BINATIONAL MIGRATION INSTITUTE

A Continued Humanitarian Crisis at the Border:

Undocumented Border Crosser Deaths Recorded by the Pima County Office of the Medical Examiner, 1990-2012

The Binational Migration Institute
The University of Arizona · June 2013

ARIZONA

Suspected migrants waiting for identification and repatriation in the morgue at the Pima County Office of the Medical Examiner. Photo courtesy of MarcSilver.net.

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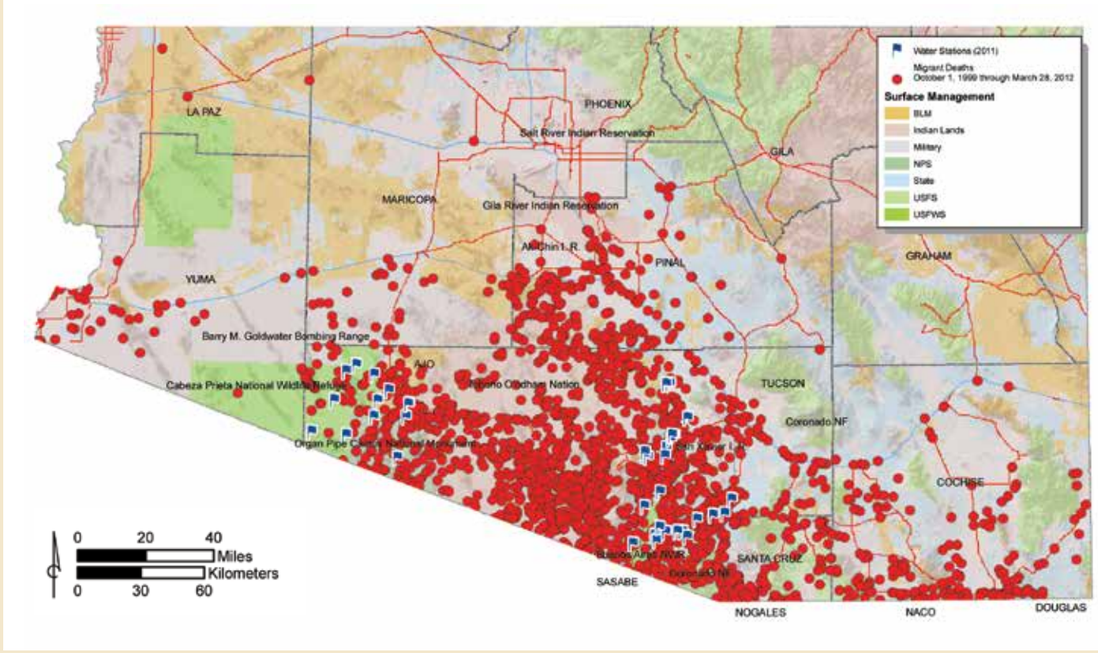
ARIZONA

1999 - 2012 RECORDED MIGRANT DEATHS AND HUMANE BORDERS WATER STATIONS



Humane Borders
Fronteras Compasivas
243 W. 33rd Street
Tucson, AZ 85713
520-398-5053
http://www.humaneborders.org/

Migrant Death Data Sources:
Pima County Medical Examiner
United States Border Patrol
Cochise County Medical Examiner
Yuma County Sheriff

This maps shows a total of 2,269 deaths,covering the period from October 1, 1999 through March 28, 2012. Over the past 13 years, Humane Borders has deployed equipment for over 80 water stations at remote, strategic locations in Mexico and the USA. Permission to use this map granted by Humane Borders.

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This document prepared June 3, 2013

PCOME Anthropologists working in the Walter H. Birkby Forensic Anthropology Laboratory examine the skeletal remains of suspected migrants recovered from the Sonoran Desert.

A Continued Humanitarian Crisis at the Border:

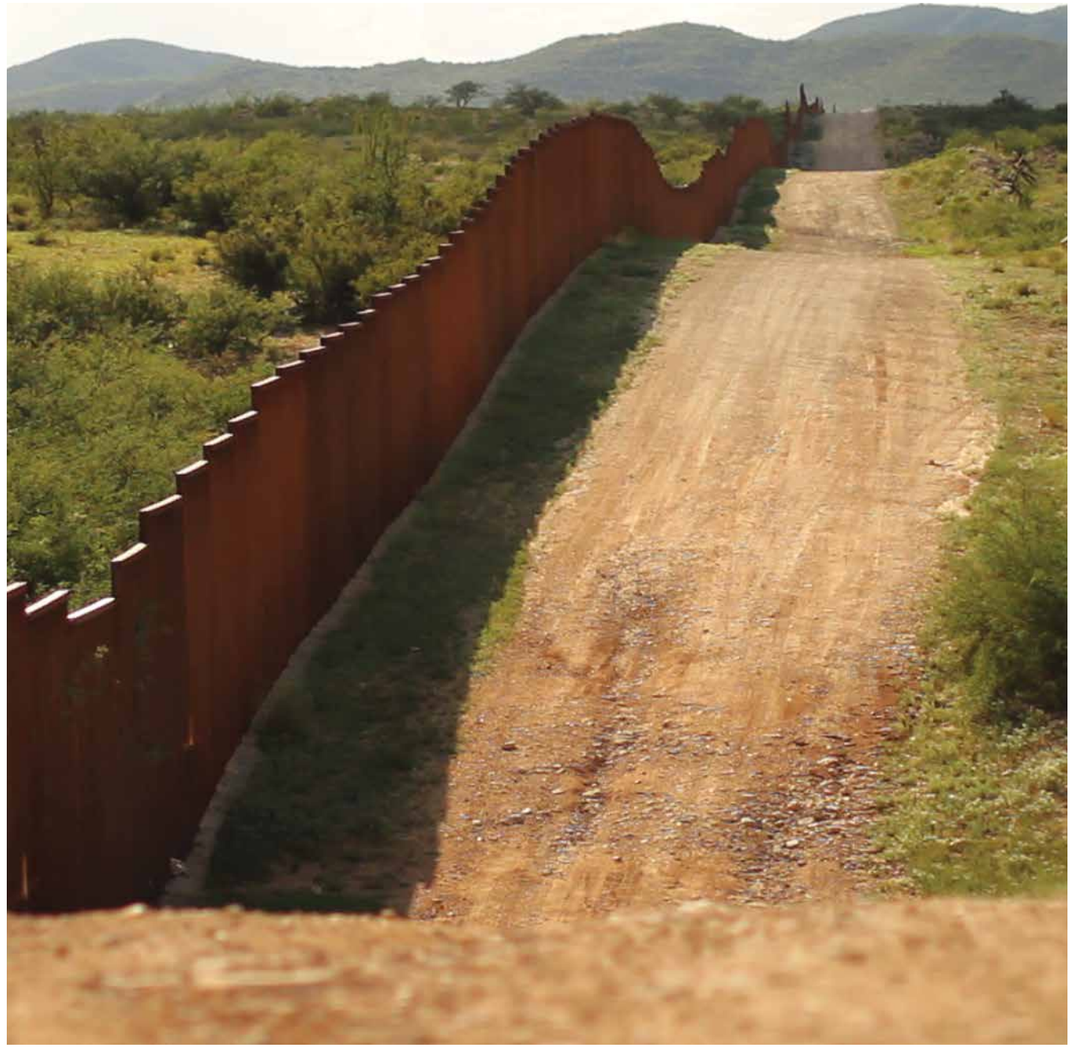
Undocumented Border Crosser Deaths Recorded by the Pima County Office of the Medical Examiner, 1990-2012

About this Report

This report analyzes the numeric trends and demographic characteristics of the deaths of undocumented border crossers in the area covered by the Pima County Office of the Medical Examiner which is located in the city of Tucson, Arizona. This office provides medico-legal death investigation for the western two-thirds of the Tucson Sector's southern border with Mexico (Anderson 2008) and has been the office responsible for the examination of over 95% of all migrant remains discovered in Arizona since 2003 (Coalición de Derechos Humanos 2013). The data for this report come from the Pima County Office of the Medical Examiner.

Acknowledgements

This report could not have been possible without the dedicated and meticulous work of forensic professionals at the Pima County Office of the Medical Examiner, now and in the past. Tucson-based immigrant rights organization, Coalición de Derechos Humanos, has tracked migrant deaths in Arizona since 2003, providing the groundwork for this research. Finally, this report builds on a study completed by the Binational Migration Institute in the Department of Mexican American Studies at the University of Arizona in 2006, which was generously supported by the Pima County Board of Supervisors. The Pima County Board of Supervisors has also been very supportive of the Pima County Office of the Medical Examiner in its efforts to evaluate and investigate suspected unauthorized border crosser deaths. Thanks to M. Melissa McCormick, Inez M. Duarte, and Kat Rodriguez for their assistance in the data collection and entry process, thanks to Jessica Hamar Martinez for looking over early drafts of the report, and thanks to Christine Scheer for help with the report format and layout. We thank the Little Chapel of All Nations for their support. We gratefully acknowledge the contributions of all those who have worked on this issue for years.



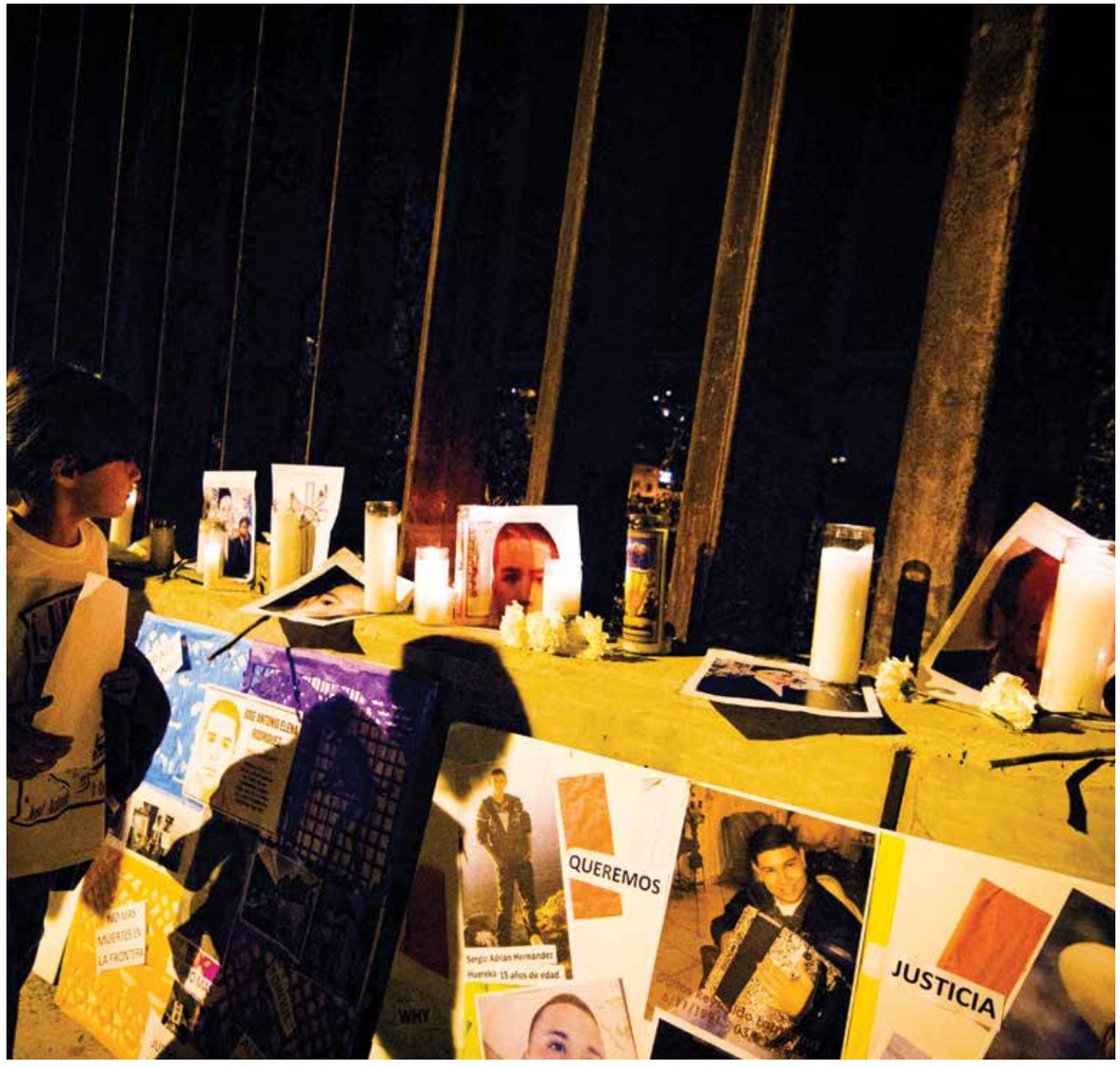
A section of the border wall near Sasabe, Arizona. Photo courtesy of MarcSilver.net.

A Note on Terminology

Undocumented Border Crosser (UBC): In this report, the terms "undocumented border crosser" (UBC) or "unauthorized migrant" will be used to refer to foreign-born non-U.S.-citizens actively involved in crossing the border without proper authorization from the United States government. Because this study does not analyze the deaths of immigrants who are established in the United States and not actively involved in crossing the border, the standard academic term "unauthorized immigrant" is not used.

Fiscal Year (FY): In this report, all data and figures are reported according to the federal fiscal year which begins on October 1st and ends September 30th. Doing so allows us to make reasonable comparisons between migrant deaths and the enforcement efforts of the Department of Homeland Security's Customs and Border Protection.

"Deaths": Throughout this article we refer to UBC "deaths" investigated by the Pima County Office of the Medical Examiner. The term "deaths" should be taken to mean "recovered remains." This distinction must be noted as the true number of migrant deaths in southern Arizona each year is not known. Further, it is possible that remains recovered in a given year may be of an individual who passed away in prior years. Nevertheless, for the sake of clarity, consistency, and compassion, we use the term "deaths" rather than "recovered remains."



During a binational protest on Day of the Dead, 2012, a young girl walks by a memorial to 16-year-old José Antonio Elena Rodriguez and other victims of U.S. Border Patrol confrontations. Photo by Murphy Woodhouse.

INTRODUCTION

The deaths of hundreds of unauthorized migrants each year along the U.S.-Mexico border continue despite recent evidence that migration from Mexico has decreased dramatically over the past five years (Passel, Cohn, and Gonzalez-Barrera 2012, Massey 2012). This humanitarian crisis is a consequence of multiple interrelated and intersecting factors, 1) the long history and socially-embedded culture of migration in many areas of Mexico (Portes and Sensenbrenner 1993), 2) neoliberal economic reform during 1990s that displaced hundreds-of-thousands of *campesinos* throughout the country (Wise 2009; Garcia Zamora 2009), 3) inadequate U.S. immigration policies ill-equipped to deal with the reality of an increasingly globalized world, 4) border enforcement and securitization practices initially instituted in the mid-1990s that effectively pushed would-be migrants into the most remote, hot, and dry regions of the desert borderlands (Cornelius 2001, 2005; Rubio-Goldsmith et al. 2006), and 5) the structurally embedded demand for immigrant labor in the United States (Cornelius 1998).

The links between increased border security and migrant fatalities have been demonstrated extensively in the literature (Eschbach, Hagan, Rodriguez, Hernandez-Leon, and Bailey 1999; Eschbach, Hagan, Rodriguez, Hernandez-Leon, and Bailey 2003; Cornelius 2001; 2005; 2006; Rubio-Goldsmith, McCormick, Martinez, and Duarte 2006; Jimenez 2009). The 1990s and 2000s saw dramatic increases in the fortification of the U.S.-Mexico border (Dunn 1996; 2010; Andreas 1998) and simultaneous increases in reported migrant deaths (Cornelius 2001; 2005; 2006; Eschbach et al. 1999; Eschbach et al. 2003). Previous research has illustrated that segmented border militarization has resulted in the funnel effect, or the redistribution of migratory flows into remote and dangerous areas such as southern Arizona (Cornelius 2001, 2005; 2006; Rubio-Goldsmith et al. 2006).

The Pima County Office of the Medical Examiner (PCOME), in Tucson, Arizona, continues to be the agency that investigates the highest number of migrant deaths in the country, and as a consequence, now handles more unidentified remains per capita than any other medical examiner's office in the United States. Arizona now ranks third in the nation, following California and New York, for the number of unidentified remains entered into the National Missing and Unidentified Persons System (NamUs), but ranks first in probable migrant remains and known missing migrants. The funnel effect has made the Tucson Sector the single most traversed crossing corridor for migrants along the entire U.S.-Mexico border. In Fiscal Year (FY) 2012, over 33% of all Border Patrol apprehensions occurred in the Tucson Sector, whereas between FY 1993 and 1996 less than 15% of all apprehensions took place in the same sector

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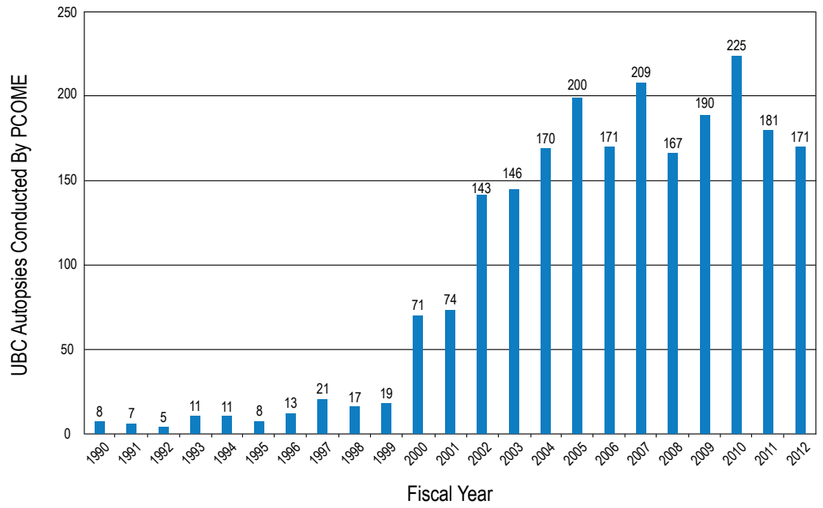
Figure 1. PCOME Deaths Coded as UBCs
FY1990-2012 (N = 2,238)



(U.S. Citizenship and Immigration Services 2010; U.S. Border Patrol 2013). It is precisely this redistribution of migration flows into southern Arizona that has led to an increase in migrant remains handled by the PCOME.

Estimated Number of Deaths

Between FY 1990 and 2012, the PCOME examined the remains of 2,238 migrants. Over a third of these decedents, or 761 cases, remained unidentified at the publication of this report, and thus their status as unauthorized migrants is predicted rather than certain. Beginning in 2001, the PCOME began to classify deceased individuals believed to be unauthorized migrants, whether identified or not, as "Undocumented Aliens," or "UDAs", then later changed the terminology used to "Undocumented Border Crossers" or "UBCs". As defined by the forensic anthropologist and former chief medical examiner, UBCs are "individuals of foreign nationality who died while crossing the border clandestinely" (Anderson and Parks 2008). Factors contributing to a UBC determination include the geographic location the remains were found, clothing or personal effects (including foreign currency and Mexican voter identification cards), association with a group of unauthorized migrants, and phenotypic characteristics consistent with Hispanic ancestry. The methodology used to classify UBCs is further detailed in **Appendix B** of this report.

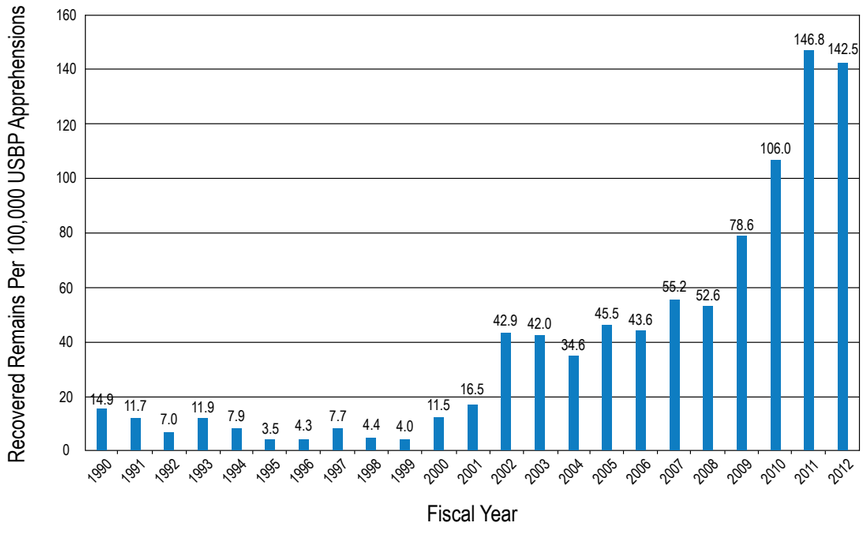
The Binational Migration Institute produced a report similar to this one in 2006, entitled The "Funnel Effect," which demonstrated that border enforcement strategies undertaken in the late 1990s and early 2000s effectively pushed would-be migrants into extremely remote areas of Arizona's border with Mexico, where they perished in great numbers (Rubio-Goldsmith et al. 2006). The updated data from the PCOME indicate that the number of deaths has not decreased. **Figure 1** illustrates that the funnel effect continues unabated, with an average of nearly 163 deaths occurring each FY since 1999, while only an average of 12 occurred annually between 1990 and 1999.

Approximate Death Rate

One could argue that the increase in migrant deaths in southern Arizona is simply due to an increase in the number of UBCs traversing the area. However, when Border Patrol apprehension statistics, a measure often used as a proxy for unauthorized migration flow, are taken into account, the death rate has actually increased exponentially since 1999. **Figure 2** shows the number of migrant deaths per year standardized to 100,000 border patrol apprehensions each year. Although not a precise measure of unauthorized crossings, previous research has demonstrated that apprehension statistics are highly correlated and fluctuate with true unauthorized migration flows (Epenshade 1995).

Our findings are consistent with those of the non-governmental organization *Coalición de Derechos Humanos*, which suggest that the UBC death rate has increased in southern Arizona, and in fact doubled between 2009 and 2011 (Coalicion de Derechos Humanos 2012). In FY 2009, the number of deaths determined to be UBCs by the PCOME was 190, while the number of apprehensions reported by the Border Patrol in the Tucson sector was 241,673. In other words, there were about 79 deaths coded as UBCs by the PCOME for every 100,000 Border Patrol apprehensions during FY 2009. Although the number of UBCs investigated by the PCOME decreased from 190 in 2009 to 183 in 2011, the number of apprehensions in the Tucson sector decreased at a much faster rate during the same period, from 241,673 to 123,285. This suggests that the number of unauthorized crossers traversing the area also decreased substantially between these years. Ultimately, remains of nearly 147 migrants were examined by the PCOME for every 100,000 border patrol apprehensions in FY 2011—a rate nearly twice that of FY 2009.

Figure 2. Approximate Death Rate in the Tucson Sector using PCOME Deaths Coded as UBCs,
FY 1990 - 2012 (N = 2,238)



FACTORS EXAMINED IN THIS REPORT

In this report we provide information on factors relevant to UBC deaths in southern Arizona: confirmed cause of death, identification rates, and demographic characteristics including biological sex, age, and place of origin.

Cause of Death

We group each migrant's cause of death into five possible categories: *exposure to the elements, homicide, motor vehicle accident, other,* and *undetermined.* Our use of the term "cause of death" is a deviation from the conventional use by medical examiners that utilize it to describe the disease or trauma that directly caused an individual's biological death. Examples of causes of death as used by medical professionals include *exposure to the elements, gunshot wound of the head, blunt force impact of the torso,* etc. On the other hand, manner of death describes how the death came about, and includes the five categories of *natural, accident, suicide, homicide,* or *undetermined.* Strictly speaking, the manner of death for a migrant who was lost or left behind in the desert while crossing and succumbed to the elements would be accidental, while the cause of death of resulting from a motor vehicle accident may be blunt force trauma. For the sake of clarity and parsimony, this report uses elements from definitions of both terms to construct the cause of death categories that are most relevant for the population under study. Although we include in our analysis the cases which list other or undetermined as the cause of death, we limit our discussion to differences between exposure, motor vehicle accident, and homicide as these are the most prevalent causes of death for unauthorized migrants attempting to cross the border without proper authorization.

Identification Rates

Thirty-four percent of all the cases categorized as UBCs by the PCOME between 1990 and 2012 remain unidentified. Unidentified remains pose a methodological challenge for researchers—the issue of missing information. Successful identification is essential for ascertaining information for some variables of interest in this report. For instance, it is possible to determine the biological sex of an unidentified individual, but impossible to establish their precise age at the time of death or their hometown. More complete information exists for some variables than for others, hence the variation in sample sizes for different factors examined.

Demographic Characteristics

Records from the PCOME provide information on important demographic characteristics of UBCs who have perished in southern Arizona. In this report we provide information on migrants' biological sex, age, and place of origin. As noted above, while biological sex is likely to be determined during a medical investigation, ascertaining a person's exact age and place of origin are contingent upon the success of identification.

The extant literature on unauthorized migration finds that a migrant's place of origin may play an important role in shaping the reasons people migrate, how and where along the border they may attempt a crossing, as well as their desired destination. In terms of place of origin, we provide information on two levels: country-level and region-level. Thirteen different Latin American countries are represented among the UBC deaths investigated by the PCOME; however the overwhelming majority of decedents originate from Mexico, Guatemala, El Salvador, and Honduras (95% among identified decedents). More specifically, 86% of all identified decedents whose countries of origin are known are Mexican nationals. We also distinguish between regions of origin among Mexican UBCs. In their seminal work on unauthorized migrants, Massey and colleagues (1987) identify four important migrant sending regions in Mexico: north, west-central (also known as the "traditional" region), central, and south-southeastern. These regional designations are actively used by Mexico's *Consejo Nacional de Población* when discussing Mexico-U.S. migration. The map below depicts these sending regions. In sum, we provide information on Mexican decedents' region of origin while also differentiating between Mexican and non-Mexican UBCs.

Migrant Sending Regions of Mexico

Source: Map created by Jeremy Slack using ARC GIS software. The migrant sending regions of Mexico were first discussed by Massey et al.1987.

DESCRIPTIVE STATISTICS: Cross-Sectional Data

Between FY 1990 and 2012, the PCOME examined the remains of 2,238 migrants. **Table 1** illustrates the descriptive statistics for cause of death and demographic characteristics of UBCs processed during this time period. Sample sizes noted in Table 1 vary due to different degrees of complete information available for each factor examined.

Table 1. Specific Causes of Death and Demographic Characteristics of PCOME Deaths Coded as UBCs, FY 1990-2012

	Percent/Mean	N
Causes of Death		
Exposure	46%	2,238
Undetermined	36%	2,238
Motor Vehicle Accident	9%	2,238
Other Miscellaneous Causes [a]	6%	2,238
Homicide	4%	2,238
Demographic Characteristics		
Identified	66%	2,238
Unidentified	34%	2,238
Male	80%	2,238
Female	18%	2,238
Unknown Biological Sex	1%	2,238
Age [b]	31 years	1,394
Region of Origin among Identified Decendents		
North	14%	1,470
West-Central (Traditional)	16%	1,470
Central	24%	1,470
South/Southeast	20%	1,470
Non-Mexican	13%	1,470
Unknown Region	13%	1,470

a. "Other" causes of death include drowning, suicide, natural causes, cases pending investigation, electrocution, envenomation, overdose and other miscellaneous causes.
b. Among identified decedents.

Note: Percentages may not sum to 100 due to rounding.

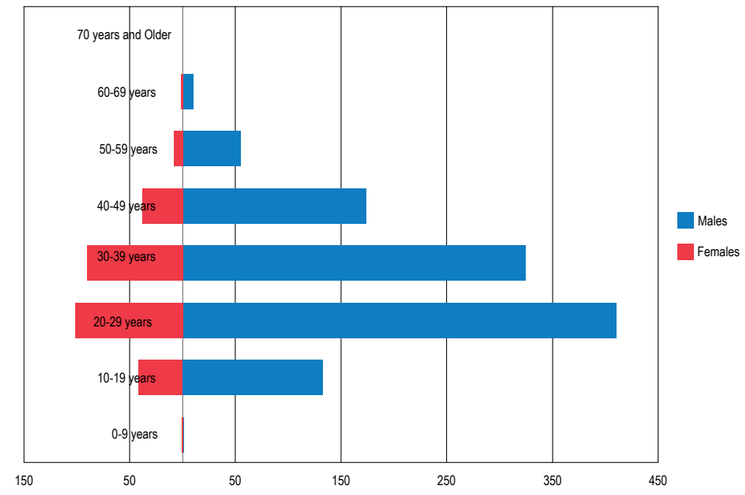
Cause of Death

Over 45% of confirmed UBC deaths were due to exposure or probable exposure, followed by undetermined cause of death (36%), motor vehicle accident (9%), other miscellaneous causes (6%), and homicide (4%). For undetermined deaths, the medical examiner was unable to assign a definitive cause of death due to the degree of decomposition or lack of compelling evidence of any one cause of death. Nevertheless, given the remote desert location where these bodies were recovered, it is likely that the cause of death for a large percentage of these undetermined cases was exposure, but this cannot be confirmed. Advanced decomposition or skeletonization of remains may prevent medical examiner staff from determining a valid postmortem interval. It is also important to note that highly decomposed remains mean that the year the remains were recovered may not be consistent with the year of death.

Demographic Characteristic: Biological Sex, Age, and Place of Origin

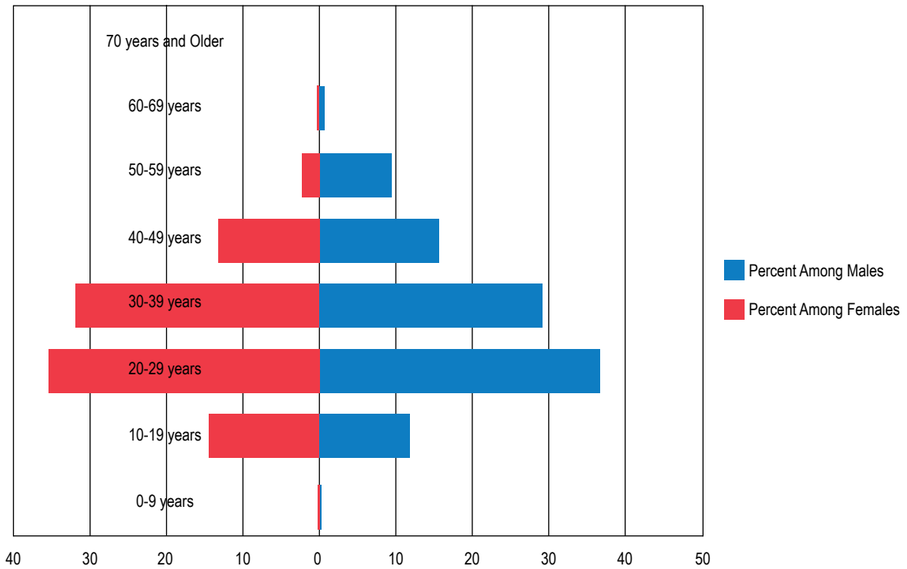
The overwhelming majority (80%) of decedents were male, with biological sex unknown in less than 1% of cases due to the fragmented condition of some skeletal remains recovered. As noted, 761 (34%) UBCs examined between 1990 and 2012 remain unidentified. Among people who were identified, the mean age was 31 years (median of 30 years). **Figure 3** (below) represents a population pyramid of all identified migrants by age and sex categories. About 30% and 23% of identified UBCs were males between the ages of 20-29 and 30-39, respectively. Thirteen percent of decedents were between the ages 10-19 (10% males and 3% females).

Figure 3. PCOME Deaths Coded as UBCs, Count in Age and Sex Category among all Indentified Decedents, FY 1990-2012 (N=1,393)



Since males make up about 80% of all UBCs, they are over-represented within all age categories. However, if we examine the age categories among only males and only females (**Figure 4**), the distribution across age categories is much more evenly distributed. For instance, about 36% of female UBCs fall in the 20-29 age category, compared to 37% among males only. Similarly, 32% of female UBCs were between 30 and 39 years of age at the time of death compared to 29% of male UBCs who fall in the same age range.

Figure 4. PCOME Deaths Coded as UBCs, Age Category among all Identified Female Decedents and Age Category among all Identified Male Decedents, FY 1990-2012 (N= 1,393)



Previous research has found that migrants' place of origin can play an important role in the unauthorized crossing experience (Massey, Durand, Malone 2002). Among those positively identified, migrants from central Mexico (24%) are the most prevalent, followed by those from southern Mexico (20%), west-central Mexico (16%), and northern Mexico (14%). Non-Mexicans accounted for about 13% of the identified decedents. Region of origin was unknown in 13% of cases among UBCs who had been successfully identified.

Table 2 illustrates the breakdown between countries of origin among identified UBCs. As noted, the majority of identified UBCs (82%) are of Mexican origin, followed by Guatemalans (7%), Salvadorans (2%), and Hondurans (2%). Country of origin was unknown in 5% of cases of identified UBCs. This is likely due to the "Country of Origin" category not being updated after the successful identification of a previously unidentified decedent.

Table 2. PCOME Deaths Coded as UBCs by Country of Origin among Identified Decedents, FY 1990 - 2012

	Percent	Number
Nationality		
Mexico	82.2	1,209
Guatemala	7.1	104
El Salvador	2.3	34
Honduras	1.4	21
Ecuador	0.5	8
Peru	0.5	8
Brazil	0.3	4
Costa Rica	0.2	3
Colombia	0.1	2
Dominican Republic	0.1	2
Chile	0.0	1
Nicaragua	0.0	1
Veracruz	0.0	1
Unknown Country	4.9	72

N = 1,470

Note: Percentages may not sum to 100 due to rounding.

A typical UBC between FY 1990 and 2012 could be described as a male near the age of 30 from central or southern Mexico who died of exposure while attempting to avoid detection by U.S. authorities. However, as we discuss in the next section, there appear to be important differences between causes of death and demographic characteristics over time.

CHANGES ACROSS TIME PERIODS

In order to better understand changes over time, we have grouped characteristics of yearly UBC deaths into three different time periods: the "Pre-Funnel Effect" era (1990-1999), the "Early Funnel Effect" era (2000-2005), and the "Late Funnel Effect" era (2006-2012). Using the same PCOME records, Rubio-Goldsmith and colleagues (2006) examined changes between the "Pre-Funnel Effect" (1990-1999) time period and what they termed the "Funnel Effect" (2000-2005) time period. We follow suit by re-examining changes between these time periods while also including an additional time period (2006-2012). Some of the sample sizes and figures reported in this study may differ from those reported by Rubio-Goldsmith et al. (2006) due to the positive identification of decedents, confirmed cause of death, or the (rare) recoding of deaths as non-UBCs. **Table 3** illustrates the changes in causes of death and demographic characteristics across the three time periods. The number of UBC deaths during each period is also reported. Asterisks denote that the changes from one time period to the next were statistically significant.

Changes in Cause of Death

Most notably for cause of death, the PCOME determination of *exposure*, the leading cause of death in the Pre- and Early Funnel Effect years, became the second most common cause of death after *undetermined* in the Late Funnel Effect years. Individuals who died from exposure perished due to hyperthermia or hypothermia, often coupled with dehydration. For undetermined deaths, the medical examiner was unable to assign a definitive cause of death due to the degree of decomposition or lack of compelling evidence of any one cause of death. The state of decomposition may also affect the ability to determine a valid postmortem interval which might place the time of death during a specific season. Due to intensified border enforcement efforts, migrants are increasingly crossing through more remote areas in order to avoid detection. For those who die in remote areas, there is a longer period of time between death and recovery, which means more decomposition and further challenges in establishing cause of death. As previously mentioned, given the remote desert location where these bodies were recovered, it is likely that the cause of death for a large percentage of these undetermined cases was exposure, but this cannot be confirmed. If we combine exposure and undetermined cause of death cases to create one group, these cases made up 81% of cases in the Early Funnel Effect era and 84% of cases during the Late Funnel Effect years. This is a much less significant change.

Another significant change between time periods is related to the percent of deaths via *motor vehicle accident*. In the Pre-Funnel Effect years, 1990 – 1999, motor vehicle accidents accounted for 20% of UBC fatalities. During this time period, fewer unauthorized migrants spent an extended amount of time in remote areas attempting to cross. In the Early Funnel Effect years from 2000 – 2005, that percentage dropped by almost half, to 11%, and dropped once again in the Late Funnel Effect years to 7%. These changes suggest that people have altered their crossing strategies as a consequence of increased enforcement, relying less on the use of motor vehicles to facilitate a crossing and more on traversing through remote areas on foot. However, it is also possible that the number of people crossing in motor vehicles has not changed drastically over the years, but rather the number of those crossing on foot is what has increased substantially between these time periods.

Table 3. Specific Causes of Death and Demographic Characteristics PCOME Deaths Coded as UBCs, by Time Period

	"Pre-Funnel Effect" (FY 1990-1999)	"Early Funnel Effect" (FY 2000-2005)	"Late Funnel Effect" (FY 2006-2012)
Causes of Death			
Exposure	39%	61%***	38%***
Undetermined	28%	20%***	46%***
Motor Vehicle Accident	20%	11%***	7%***
Other Miscellaneous Causes [1]	8%	5%	6%
Homicide	6%	4%	4%
N	120	804	1,314
Demographic Characteristics			
Unidentified	33%	23%*	41%***
N	120	804	1,134
Female	13%	23%*	16%***
N	120	803	1,283
Age [2]	29 years	30 years	32 years*
N	74	605	715
Region of Origin among Identified Decendents			
North	39%	10%***	15%***
Traditional	17%	18%	15%†
Central	5%	24%***	25%
South/Southeast	9%	22%**	20%
Non-Mexican	7%	9%	17%***
Unknown Region	23%	17%	8%***
N	80	620	770

1. "Other" causes of death include drowning, suicide, natural causes, cases pending investigation, electrocution, envenomation, overdose and other miscellaneous causes.
2. Among identified decedents.
Note: * p <0.05, ** p <0.01, *** p <0.001 indicate the change from the previous time period is statistically significant. Percentages may not sum to 100 due to rounding.

Recently, notable media attention has been paid to the increase in cartel violence throughout Mexico since former Mexican president Felipe Calderon declared a war on drug trafficking organizations in 2006. Estimates suggest that nearly 95,000 people have been killed (Herrera 2012), and over 26,000 have disappeared in Mexico since 2006 (Castillo 2013). A notable portion of the drug cartel-related violence has clustered along contested crossing corridors and disputed territories in northern part of the country. Although Mexico has a much lower homicide rate (18 per 100,000 residents) than other Latin American countries such as Guatemala, El Salvador, Honduras, Venezuela, and Colombia (Molzahn, Rodriguez Ferreira and Shirk 2012), some municipalities in the northern Mexican states of Sonora, Chihuahua, and Tamaulipas have some of the highest homicides rates in the world (Kronick 2010). This has led to the concern of a possible "spill over" effect of cartel violence into the United States. Yet, with the exception of a few well-publicized and isolated incidents, there is little evidence supporting the notion of a "spill over" effect. Juarez, Chihuahua, has one of the highest homicide rates in the world, yet its U.S. sister city of El Paso is one of the safest cities in the country (CQ Press 2013). PCOME records suggest the percent of UBCs that have been victims of homicide has remained unchanged at 4% in both the Early Funnel Effect era and the Late Funnel Effect era—a time period that coincides with Calderon's declaration of the war on drug trafficking organizations in Mexico.

This finding should not be taken as suggesting that unauthorized migrants are not at risk of falling victim to cartel violence during unauthorized crossing attempts. However, it is likely that much of the violence migrants experience tends to be in Mexican territory. A recent report notes that unauthorized migrants are at risk for kidnapping, robbery, and assault upon deportation by U.S. authorities to Mexican border towns (Slack, Martinez, Whiteford, and Peiffer 2013).

Finally, we feel it is important to note that our classification of "homicide" not only includes migrants who were possibly killed by *coyotes* (human smugglers), *bajadores* (border bandits), or other migrants, but also consists of migrants who were killed during an encounter with U.S. officials. One source notes that nineteen people have been killed by Customs and Border Protection agents across the border since 2010 alone (Southern Border Communities Coalition 2013). We feel this is an important distinction to make considering the qualitatively different roles these various actors play in the unauthorized migration process. For the sake of this report, we do not disaggregate between these types of homicides. Nevertheless, a closer examination of this distinction warrants future consideration.

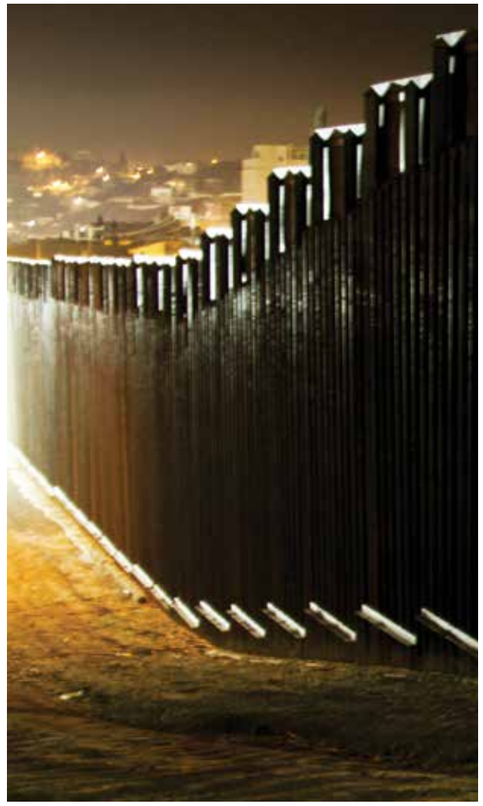
Changes in Demographic Characteristic

Overall, females account for 18% of all UBCs examined at PCOME since 1990 (see **Table 1**). However, there have been significant changes in the ratio of females to males across the three time periods. As noted in **Table 3**, approximately 13% of UBCs during the Pre-Funnel Effect years were female. This figured jumped to 23% during the Funnel Effect era, and decreased to 16% in the Late-Funnel Effect time period. One of the many consequences of increased border enforcement has been the decreased probability of migrants returning to their countries of origin, ultimately transforming would-be seasonal migrants into longer-term settlers. Historically, migration from Mexico to the United States has been a gendered process, with men making up the majority of migrants (Wilson 2010). However, the fact that men are staying in the United States longer has led to an increase in the migration of women for the purposes of family reunification, which helps explicate the increase in female UBCs between the Early and Funnel Effect eras.

The number of women migrating today appears to have decreased over the past several years. It is possible that the family reunification process has slowed as more and more women have successfully been reunited with their male family members in the United States over the last decade. U.S. Border Patrol apprehension data seem to support this notion. For example, in FY 2004 females made up approximately 18% of all apprehensions, however, this figure fell to 12% in FY 2012. Nevertheless, females do appear to be slightly overrepresented among UBCs when compared their share of Border Patrol apprehensions, suggesting that women may be at a higher risk for death while crossing the border than men.

Further, studies have found that among deceased UBCs, women were more likely to have died of exposure than other causes when compared to men (Rubio-Goldsmith et al. 2006; Martinez and Reineke n.d.). However, more research is needed to definitively determine whether or not females are at higher risk of death while crossing when compared to males.

Table 3 illustrates that the average age of UBCs has increased from 30 years in the Funnel Effect Era to 32 years in the Late Funnel effect time period. This change is statistically significant at the 0.05 alpha-level. It is possible that interior immigration enforcement programs in effect during this time period, such as the federal government's *Secure Communities* or state level initiatives such as Arizona's *SB 1070*, Alabama's *HB 56*, or Indiana's *SB 590* have disproportionately affected older, more established migrants residing in the United States rather than younger seasonal workers. Older migrants with strong ties to this country are likely undeterred by these removal programs and attempt to cross the border upon deportation (Slack et al. 2013) in part explaining why the average age of UBCs has increased over the past several years. However, the population of Mexico as a whole is aging and birth rates have decreased, so it is also possible that this difference is, in part, due to demographic changes occurring in the country (*The Economist* 2012; Passel, Cohn and Gonzalez-Barrera 2012). Nevertheless, further attention should be given to the impact that interior removal programs have had on changing the profile of unauthorized border crossers.



The U.S.-Mexico border wall at night, a mile west of downtown Nogales, Arizona. Photo by Murphy Woodhouse.

Changes in Place of Origin

There have been notable changes in the regions of origin represented among UBCs. As noted, following Massey et al. 1987 and CONAPO, we identify four main Mexican sending regions: north, west-central (traditional), central, and south-southeastern. We also group non-Mexicans together, although the majority of non-Mexican identified UBCs are from the countries of Guatemala, El Salvador, and Honduras.

Generally speaking, the most significant changes among Mexican UBCs in terms of region of origin occurred between the Pre-Funnel Effect and Early Funnel Effect time periods. In the Pre-Funnel Effect era, around 39% of identified UBCs were from northern Mexico, however, this share decreased to 10% in the Early Funnel Effect era. Similarly, the share of those from the central and south-southeastern region in the earliest time period only made up 5% and 9% of all identified UBCs, respectively. Yet, by the Early Funnel Effect era, these percentages increased to 24% among those from the central region and 22% among those from the south. This change can likely be attributed to increased migration from these regions stemming from the implementation of North American Free Trade Agreement which displaced thousands of rural Mexicans (Wise 2009; Garcia Zamora 2009).

Changes in UBCs' regions of origin were less pronounced between the Early Funnel Effect Era and the Late Funnel Effect time period. One exception was the share of UBCs from the northern regions, which increased from 10% in the Early Funnel Effect era to 15% in the most recent time periods. Similarly, the percent of non-Mexicans has increased from 9% to 17% between these two time periods. A 2005 Congressional Report by Nuñez-Neto, Siskin, and Viña suggests that the proportion of non-Mexican border crossers has been on the rise since the late 1990s. More recent data from U.S. Border Patrol apprehension statistics support this claim. In FY 2005, roughly 14% of all apprehensions were of non-Mexicans, or what the Border Patrol call "OTMs" (Other than Mexicans). By FY 2012 this share nearly doubled to 27% across all sectors. The proportion of non-Mexicans crossing through southern Arizona, however, is substantially lower than in other areas along the border. A significant number of unauthorized Central Americans travel through Mexico atop of freight trains to the Tamaulipas-Texas border and attempt to cross through South Texas after crossing the Rio Grande. Nevertheless, the proportion of non-Mexicans crossing through the Sonoran Desert also appears to be on the rise in recent years. For instance, only 3% of U.S. Border Patrol apprehensions in the Tucson Sector in FY 2005 were of non-Mexicans, compared to 14% in FY 2012 (U.S. Border Patrol 2013).

The Appendix of this report contains several figures illustrating trend data on causes of death, biological sex, age, and region and country of origin between FY1990 – 2012. Marginal changes from one year to the next should be interpreted with caution due to small sample sizes.

An old border crossing point near Nogales, Arizona. Photo courtesy of MarcSilver.net.

Border Patrol agents watching the line east of Nogales, Arizona. Near urban areas, patrol vehicles are spaced at tight intervals to deter would-be border crossers. Photo by Murphy Woodhouse.

A portion of the border fence between the United States and México. Photo by Tim Hoover, MCC.

CONCLUSION

The number of unauthorized border crosser remains examined by the Pima County Office of the Medical Examiner has increased substantially since FY 2000 and has remained at about 150 decedents per year since 2004. This increase has coincided with intensified enforcement efforts across the border, further supporting previous studies that have asserted border militarization has redistributed migration flow into remote areas increasing the risk of death associated with attempting an unauthorized border crossing attempts.

The increased number of migrant remains examined by the PCOME is not simply a consequence of more migrants crossing through southern Arizona, as U.S. Border Patrol apprehensions, often used as a proxy for unauthorized migration flows by scholars, have decreased over the past several years in the Tucson Sector. This suggests migrants are crossing for longer periods of time through more remote areas to avoid detection by U.S. authorities, thus increasing the probability of death.

Remote areas along the California-Baja California border experienced notable increases in migrant deaths when border enforcement efforts first began in the early 1990s (Cornelius 2001). Migrant deaths then appeared to shift east into southern Arizona in the early-to-mid-2000s. This assertion is supported by the near two-fold increase in the number of migrant deaths investigated by the PCOME between FY 2001 and FY 2002. Although migrant deaths and the death rate remain near all-time highs in southern Arizona, counties close to the South Texas-Tamaulipas border have begun reporting strikingly high numbers of migrant deaths, especially considering the size of said counties. For instance, Brooks County, which is nearly ten times smaller than Pima County in terms of geographical area, reported 129 deaths in calendar year 2012 compared to just 20 in 2010 (MacCormack 2013; Miroff 2013). The increase in migrant deaths in South Texas is confirmed by figures compiled by the U.S. Border Patrol. The number of deaths in the Rio Grande Valley and Laredo sectors increased from 66 and 65 in FY 2011 to 150 and 90 in FY 2012, respectively (U.S. Border Patrol 2013). Scholars and policy makers alike should be concerned with this drastic increase, which is likely related to increased border enforcement efforts including deportation practices which currently repatriate a high number of deportees to areas just south of Texas. Counties along the Texas-Mexico border tend to be smaller in terms of area and population, and have limited financial and institutional resources.

Further, given the sheer number counties along the Texas-Mexico border, it is not entirely clear which agency or entity has the responsibility of investigating migrant deaths. Given these considerations, counties in South and West Texas may not be equipped to properly investigate migrant deaths and disappearances in the area. The institutional and structural limitations noted will likely adversely affect the identification rate of migrants, ultimately contributing to an ever-growing list of "John" and "Jane Does" whose remains may never be reunited with their family members.

Understanding the causes and solutions of unauthorized migration and migrant deaths requires an understanding of the extent of these phenomena. At present, the true number of migrant deaths occurring across the border on an annual basis is unknown. Nevertheless, the Pima County Office of the Medical Examiner continues

CONCLUSION (continued)

to collect reliable and valid data on estimated border crosser deaths in southern Arizona and, most importantly, is committed successfully identifying the deceased. Both tasks are of paramount importance. The former should help inform policy makers about the consequences of current immigration and border enforcement policies, while the latter helps provide closure to the families that have lost loved ones who died while traversing the Sonora-Arizona border in search of a better life. Our hope is that policy makers will consider the data presented in this report as they debate what is arguably the single most important piece of immigration legislation in nearly three decades. Access to concrete data is crucial when making decisions of this caliber.

Identifying the remains of deceased migrants is just one of many functions of the Pima County Office of the Medical Examiner. Through the Missing Migrant Project, the PCOME has also been tracking missing migrants, of which there are over 1,300 since the year 2000. Undoubtedly, some of these missing relate to unidentified remains examined by the PCOME, some may not be deceased, and others relate to remains yet to be found. A report on the missing is forthcoming.

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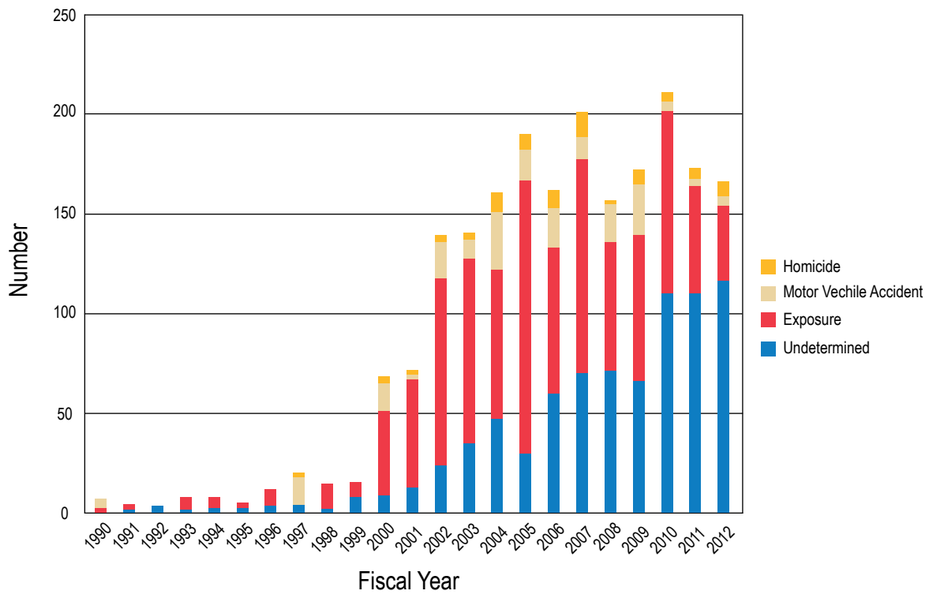
APPENDIX A: Additional Figures

This section provides several figures depicting data over time on causes of death, biological sex, identification rates, age, and region and country of origin between FY1990 – 2012. Marginal changes from one year to the next should be interpreted with caution due to small sample sizes. **Figure A** illustrates specific causes of death for FY 1990 to 2012 among people coded as UBCs by the PCOME.

Figure A. PCOME Deaths Coded as UBCs by Cause of Death, FY 1990-2012 (N = 2,238)

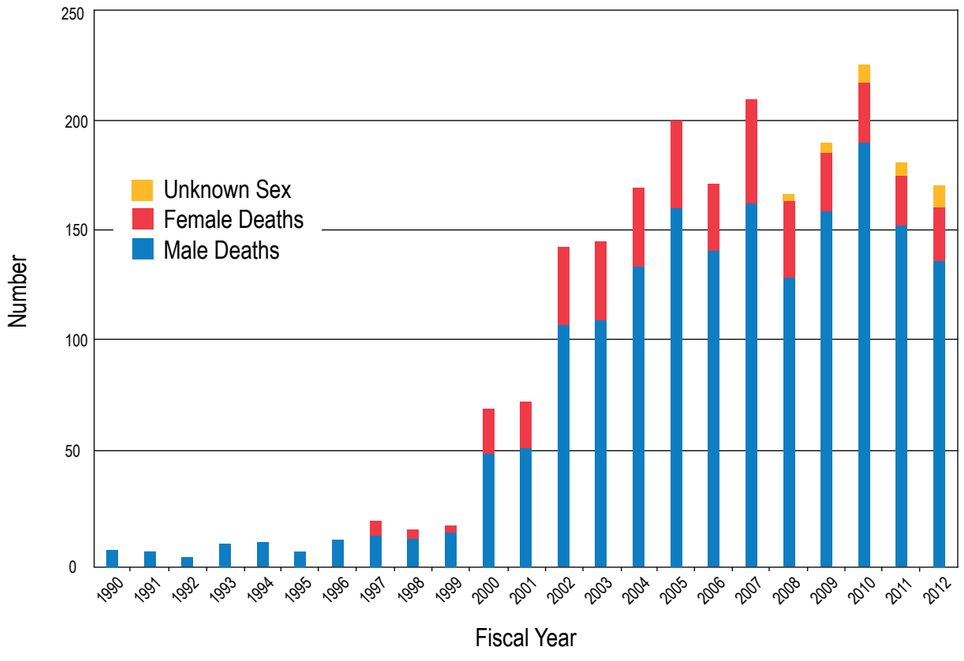


APPENDIX A (Figure B)

Figure B depicts the breakdown by biological sex between FY 1990 and 2012 among deaths coded as UBCs by the PCOME.

Figure B. PCOME Deaths Coded as UBCs by Sex

FY 1990 - 2012 (N = 2,238)

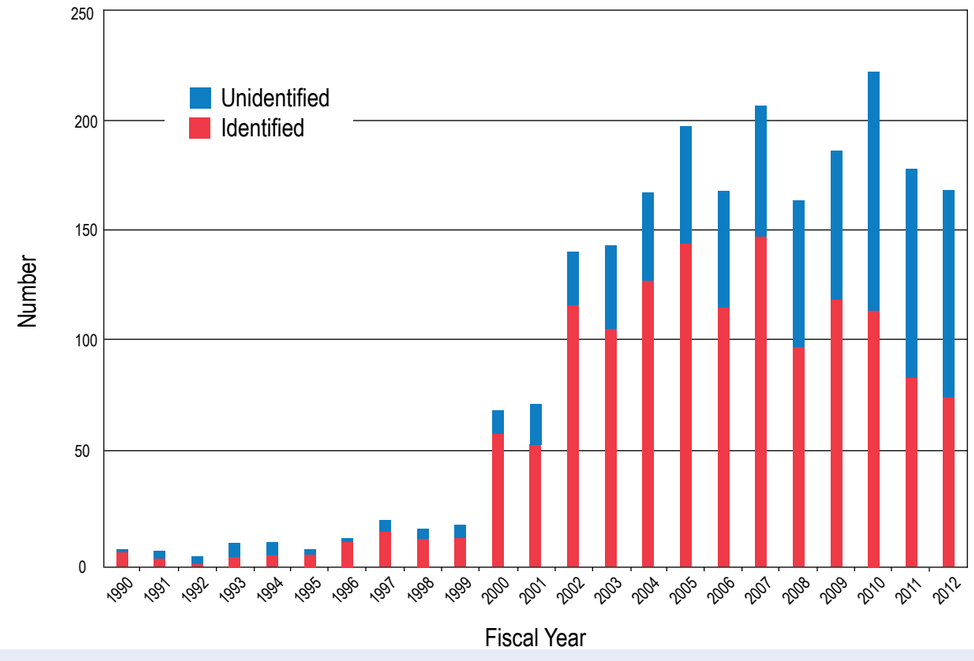


APPENDIX A (Figure C)

Figure C illustrates the number of people between FY 1990 and 2012 who were positively identified compared to those who remained unidentified among deaths coded as UBCs by the PCOME.

Figure C. PCOME Deaths Coded as UBCs by Identified and Unidentified

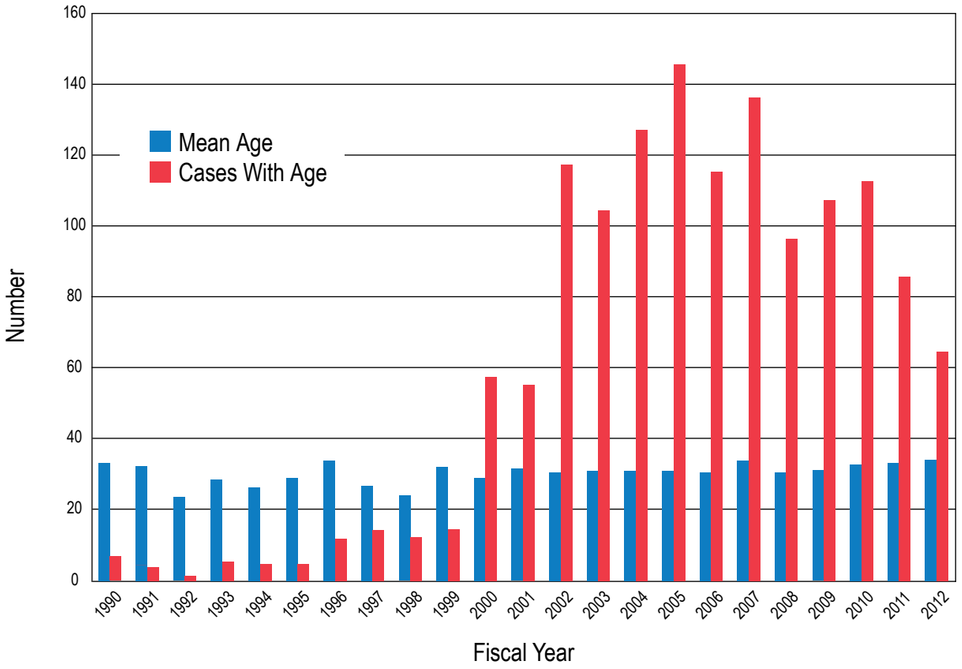
FY 1990 - 2012 (N = 2,238)



APPENDIX A (Figure D)

Figure D illustrates the mean age of identified UBCs per year between FY 1990 and 2012 (blue bar). The number of cases in which age was known is also noted (red bar) for each year.

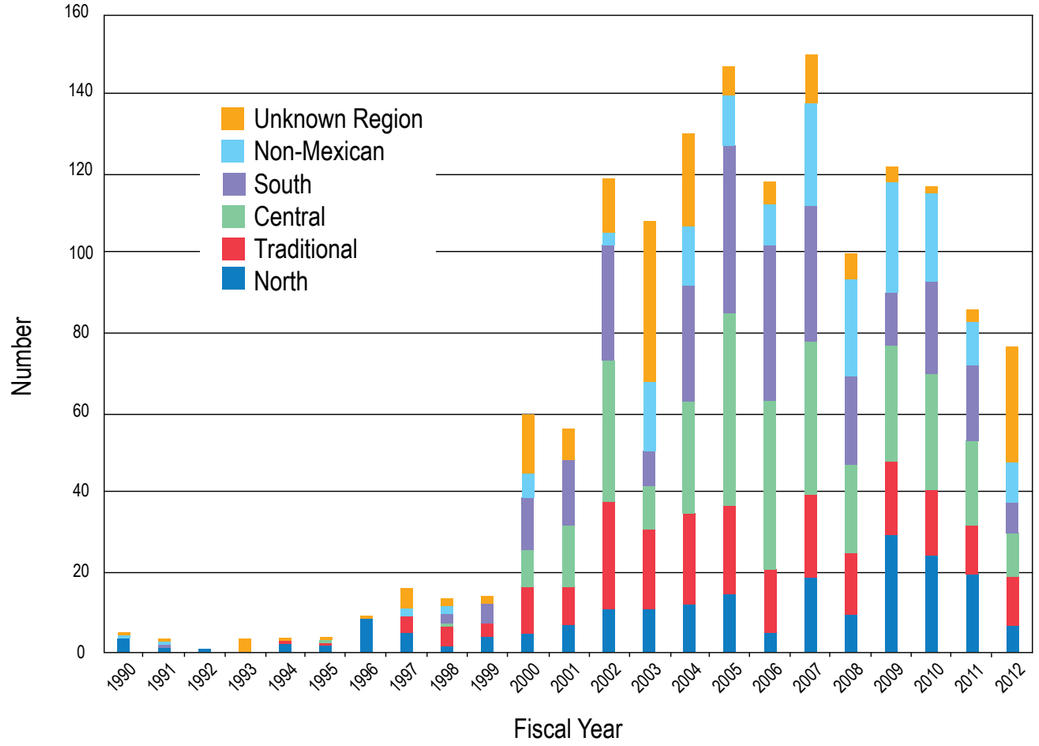
Figure D. PCOME Deaths Coded as UBCs by Mean Age among Identified Decedents, FY 1990 - 2012 (N = 1,394)



APPENDIX A (Figure E)

Figure E depicts PCOME deaths coded as UBCs by Mexican region of origin among identified decedents between FY 1990 and 2012.

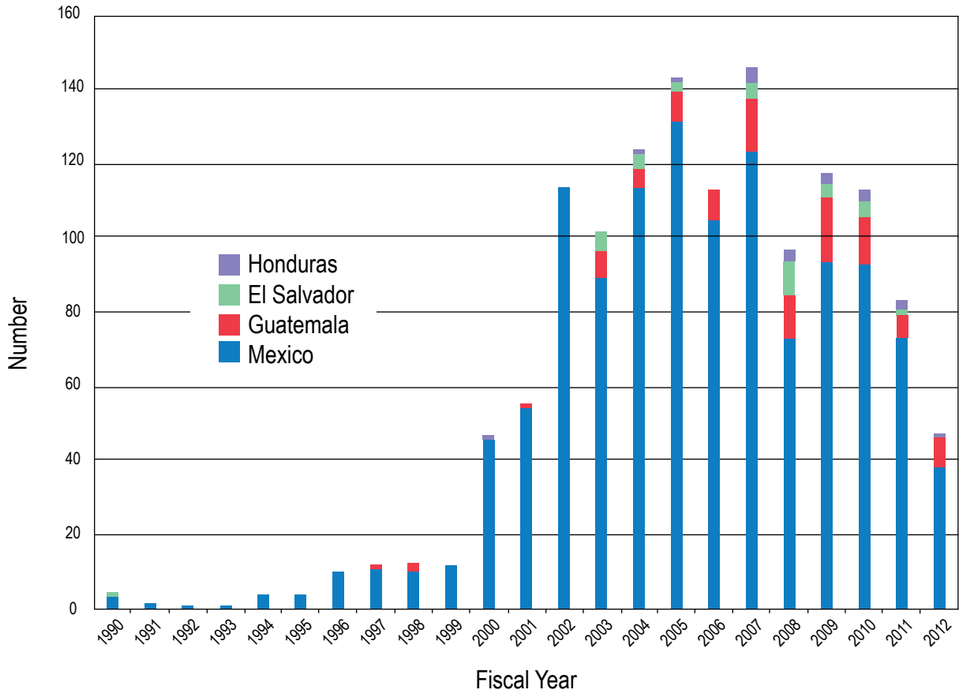
Figure E. PCOME Deaths Coded as UBCs by Mexican Region of Origin among Identified Decedents FY 1990 - 2012 (N = 1,470)



APPENDIX A (Figure F)

Figure F illustrates the top four countries of origin represented each year between FY 1990 and 2012 among identified decedents coded as UBCs by the PCOME.

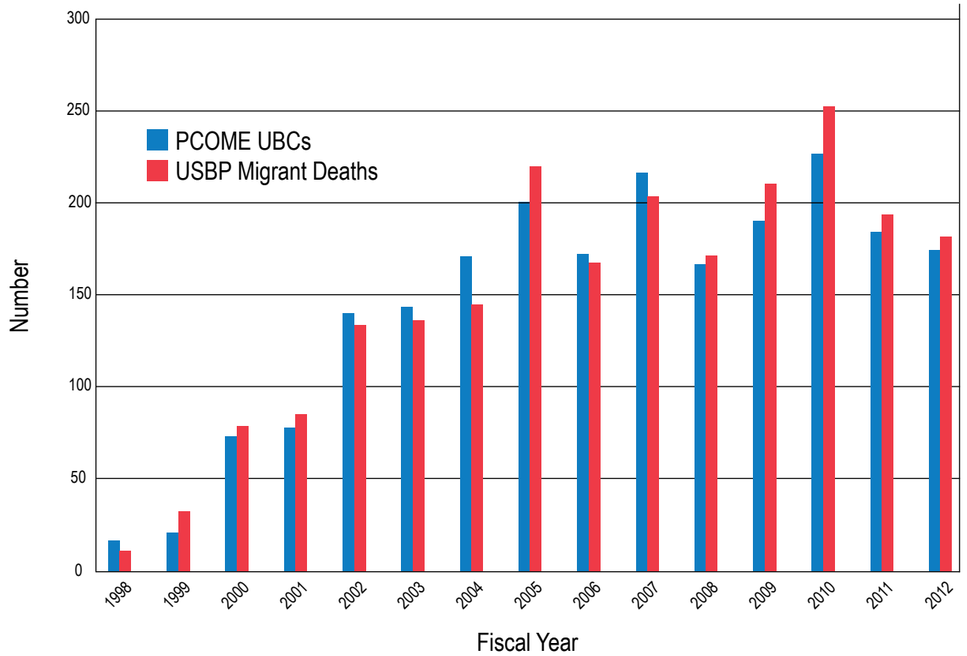
Figure F. PCOME Deaths Coded as UBCs by Top Four Countries of Origin among identified Decedents, FY 1990 - 2012 (N = 1,368)



APPENDIX A (Figure G)

Figure G illustrates a comparison between the number of PCOME deaths coded as UBCs and U.S. Border Patrol migrant deaths in the Tucson Sector between FY 1998 and 2012. The two estimates of migrants deaths in southern Arizona are highly correlated (r = 0.98) in the positive direction. The Pearson correlation is statistically significant beyond the 0.000 alpha-level. *Sources: Pima Country Office of the Medical Examiner and U.S. Border Patrol, 2013. Figure created by Daniel E. Martinez.*

Figure G. PCOME Deaths Coded as UBCs and U.S. Border Patrol Migrant Deaths in the Tucson Sector, FY 1998 - 2012



APPENDIX B: Methodology

Data were collected from computerized decedent records of unauthorized migrants at the Pima County Office of the Medical Examiner (PCOME) in Tucson, Arizona. The PCOME performs the majority of the autopsies and medicolegal investigations of suspected unauthorized migrants in the Border Patrol's Tucson Sector. The PCOME also conducts some medicolegal investigation of unauthorized migrants who have perished in the Yuma Sector, although this is rare. To date, the PCOME has examined the highest number of UBC remains in the United States, making this data set currently the most complete and comprehensive source available nationally.

A team of BMI researchers began compiling data on UBC deaths using PCOME records in October of 2005 and continue to do so to this day. Data analyzed in this report include all known migrant death cases investigated by the PCOME between FY 1990 and FY 2012 (N = 2,238). Beginning in 2001, the PCOME adopted a new record keeping system that allowed medical examiners and investigators to record significantly more detailed information within each report. Also at this time, the PCOME began to classify individuals believed to be unauthorized migrants as *undocumented border crossers* or "UBCs," which, as defined by the PCOME forensic anthropologist and former chief medical examiner, are "individuals of foreign nationality who died while crossing the border clandestinely" (Anderson and Parks 2008). This coding is predictive, and includes unidentified remains matching certain characteristics. For this report, researchers carefully reviewed and scrutinized each individual autopsy report before 2001 and concluded whether or not the individual was an UBC. The methods used to make this determination follow the PCOME criteria to assess whether or not an individual was an unauthorized migrant, as do other studies that used PCOME records (Keim et al. 2006; Sapkota et al. 2006).

Factors considered to determine UBC classification follow the PCOME determination and include, but are not limited to, the individual's place of origin, ethnicity/ancestry, surname, possession of a permanent U.S. address or social security number, clothing or personal effects (including foreign currency and identification cards), association with a group of unauthorized migrants, and geographical location of discovery. Each case was reviewed several times and the decedent was only classified as a UBC if significant supporting evidence was present. Unidentified skeletal remains recovered from remote high migrant-traffic areas were considered unauthorized migrants. Because the computerized record-keeping system used prior to 2000 was less detailed than that used after, hard-copy files of suspected unauthorized migrants between 1990 and 1997 (files from 1998 and 1999 were unavailable) were retrieved from the archive and reviewed for further information. Data collectors wanted to ensure that people classified as UBCs were in fact migrants in transit and not permanent residents.

As noted, the coding used by the PCOME to classify someone as a UBC is predictive. We acknowledge that we may slightly over-represent the number of migrant deaths, however, to exclude the data on unidentified UBCs would be drastically under-reporting the true number of deaths. It should also be noted that it is impossible to say in some instances whether an individual was traveling into Mexico rather than out of Mexico. Although likely a rare occurrence, there has been at least one confirmed instance where this was the case.

Future Considerations in Methodology

Over the last several years, the PCOME has also made a continued effort to verify a person's suspected foreign nationality via DNA and is exploring the possibility of utilizing isotopic analyses to identify people's region of origin. In addition, the PCOME is committed to improving its coding methods. For example, the PCOME has developed an eight-item "decomposition scale" that will make the coding of body condition more objective. The PCOME is also making an effort to include estimated "postmortem" intervals in their investigations of UBCs. This, in conjunction with the use of the "decomposition scale", will increase the ability to determine whether an individual actually died during the same year that his or her remains were recovered (although this process will still be very difficult with skeletonized remains). These methodological adjustments could help to account for any variation between the date the remains were recovered and the approximate time of death.

A view of the Sonoran desert in the area around the Baboquivari mountain range. Photo courtesy of MarcSilver.net.

CONTACT

Pima County Office of the Medical Examiner

The mission of the Pima County Office of the Medical Examiner-Forensic Science Center is to provide accurate, timely, compassionate and professional death investigation services for the citizens of Pima County, Arizona. Core functions include: postmortem examinations, screening deaths for public health significance, forensic anthropology/odontology services, certification of death certificates prior to cremation, organ/tissue donation approvals, organ transplant approvals in cases under OME jurisdiction, courtroom testimony, disaster response and teaching services.
Please visit the website: **www.pima.gov/cmo/ome**

Binational Migration Institute

Arizona has the most active migratory transit, the most militarized, and most deadly border area in the U.S. This harsh and complicated situation has profound consequences for the state, the nation, and U.S. relations with Mexico. BMI's interdisciplinary focus has been shaped by the ways in which immigration policies and practices impact the lives of hundreds-of-thousands of migrants and Arizona residents.
César E. Chávez Building Rm 208
P.O.Box 210023
Tucson, AZ 85721-0023
Please visit the website: **bmi.arizona.edu**

Department of Mexican American Studies

is committed to contemporary applied public policy research on Mexican Americans. As the leading public policy research center addressing issues of concern to this minority group in Arizona, the Department works collaboratively with key community agencies in promoting leadership and empowerment of Mexican Americans within the state and the nation.
César E. Chávez Building Rm 207C
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Tucson, AZ 85721-0023
Please visit the website: **mas.arizona.edu**

The Missing Migrant Project

The Missing Migrant Project, which developed within the Pima County Office of the Medical Examiner, is an initiative designed to centralize data regarding missing persons last seen crossing the U.S.-Mexico border, and to compare such reports to unidentified remains discovered on the U.S. side of the border. The project is currently the only non-law enforcement agency capable of entering missing persons reports for foreign nationals into the National Missing and Unidentified Persons Systems (NamUs). The project collects and enters missing person data from families, consulates, and other agencies relevant to migrants last seen crossing into Arizona as well as California, New Mexico, and Texas.
Please visit the website: **www.pcmmp.org**

The College of Social & Behavioral Sciences

The College of Social & Behavioral Sciences — "The People College" — focuses on advancing fundamental research on the human condition. We study people – their thoughts and beliefs, speech and behavior, histories and geography, societies and culture, and organizations and economy. SBS equips its students with the critical thinking and problem-solving tools they will need to address real-world issues when they graduate — issues related to healthy families and secure communities, global conflict and poverty, and environmental change.
Please visit the website: **sbs.arizona.edu**

The University of Arizona

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