd regular session, Texas Legislature; 2010.
37. Cerreta LE, Monárez Fraga JE. Sistema de información geográfica de la violencia en el municipio de Juárez, Chihuahua: Geo-referenciación y su comportamiento espacial en el contexto urbano y rural; 2010.


74. Mexico, Secretaría de Salud, Subsecretaría de Prevención y Promoción de la Salud. Cobertura de vacunacion sectorial por tipo de biológico, y esquemas completos según censo nominal por municipio en menores de 5 años. Secretaría de Salud, CeNSIA, PROVAC; 2009.


112. United States, Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Control. Public Health Emergency [Internet]. Available at: http://www.phe.gov/about/Pages/default.aspx Accessed on 29 December 2011.


115. Conferencia de Gobernadores Fronterizos. XXIX Conferencia de Gobernadores Fronterizos en


