

August 2006

# ILLEGAL IMMIGRATION

## Border-Crossing Deaths Have Doubled Since 1995; Border Patrol's Efforts to Prevent Deaths Have Not Been Fully Evaluated





Highlights of [GAO-06-770](#), a report to the Honorable Bill Frist, Majority Leader, United States Senate

### Why GAO Did This Study

Reports in recent years have indicated that increasing numbers of migrants attempting to enter the United States illegally die while crossing the southwest border. The Border Patrol implemented the Border Safety Initiative (BSI) in 1998 with the intention of reducing injuries and preventing deaths among migrants that attempt to cross the border illegally.

GAO assessed: (1) Trends in the numbers, locations, causes, and characteristics of border-crossing deaths. (2) Differences among the Border Patrol sectors in implementing the BSI methodology. (3) The extent to which existing data allow for an evaluation of the effectiveness of the BSI and other efforts to prevent border-crossing deaths.

### What GAO Recommends

GAO recommends that the Commissioner of Customs and Border Protection (CBP) ensure that BSI sector coordinators follow consistent protocols for collecting migrant death data from local authorities and that CBP assess the feasibility of using multivariate statistical approaches to enhance estimates of the impacts of its initiatives. The Department of Homeland Security (DHS) concurred with GAO's findings and outlined plans for addressing both recommendations. DHS and the Department of Health and Human Services also provided technical comments, which were incorporated as appropriate.

[www.gao.gov/cgi-bin/getrpt?GAO-06-770](http://www.gao.gov/cgi-bin/getrpt?GAO-06-770).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Laurie Ekstrand at (202) 512-2758 or [ekstrandl@gao.gov](mailto:ekstrandl@gao.gov).

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# Border-Crossing Deaths Have Doubled Since 1995; Border Patrol's Efforts to Prevent Deaths Have Not Been Fully Evaluated

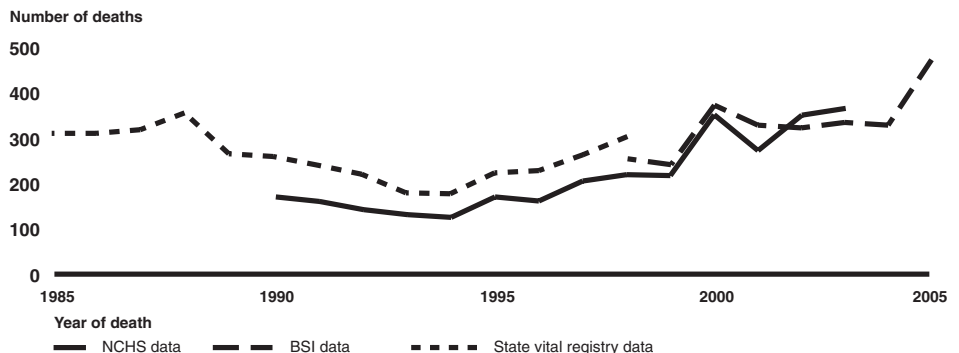
### What GAO Found

GAO's analysis of data from the BSI, the National Center for Health Statistics (NCHS), and studies of state vital registries shows consistent trends in the numbers, locations, causes, and characteristics of migrant border-crossing deaths that occurred along the southwest border between 1985 and 2005. Since 1995, the number of border-crossing deaths increased and by 2005 had more than doubled. This increase in deaths occurred despite the fact that, according to published estimates, there was not a corresponding increase in the number of illegal entries. Further, GAO's analysis also shows that more than three-fourths of the doubling in deaths along the southwest border since 1995 can be attributed to increases in deaths occurring in the Arizona desert.

Differences among the BSI sector coordinators in collecting and recording data on border-crossing deaths may have resulted in the BSI data understating the number of deaths in some regions. Despite these differences, our analysis of the BSI data shows trends that are consistent with trends identified in the NCHS and state vital registry data. However, the Border Patrol needs to continue to improve its methods for collecting data in order to accurately record deaths as changes occur in the locations where migrants attempt to cross the border—and consequently where migrants die. Improved data collection would allow the Border Patrol to continue to use the data for making accurate planning and resource allocation decisions.

Comprehensive evaluations of the BSI and other efforts by the Border Patrol to prevent border-crossing deaths are challenged by data and measurement limitations. However, the Border Patrol has not addressed these limitations to sufficiently support its assertions about the effectiveness of some of its efforts to reduce border-crossing deaths. For instance, it has not used multivariate statistical methods to control for the influences of measurable variables that could affect deaths, such as changes in the number of migrants attempting to cross the border.

**Migrant Border-Crossing Deaths, 1985 through 2005**



Source: GAO analysis of BSI and NCHS data; findings from the Center for Immigration Research, University of Houston.

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### Abbreviations

ABCI	Arizona Border Control Initiative
BORSTAR	Border Patrol Search, Trauma, and Rescue
BSI	Border Safety Initiative
BSITS	Border Safety Initiative Tracking System
CDC	Centers for Disease Control and Prevention
CIR	Center for Immigration Research, University of Houston
CPS	Current Population Survey
ICD	International Classification of Diseases
INS	Immigration and Naturalization Service
IRP	Interior Repatriation Program
LRP	Lateral Repatriation Program
NCHS	National Center for Health Statistics

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United States Government Accountability Office  
Washington, DC 20548

August 15, 2006

The Honorable Bill Frist  
Majority Leader  
United States Senate

Dear Senator Frist:

Reports by GAO and others in recent years have indicated that increasing numbers of migrants attempting to illegally enter the United States die while crossing the southwest border in remote, desert areas or in other areas with particularly rugged and dangerous terrain. The U.S. Border Patrol implemented the Border Safety Initiative (BSI) in June 1998 with the intention of enforcing border security, educating and informing migrants of the dangers involved in crossing the border illegally, and carrying out search and rescue operations to help migrants in life-threatening situations. Additionally, the Border Patrol implemented the Arizona Border Control Initiative (ABCI) and the Interior Repatriation Program (IRP), efforts that also include components designed to reduce migrant deaths. As part of the BSI's mission, the Border Patrol established a methodology that outlines procedures to identify, track, and record data on migrant border-crossing deaths and rescues. The BSI methodology defines border-crossing deaths as those occurring in furtherance of an illegal entry and includes guidelines for recording those deaths occurring within its target zone—an area consisting of 45 counties on or near the southwest border with Mexico.<sup>1</sup> These 45 counties are within an area that includes 9 of the 20 Border Patrol sectors responsible for enforcing U.S. borders and securing official ports of entry (see fig. 1). According to BSI reports, since fiscal year 1998, there has been an upward trend in the number of migrant border-crossing deaths annually, from 266 in 1998 to 472 in 2005, with some fluctuations over time.

In light of concerns about reported increases in border-crossing deaths and interest in the BSI's approach to tracking and reducing these incidents, you asked us to analyze federal data on border-crossing deaths as well as available data on the Border Patrol's efforts to reduce such deaths. Specifically, for this report, we assessed: (1) How do the Border

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<sup>1</sup>We refer to this area as the BSI target zone.

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Patrol's data on trends in the numbers, locations, causes, and characteristics of border-crossing deaths compare to other sources of data on these types of deaths? (2) What differences, if any, are there in how the Border Patrol has implemented the BSI methodology across its sectors? (3) To what extent do existing data allow for an evaluation of the effectiveness of the BSI and other Border Patrol efforts to prevent border-crossing deaths?

You also asked us to compare deaths among migrants to deaths in the general U.S. population living within the BSI target zone. We compared each group's share of deaths for the causes of death most commonly associated with border-crossing (see app. IV).

To address our objectives, we analyzed data on migrant border-crossing deaths that occurred between 1990 and 2005 within the BSI target zone—which includes 45 counties on or near the border in California, Arizona, New Mexico, and Texas. We analyzed data on border-crossing deaths recorded by the Border Patrol in the Border Safety Initiative Tracking System (BSITS) for fiscal years 1998 through 2005. We also analyzed data from the National Center for Health Statistics (NCHS) mortality files from the National Vital Statistics System for the years 1990 through 2003, the most recent year for which NCHS data were available at the time we did our work. The NCHS data contain information from death certificates for all deaths occurring within the United States, regardless of the cause of death. Because death certificates do not explicitly identify deaths as border-crossing deaths, we used information about place of birth, residence, and cause of death to identify likely incidents of migrant deaths. These estimates may either under or over count actual border-crossing deaths, depending on a number of factors (see app. I for additional discussion). We assessed the reliability of both sources of data and determined that they were sufficiently reliable for our purposes of describing trends in deaths over time and across locations. We then supplemented our analysis of these data by reviewing data on transient migrant deaths reported in studies by the University of Houston's Center for Immigration Research (CIR) that used state vital registry data to estimate the number of border-crossing deaths among migrants for the

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years 1985 through 1998.<sup>2</sup> Because both the NCHS and state vital registry data are collected independently of the Border Patrol's efforts to collect BSI data, we used them to corroborate or refute the trends that were identified in our analysis of the BSI data. (For details regarding our methods for analyzing the data, see app. I.) In addition to the data analysis, we reviewed the written BSI methodology for tracking and recording deaths in the BSITS database, and we interviewed Border Patrol officials at Department of Homeland Security headquarters in Washington, D.C., as well as officials in the nine southwest Border Patrol sectors, about issues related to migrant border-crossing deaths and the BSI. We also reviewed the methods for collecting data on border-crossing deaths used by county coroners and medical examiners that track these deaths and reviewed the studies on migrant border-crossing deaths conducted by CIR<sup>3</sup>, as well as a study by researchers at the Centers for Disease Control and Prevention (CDC).<sup>4</sup> Finally, we interviewed journalists, officials from various advocacy groups, and state and local health officials in Arizona, New Mexico, and California.

We conducted our work between August 2005 and June 2006 in accordance with generally accepted government auditing standards.

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## Results in Brief

Our analysis of the BSI and NCHS data shows that both datasets reflect similar trends in the numbers, locations, causes, and characteristics of migrant border-crossing deaths between 1990 and 2005. These trends are consistent with the trends identified in the studies by CIR that used state-level vital registry data to document migrant border-crossing deaths between 1985 and 1998. From the late 1980s through the early 1990s, the number of border-crossing deaths declined. Then, from the late 1990s through 2005, the number of deaths approximately doubled. For example,

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<sup>2</sup>Karl Eschbach, et al., "Causes and Trends in Migrant Deaths along the U.S.-Mexican Border, 1985-1998," Working Paper No. WPS 01-4. Center for Immigration Research, University of Houston, Houston, Tex., 2001. Karl Eschbach, et al., "Deaths During Undocumented Migration: Trends and Policy Implications in the New Era of Homeland Security," *In Defense of the Alien*, Vol. 26, 2003, 37-52. We also reviewed CIR findings as reported in Belinda I. Reyes, et al., "Holding the Line? The Effect of the Recent Border Build-up on Unauthorized Immigration," Public Policy Institute of California, San Francisco, Calif., 2002, 68.

<sup>3</sup>Eschbach, et al., 2001 and Eschbach, et al., 2003.

<sup>4</sup>Sanjeeb Sapkota, et al., "Unauthorized Border Crossing and Migrant Deaths: Arizona, New Mexico and El Paso, Tex., 2002-2003," *American Journal of Public Health*, July 2006.



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our analysis of the BSI data shows that the annual number of border-crossing deaths increased from 241 in 1999 to a total of 472 deaths recorded in 2005. Further, the majority of the increase in deaths during this period occurred within the Border Patrol's Tucson Sector—which includes much of the Arizona desert. Our analysis of the NCHS data indicates that, between 1990 and 2003, more than three-fourths of the rise in migrant border-crossing deaths along the southwest border can be attributed to an increase in deaths in the Tucson Sector. Over this period, deaths due to exposure, especially heat-related exposure, increased substantially, while deaths from traffic fatalities and homicide declined. This pattern represents a major shift in the causes of migrant border-crossing deaths, as traffic fatalities were the leading cause of migrant border-crossing deaths during the early 1990s, while from the late 1990s onward, heat exposure was the leading cause of death. The increase in deaths due to heat exposure over the last 15 years is consistent with our previous report that found evidence that migrant traffic shifted from urban areas like San Diego and El Paso into the desert following the implementation of the Southwest Border Strategy in 1994. Our analysis indicates little change over time in the ages of border-crossing decedents, and while the majority of decedents are male, the percentage of female decedents has more than doubled from 1998 to 2005.

Differences in the extent to which the Border Patrol's established methodology for tracking and recording deaths has been implemented consistently across its sectors may have led to the BSI data understating the total number of border-crossing deaths occurring within any given year. For example, although the BSI methodology instructs BSI sector coordinators—agents responsible for managing BSI operations within each of the nine Border Patrol sectors along the southwest border—to maintain regular contact with local officials such as county coroners and medical examiners in order to obtain information on any border-crossing deaths where the Border Patrol was not involved, we found differences among the sectors in the nature and frequency of the contacts made. Additionally, methods for coordinating with local officials have not yet been formalized in some sectors. These sectors are in locations in which relatively few border-crossing deaths occur, and as a result, the informal communication patterns may have had little impact on the total numbers of deaths recorded in the BSI data thus far. However, these trends have the potential to change in the future, as they did in the Tucson Sector between 1998 and 2005. According to our analysis of the BSI data, the number of deaths in the Tucson Sector increased from 11 in 1998 to 216 in 2005. Irregular communication, as well as variation in the nature and frequency of contacts with local officials, may lead to inconsistencies in

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tracking and recording deaths over time and across sectors and could ultimately result in the Border Patrol's data on border-crossing deaths being incomplete. Such incomplete data may in turn affect the Border Patrol's ability to understand the scale of the problem in each sector and affect the agency's ability to make key decisions about where and how to deploy BSI resources across the southwest border.

Measurement challenges and data limitations inhibit a comprehensive evaluation of the BSI's efforts to prevent border-crossing deaths. Furthermore, there is insufficient evidence to support the Border Patrol's assertions that related efforts such as the ABCI and IRP reduced migrant deaths between 2003 and 2004. The effectiveness of the Border Patrol's efforts to prevent deaths cannot simply be measured by examining changes in the number of migrant deaths following the introduction of a prevention effort, as other factors may also affect the number of deaths. For example, changes in the number of migrants attempting to cross the border, variations in the locations where migrants attempt to cross, fluctuations in weather patterns, and changes in Border Patrol enforcement activities may all affect the number of border-crossing deaths in any given year. The effects of such factors on the number of migrant deaths need to be taken into account when assessing the impact of the BSI and related efforts. In addition, evaluating the BSI's efforts to prevent deaths is further limited by the extent to which the Border Patrol can accurately measure the hours and resources dedicated exclusively to the BSI and other prevention activities. As the Border Patrol is primarily an enforcement agency, search and rescue activities often occur simultaneously with enforcement activities, thus making it difficult to separate the resources dedicated to each type of activity. The Border Patrol's assertions that its prevention efforts have resulted in a reduction in migrant deaths have not taken such factors into account. In the absence of using multivariate statistical methods that control for the influences of other measurable factors, the effectiveness of these programs' impact on border-crossing deaths cannot be demonstrated.

In order to improve the implementation of the BSI methodology and the accuracy of the data on migrant border-crossing deaths in any given year, we recommend that the Commissioner of Customs and Border Protection take steps to ensure that BSI sector coordinators follow a consistent protocol for collecting and recording information about border-crossing deaths and that all coordinators follow established procedures for maintaining and documenting regular contacts with local authorities.

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In order to better demonstrate the effectiveness of the Border Patrol's efforts to reduce migrant deaths, we recommend that the Commissioner of Customs and Border Protection assess the feasibility and cost-effectiveness of using multivariate statistical approaches to enhance estimates of the impacts of its initiatives.

We provided a draft of this report to the Departments of Homeland Security, Health and Human Services, Justice, and State for review and comment. On July 20, 2006, we received written comments on the draft report from the Department of Homeland Security (DHS), which are reproduced in full in appendix V. DHS concurred with our findings and outlined plans to address both of the recommendations. In its letter, DHS noted that because the Office of Border Patrol is an enforcement agency, Border Patrol agents exercise daily border safety functions in the course of carrying out their priority mission and that apprehending illegal aliens before they come into distress diminishes the risk involved with illegally crossing into the United States. We agree with this statement; one of the confounding issues to measuring the outcomes of border safety initiatives is that border enforcement and border safety are interconnected. DHS and the Department of Health and Human Services also provided a number of technical comments and clarifications, which were incorporated into the report as appropriate. The Departments of Justice and State did not have comments on the draft.

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## Background

In 1994, the Attorney General announced plans for the Southwest Border Strategy, an enforcement initiative designed to strengthen enforcement of the nation's immigration laws and to shut down the traditional corridors for the flow of illegal immigration along the southwest border. The strategy called for the former Immigration and Naturalization Service (INS)<sup>5</sup> to incrementally increase control of the border in four phases with the goal of making it increasingly difficult and costly for migrants to attempt illegal entry so that fewer individuals would try. The strategy called for adding resources along the southwest border by first concentrating personnel and technology in those sectors with the highest levels of illegal immigration activity (as measured by apprehensions) and by then moving to the areas with the least activity. Additional Border

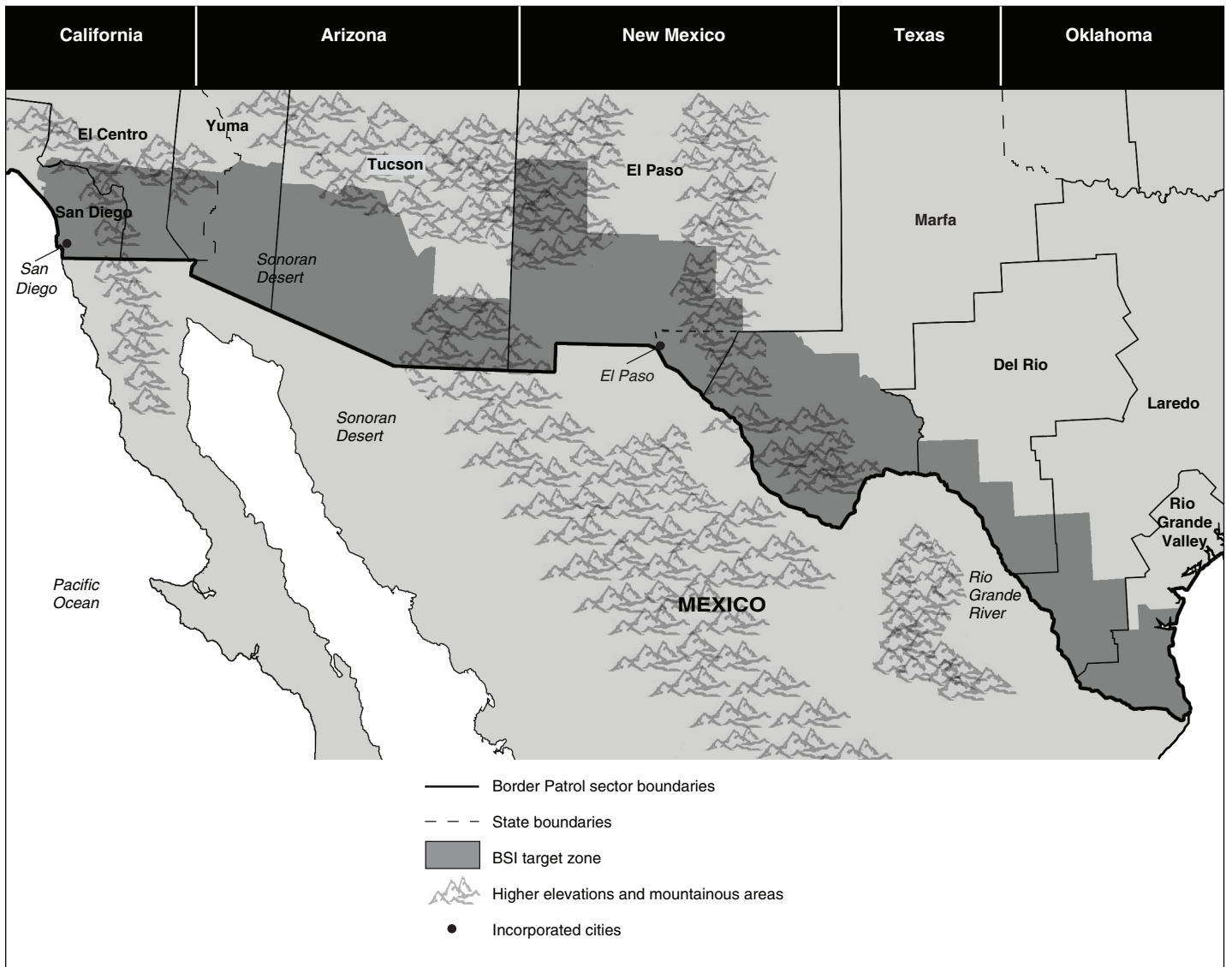
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<sup>5</sup>Following the creation of DHS in 2003, the former INS was 1 of 22 federal agencies brought together within DHS. INS functions related to border security were assumed by U.S. Customs and Border Protection under the newly created DHS.

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Patrol resources were initially allocated in the San Diego, California, and El Paso, Texas, sectors. The strategy assumed that as the urban areas were controlled, the migrant traffic would shift to more remote areas where the Border Patrol would be able to more easily detect and apprehend migrants entering illegally. The strategy also assumed that natural barriers including rivers, such as the Rio Grande in Texas, the mountains east of San Diego, and the desert in Arizona would act as deterrents to illegal entry (see fig. 1).

**Figure 1: Border Patrol Sectors and the BSI Target Zone along the United States-Mexico Border**



Source: GAO; U.S. Border Patrol.

Notes: Solid lines are used where state and sector boundaries overlap. The Rio Grande River flows south through New Mexico, along the border between Texas and Mexico, and into the Gulf of Mexico.

As we reported in 2001, INS' analysis of apprehensions data indicated that the increased enforcement efforts in the San Diego and El Paso sectors

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that began in 1994 ultimately resulted in the redirection of migrant flows to eastern California and the Sonoran Desert of Arizona.<sup>6</sup> However, INS did not anticipate the sizable number of migrants that would continue to attempt to enter the United States through this harsh terrain. Studies of migrant deaths along the southwest border at the time concluded that, while migrants had always faced danger crossing the border and many died before INS began the Southwest Border Strategy, following the implementation of the strategy, there was an increase in border-crossing deaths resulting from exposure to either extreme heat or cold.

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## The Border Patrol Implemented the Border Safety Initiative in June 1998

In response to concerns about the number of migrants who are injured or die while attempting to cross the border, the INS implemented the Border Safety Initiative (BSI) and a number of related programs beginning in June 1998. These initiatives were implemented in conjunction with the Border Patrol's ongoing enforcement efforts; the Border Patrol views the BSI and related efforts to prevent deaths as complementary to its primary mission of enforcing the law and securing the border. The primary objectives of the BSI are to reduce injuries among migrants and to prevent migrant deaths in the southwest border region. Many migrants suffer severe dehydration and heat exhaustion as a result of attempting to cross the desert where temperatures can exceed 115 degrees in the summer. Agents provide assistance to migrants who are stranded and may supply food, water, and medical care to migrants who become injured or lost in the course of attempting to cross the border.

As part of the BSI's efforts to prevent migrant deaths, several of the Border Patrol sectors in the BSI target zone have rescue beacons installed in those areas of the desert considered to be especially dangerous for migrants attempting to cross the border. Each beacon has a button that migrants can push to activate a sensor, thus alerting nearby Border Patrol agents that they are in need of help. Each sector also has a number of specialized search and rescue units known as Border Patrol Search, Trauma, and Rescue (BORSTAR) teams. BORSTAR agents have specialized training in a number of areas including medical skills, technical rescue, navigation, communication, swiftwater rescue, and air operations in order to prepare them to carry out emergency search and rescue operations. BORSTAR units conduct search and rescue operations as part of the Border Patrol's

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<sup>6</sup>GAO, *INS' Southwest Border Strategy: Resource and Impact Issues Remain after Seven Years*, [GAO-01-842](#) (Washington, D.C.: August 2001).

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ongoing efforts to enforce and secure the border. As of October 2005, the Border Patrol had deployed 164 BORSTAR agents within its nine Border Patrol sectors along the southwest border.

The Interior Repatriation Program (IRP) and Lateral Repatriation Program (LRP) are additional initiatives designed by the Border Patrol to prevent deaths and to discourage migrants from crossing the border in dangerous areas of the desert. The IRP was implemented in 2004 in conjunction with the Mexican government with the goal of removing migrants from those areas considered to be smuggling corridors in an effort to break the cycle of illegal immigration among those migrants who make repeated attempts to cross the border following apprehension. The program transports migrants who are apprehended in the Tucson and Yuma Sectors, and who volunteer for the program, to their hometowns in the interior of Mexico, rather than deporting them to points along the Arizona border where they may be more likely to attempt to cross again. Similarly, the LRP was implemented when the United States was unable to negotiate an agreement to return migrants to the interior of Mexico with the Mexican government in September 2003. Migrants apprehended in Arizona were instead transported to ports of entry in Texas in an effort to discourage them from attempting multiple crossings in the desert.

In response to the escalating problems with illegal immigration in Arizona, the Border Patrol also implemented the Arizona Border Control Initiative (ABCI) in 2004 as a multi-disciplinary initiative with the goal of coordinating federal, state, and local authorities to control the Arizona border. The ABCI strategy focused on confronting illegal immigration along the western part of the Arizona desert before it reached the United States. Components of the program included a media campaign warning migrants of the dangers associated with crossing the border and increased infrastructure and manpower along the Arizona border. While not intended primarily as a safety initiative, the enhanced infrastructure and increased manpower associated with the ABCI also allowed Border Patrol officers to better track and rescue migrants and to prevent deaths. Additional components of the program include roving patrols, camp details, and air support, and included increased assistance with highway patrols from state, local, and tribal authorities.

The Border Patrol has also implemented a number of additional efforts to discourage migrants from attempting to cross the border as part of the BSI's prevention component. Prevention efforts have included broadcasting public service announcements in Mexico about the risks involved in hiring smugglers and posting signs in high-risk areas to warn

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potential crossers of the dangers at the border. Because many migrants attempting to enter the United States illegally may not carry identification, the BSI also attempts to identify those who have died while crossing the border. Border Patrol officers work in conjunction with Mexican Consulates in the region in order to identify migrants who may have been reported missing by friends or family.

In 2000, the BSI also began formally tracking and recording data on migrant rescues and deaths through the establishment of a database known as the Border Safety Initiative Tracking System (BSITS). BSI data are used by the Border Patrol for tracking numbers and locations of deaths and rescues, identifying trends and high-risk areas, allocating resources for BSI projects, and measuring the effectiveness of various programs and projects that are related to the BSI. The database includes information such as cause and location of death as well as the decedent's gender and nationality. In order to ensure consistent tracking and recording of incidents along the southwest border, the BSI has developed a formal, written methodology that outlines the roles and responsibilities of each BSI sector coordinator in collecting and recording data on migrant deaths and rescues. The methodology also outlines definitions for the types of incidents that should be recorded in the BSITS database. The methodology defines a BSI-related death as a death involving an undocumented migrant in furtherance of illegal entry within the BSI target zone, or deaths occurring outside the target zone when the Border Patrol was directly involved. The methodology includes detailed instructions regarding the time frame for reporting incidents, protocols for entering and updating information recorded in BSITS, and guidelines for coding incidents using appropriate rescue and cause of death categories. In order to ensure that all migrant border-crossing deaths in the target zone are reported, the methodology also specifies that BSI sector coordinators should establish contact with local medical examiners or county coroners as well as Mexican Consulates in the region about those deaths where the Border Patrol was not involved in order to record the deaths in the BSITS database.

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## Various Groups Track and Record Border-Crossing Deaths Using Different Methodologies That Can Lead to Differing Counts of Deaths

A number of groups in addition to the Border Patrol have also attempted to track incidents of border-crossing deaths. Advocacy groups, media outlets, medical examiners' offices in some border counties, researchers at the CDC, and the Mexican government are among the organizations that have collected and reported data on border-crossing deaths, but each uses a different methodology to count and record deaths. All agree that a border-crossing death involves a migrant who dies in the course of



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attempting to cross illegally into the United States. However, each may operationalize the definition differently and rely on a variety of sources of information for making determinations about which deaths to include in their counts. For example, the “Victoria 19”—an incident in which 19 migrants who were smuggled in the back of a tractor-trailer were all found to have suffocated near Victoria, Texas, in 2002—would not be included in the Border Patrol’s counts of migrant border-crossing deaths because it occurred outside the BSI target zone and there was no direct Border Patrol involvement in the case.<sup>7</sup> By contrast, some advocacy groups that track and record border-crossing deaths include the Victoria 19 in their totals. Because the incident involved migrants who were in transit across the border into the United States, they consider it a border-crossing death, even though it occurred outside the Border Patrol’s identified BSI target zone.

In making decisions about whether or not to count the death of an unidentified person as a border-crossing death, Border Patrol officials and others may rely on professional judgment of circumstantial evidence. This may also result in differing counts of deaths from one group to the next. For example, data on border-crossing deaths maintained by the Pima County Medical Examiner’s office for the Tucson area have been cited by the media in news reports. Some cases of border-crossing deaths may involve unidentified bodies that were discovered in the desert; these cases can often include skeletal remains or decomposed bodies. In determining whether to count these incidents as border-crossing deaths, the Pima County Medical Examiner’s office uses information about where a body is found—for example, along a known migrant corridor—as well as other circumstantial evidence such as the decedent’s clothing or personal effects that may indicate a country of origin. The Pima County Medical Examiner’s office reported that it records all cases of migrant deaths including a few cases involving migrants who die of natural causes such as heart attacks or appendicitis, noting that, if there is evidence that the person died while in transit between Mexico and the United States, the office will count it as a border-crossing death regardless of the cause. However, the Pima County Medical Examiner’s office places some limitations on which cases it records as border-crossing deaths. For example, the office attempts to exclude any cases involving illegal immigrants who had established residency in the United States from its

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<sup>7</sup>Victoria, Texas, lies within Victoria County, which is within the Border Patrol’s Rio Grande Valley Sector. However, it is not 1 of the 45 counties that comprise the BSI target zone.

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counts of border-crossing deaths in order to distinguish deaths occurring among illegal immigrants who had been living and working in the United States for some time from migrants who died in the course of attempting to cross the border.

Using another method to measure migrant border-crossing deaths, researchers at the CDC designed a study to track and record migrant border-crossing deaths occurring in U.S. border counties in Arizona, New Mexico, and Texas between 2002 and 2003.<sup>8</sup> They requested that medical examiners in these states provide them with information about cases that met a number of standardized criteria. The researchers then reviewed the death certificates and other information about these cases in order to describe trends in border-crossing deaths. They asked medical examiners to include only those cases involving decedents who were found in one of several selected U.S. counties along the U.S. border with Mexico, whose immigration status was determined to be unauthorized, and who were determined to have died during transit from Mexico into the United States within 30 days of their arrival in the country. According to their methodology, an unauthorized decedent was identified based upon one or more of the following criteria: a person who was identified as not being a legal resident or an authorized entrant into the United States, a person who was identified as a resident of another country based upon reports by family, friends, or officials, or a person who was identified as being a resident of another country based upon analysis of circumstantial evidence found with the decedent. Such circumstantial evidence included tattoos, items found on or near the body, personal items found in bags, clothes, and documents including birth and marriage certificates. Decedents were not included in the study if they were known to have resided illegally in the United States for more than a month before their death, if they were determined not to have died while crossing the border, or if they had died after being treated in a U.S. border hospital.

Table 1 illustrates the counts recorded by some of the groups attempting to track and record border-crossing deaths in Pima County, Arizona, between 2002 and 2005.

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<sup>8</sup>Sapkota, et al., 2006.

**BSI and NCHS Data Show That, Since the Late 1990s, Increases in Deaths along the Southwest Border Were Accounted for by Increases in Deaths in the Tucson Sector**

**Table 1: Number of Migrant Border-Crossing Deaths Occurring in Pima County, Arizona, as Reported by Various Sources, 2002 through 2005**

Source	Year			
	2002	2003	2004	2005
Sapkota, et al.	139	131	<sup>a</sup>	<sup>a</sup>
Pima County Medical Examiner	139	131	130	155
BSI data	95	75	84	154

Sources: GAO analysis of data in Sapkota, et al., 2006 and of BSI data; Pima County Medical Examiner data.

<sup>a</sup>The Sapkota, et al., study was limited to deaths occurring during 2002 and 2003; hence, figures for these years are not available.

Our analysis of the BSI and NCHS data shows consistent trends in the numbers, locations, causes, and characteristics of deaths over time. Consistent with reported trends in prior studies of border-crossing deaths, our analysis of both data sources shows an increase in the overall numbers of deaths occurring along the southwest border between 1998 and 2005 following a decline between 1990 and 1994. Our analysis of the NCHS data shows that the number of deaths doubled from the mid-1990s through 2003, and our analysis of the BSI data shows that the majority of the increase in deaths that occurred between 1998 and 2005 was concentrated within the Border Patrol’s Tucson Sector. Consistent with the increase in Tucson, the number of border-crossing deaths due to heat exposure also steadily increased beginning in 1998. While the majority of deaths have occurred among men, according to our analysis of the BSI data, deaths among women increased from 9 percent of all deaths in 1998 to 21 percent of all deaths in 2005.<sup>9</sup> Further, increases in deaths among women in the Tucson Sector accounted for the majority of the overall increase in deaths among women in all sectors. The increase in the number of deaths in the Tucson Sector between 1998 and 2005 occurred despite the fact that the number of apprehensions of illegal immigrants recorded by the Border Patrol in the Tucson Sector had declined following a peak in 2000. To the extent that apprehensions are correlated with the number of attempted crossings, the increase in deaths in the Tucson Sector indicates that the desert is a particularly difficult region for migrants attempting illegal entry.

<sup>9</sup>Our analysis of NCHS data shows that deaths among women increased from 12 percent of all deaths in 1998 to 26 percent of all deaths in 2003, the most recent year for which data are available.

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## BSI and NCHS Data Show Consistent Trends in Numbers, Locations, and Causes of Death

Our analysis of the BSI data as well as our analysis of the NCHS data reveals trends that are consistent with trends identified in previous studies by CIR examining the numbers, locations, and causes of border-crossing deaths over time. All three sources of data show that trends in migrant deaths follow a somewhat U-shaped curve as deaths within the BSI target zone increased beginning in the mid-1990s following a period of decline between 1990 and 1994 (see fig. 2). We used NCHS data—which are based on death certificates filed by local coroners and medical examiners throughout the country and include records of all deaths that occur within the United States, regardless of the decedent’s country of origin—as an independent data source to corroborate trends identified in the BSI data.<sup>10</sup> Additionally, the trends in the NCHS data between 1990 and 1998 are also consistent with the trends in border-crossing deaths reported by Karl Eschbach and his colleagues at the Center for Immigration Research in their analysis of state-level vital registry data. Differences in the total numbers of deaths in the NCHS and CIR data arise from the differences in the methodologies used by each.<sup>11</sup> Our analysis of the NCHS data shows that deaths declined in the San Diego and El Centro Sectors between 1990 and 1994 and that over this period, deaths from traffic fatalities and homicide also declined. This pattern represents a major shift in the causes of migrant border-crossing deaths, as traffic fatalities were the leading cause of migrant border-crossing deaths during the early 1990s, while from the late 1990s onward, heat exposure was the leading cause of death. Additionally, according to our analysis of the NCHS data, homicides decreased from 24 percent of all deaths in 1990 to 9 percent in 2003. Our analysis of the BSI data also shows that heat exposure was the leading cause of death from 1998 to 2005. The increase in deaths due to heat exposure over the last 15 years is consistent with our previous report that found evidence that migrant traffic shifted from urban areas like San Diego and El Paso into the desert following the implementation of the Southwest Border Strategy in 1994.<sup>12</sup>

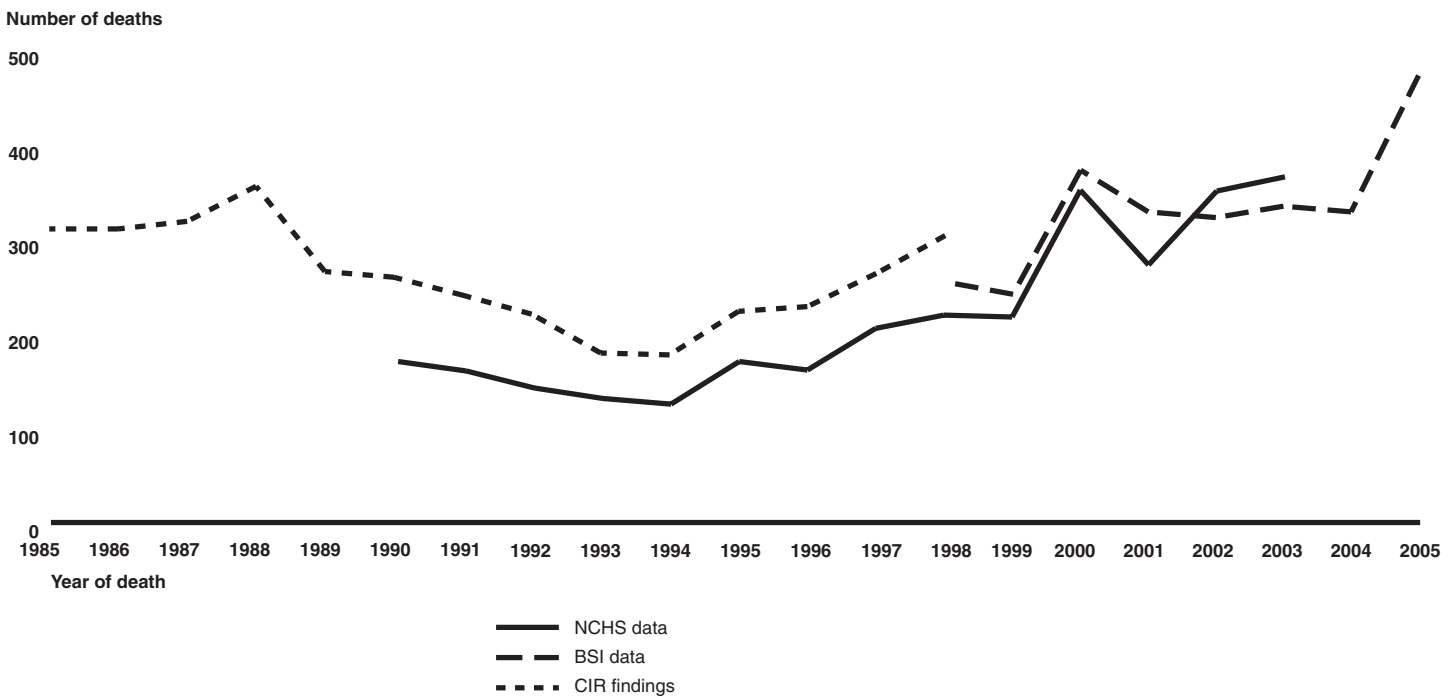
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<sup>10</sup>Our counts differ from Border Patrol reports due to differences in methodology. See app. I for details about our methodology.

<sup>11</sup>Our analysis of the NCHS data includes deaths in the 45 counties that make up the BSI target zone, while CIR’s analysis includes a total of 55 counties on or near the southwest border with Mexico. Additional differences between the two data sources include the codes used to identify common causes of migrant deaths. See app. 1 and Eschbach, et al., 2003, for additional discussion.

<sup>12</sup>[GAO-01-842](#).

**Figure 2: Migrant Border-Crossing Deaths in the BSI Target Zone, 1985 through 2005**



Source: GAO analysis of BSI and NCHS data; CIR findings, as reported in Reyes, et al., 2002, 68.

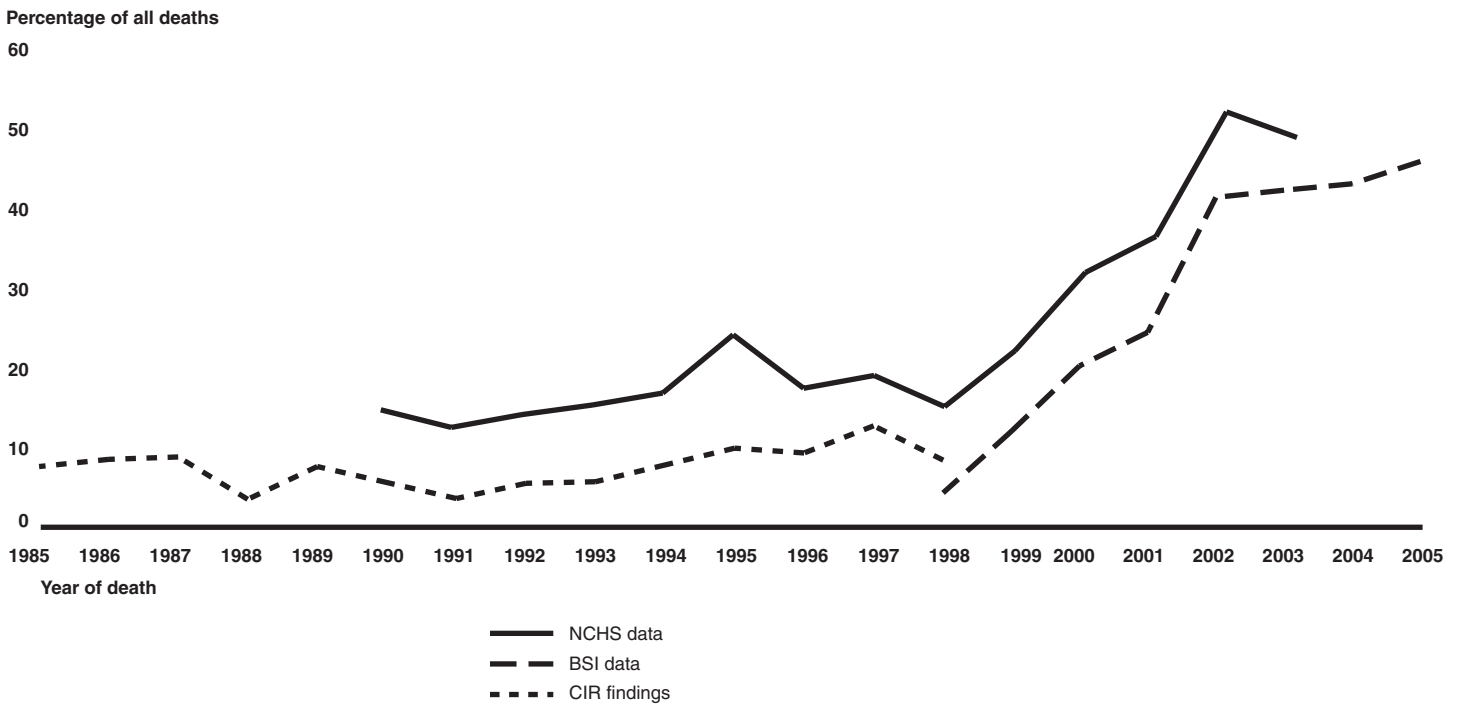
Notes: BSI data are arrayed on a fiscal year basis, while NCHS data and CIR findings are on a calendar year basis. Annual totals for CIR findings are based on cause of death counts as reported in Reyes, et al., 2002, 68. CIR findings include data from 55 counties.

Our analysis of the BSI data shows that the total number of border-crossing deaths increased from 254 in 1998 to 334 in 2003 and then increased to 472 in 2005.<sup>13</sup> Similarly, our analysis of the NCHS data shows that the number of deaths increased from 219 in 1998 to 365 in 2003. Corresponding with the increases in deaths that occurred between 1998 and 2005, border-crossing deaths also became increasingly concentrated within the Tucson Sector—a region that corresponds with Arizona’s portion of the Sonoran Desert. For example, our analysis of the BSI data shows that the Tucson Sector’s share of all border-crossing deaths increased tenfold, from 4.3 percent of all deaths in 1998 to 45.8 percent in 2005 (see fig. 3), so that by 2005, of the 472 deaths that occurred across all

<sup>13</sup>Border Patrol reported a total of 291 deaths during the first 9 months of fiscal year 2006 (October 1, 2005, through June 30, 2006). Our analysis of the BSI data for the first 9 months of fiscal year 2005 (October 1, 2004, through June 30, 2005) shows a total of 241 deaths.

nine southwest sectors, 216 occurred within the Tucson Sector. Our analysis of the NCHS data shows a similar trend, in that the Tucson Sector's share of border-crossing deaths increased at least threefold between 1998 and 2003. The total number of deaths in the eight other Border Patrol sectors remained relatively constant over this period.<sup>14</sup>

**Figure 3: Percentage of All Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Tucson Sector, 1985 through 2005**



Source: GAO analysis of BSI and NCHS data; CIR findings, as reported in Reyes, et al., 2002, 68 and Eschbach, et al., 2001, 24-61.

Notes: BSI data are arrayed on a fiscal year basis, while NCHS data and CIR findings are on a calendar year basis. CIR findings exclude deaths from unknown causes.

Further, the increase in deaths occurring within the Tucson Sector accounted for the majority of the increase in deaths along the southwest border. For example, our analysis of the NCHS data indicates that the increase in deaths in the Tucson Sector from 1990 to 2003 accounted for more than 78 percent of the total increase in border-crossing deaths along the entire southwest border. Across all sectors during these years, the total number of border-crossing deaths increased by 195, and of that

<sup>14</sup>For the number of deaths in each sector, see figs. 8 through 16 in app. II.

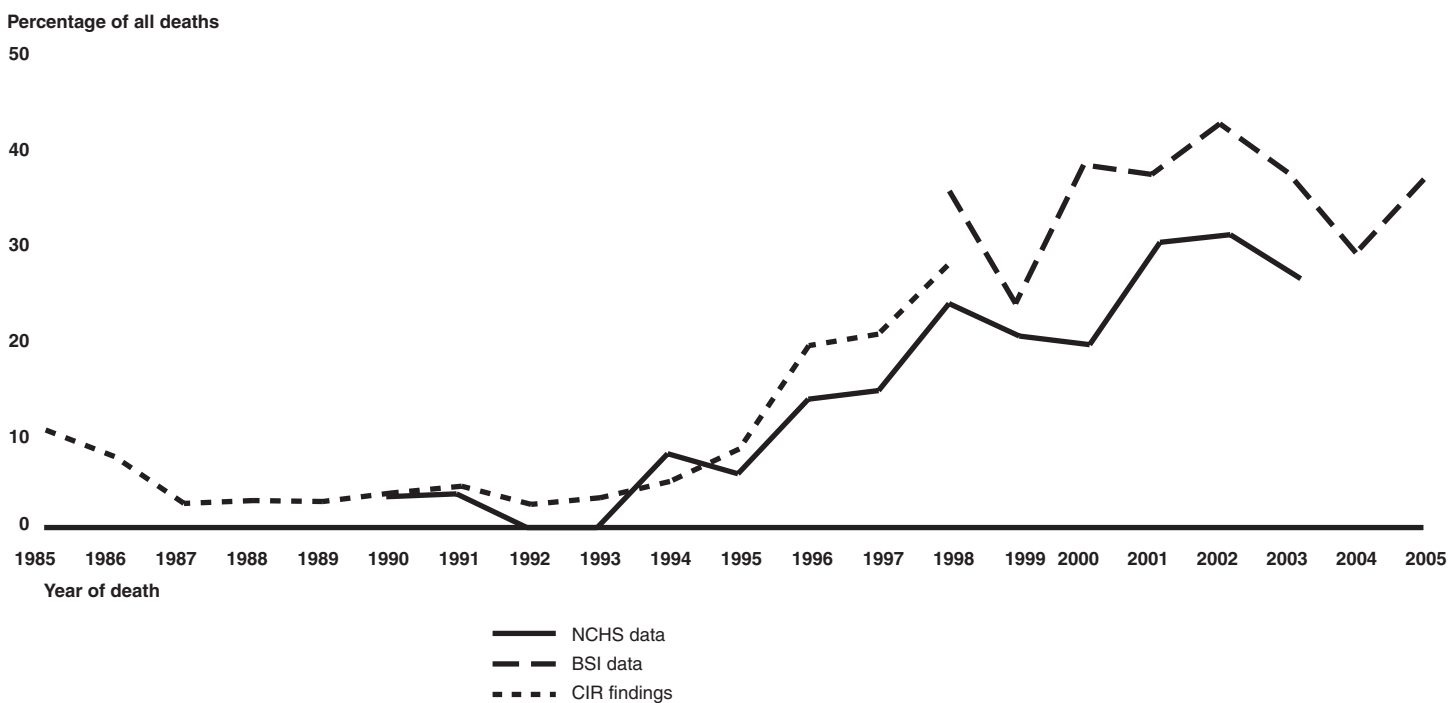
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increase, 153 deaths occurred in the Tucson Sector. Our analysis of the BSI data shows a similar result: between 1998 and 2005, deaths across all sectors increased by 218, and the Tucson Sector accounted for 205—or 94 percent—of the increase. The increase in deaths in the Tucson Sector is also consistent with the shifting of migrant traffic from urban areas in San Diego and El Paso into the desert following the implementation of the Southwest Border Strategy. The increase in deaths in the Tucson Sector occurred after the number of deaths occurring within the San Diego Sector declined, beginning in the early 1990s (see fig. 8 in app. II). In 1990, the San Diego Sector accounted for over one-third of all border-crossing deaths. By 2003, the San Diego Sector accounted for only 8 percent of all deaths.

While much of the migrant traffic appears to have shifted to sectors east of San Diego like Tucson, a similar shift does not appear to have occurred in the sectors east of El Paso. Border Patrol officials have noted that there are few population centers on the Mexican side of the border in those regions that might serve as a starting point for migrants intending to cross. Similarly, on the U.S. side of the border, sectors like Marfa in western Texas are more sparsely populated. Border Patrol officials have speculated that fewer migrants attempt to cross in these areas because they largely consist of small towns and communities. Consequently, migrants may have to walk longer distances to reach a population center and may face an increased risk of being apprehended as a result of being noticed by the local population or Border Patrol agents.

As the number of deaths occurring within the desert in and around the Tucson Sector increased, so too did the number of deaths due to heat exposure. While there has been an overall increase in the number of heat exposure deaths between 1994 and 2005, there have been some fluctuations between years. These fluctuations may be due to factors such as temperature changes from one year to the next as higher desert temperatures in some summers may result in an increase in migrant deaths. Our analysis of both the BSI and NCHS data shows increases in the total percentage of border-crossing deaths due to heat exposure over time. For example, by 2001, heat exposure deaths in the BSI data accounted for more than one-third of all deaths. Our analysis of the NCHS data also shows that by 2001 heat exposure deaths accounted for more than 30 percent of all border-crossing deaths, an increase from about 4 percent in 1990 (see fig. 4).

**Figure 4: Percentage of All Migrant Border-Crossing Deaths in the BSI Target Zone Due to Heat Exposure, 1985 through 2005**



Source: GAO analysis of BSI and NCHS data; CIR findings, as reported in Reyes, et al., 2002, 68.

Notes: BSI data are arrayed on a fiscal year basis, while NCHS data and CIR findings are on a calendar year basis. CIR findings include data from 55 counties and deaths from all environmental causes, such as heat exposure and hypothermia.

As the number of deaths due to heat exposure increased, the number of deaths due to traffic-related fatalities, homicide, and drowning either remained relatively constant or declined (see fig. 5).<sup>15</sup> For example, our analysis of the NCHS data shows that traffic fatalities declined from more than half of all border-crossing deaths in the early 1990s to less than 30 percent of deaths by 2003. Our analysis of the BSI data shows similar trends, with deaths due to exposure increasing from 107 to 185 while deaths due to motor vehicle accidents, homicide,<sup>16</sup> and drowning

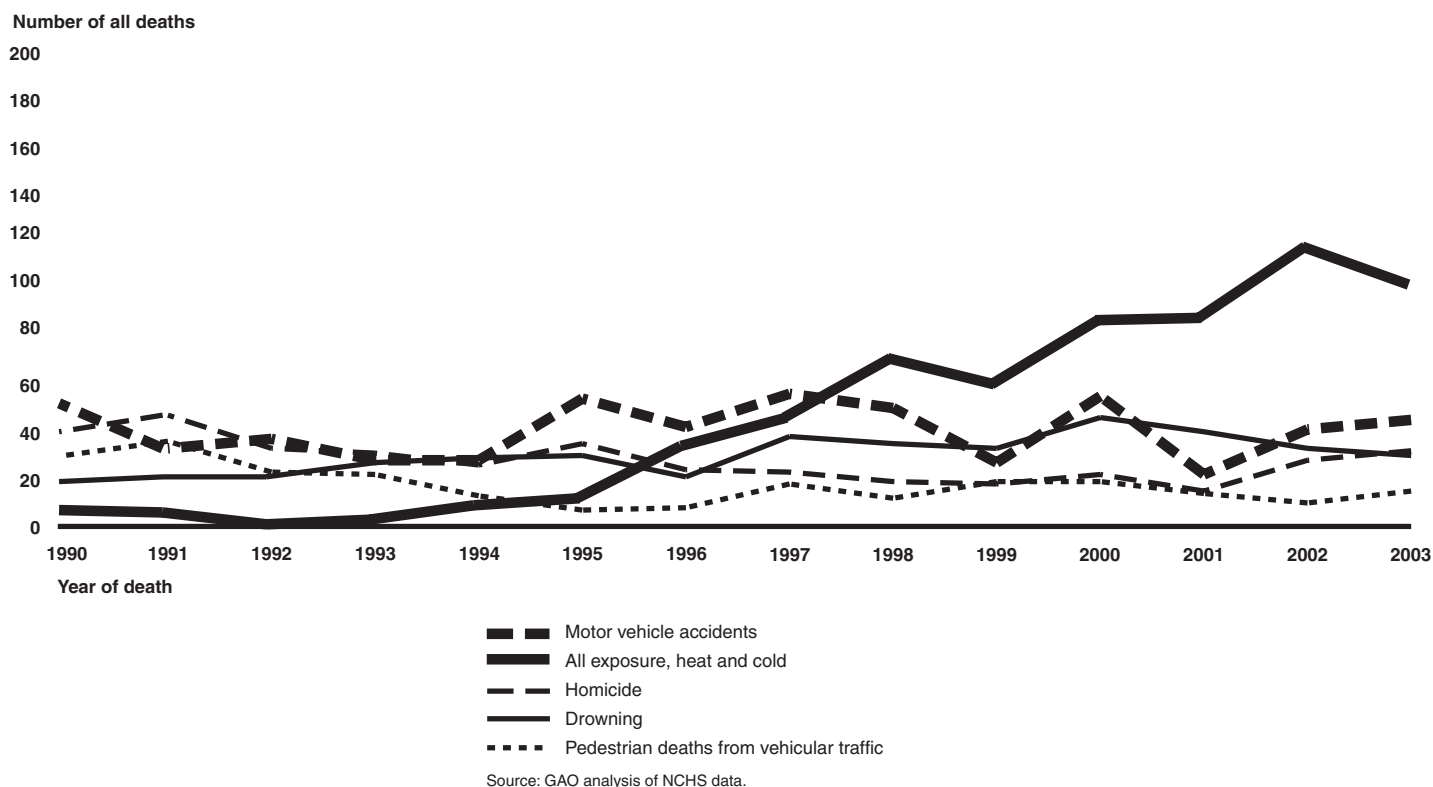
<sup>15</sup>See app. III for causes of death according to BSI data and the CIR findings.

<sup>16</sup>This figure also includes deaths from suicide and Border Patrol shootings.



decreased slightly from 109 to 103 between 1998 and 2005.<sup>17</sup> Our analysis of the NCHS data also shows that homicides have also declined slightly, accounting for 41 border-crossing deaths in 1990, and 33 deaths in 2003. Despite the decline in homicides, Border Patrol officials have noted an increase in border-related violence among smugglers and migrants including assault and robbery, though officials stated that few incidents have resulted in deaths thus far.

**Figure 5: Migrant Border-Crossing Deaths, by Cause of Death, NCHS Data, 1990 through 2003**



<sup>17</sup>These totals do not reflect unknown cases recorded by the Border Patrol that may include skeletal remains for which the cause of death could not be determined. Our analysis of the data shows that unknown causes of death as recorded in BSITS have increased from 11 percent in 1998 to 36 percent in 2005.

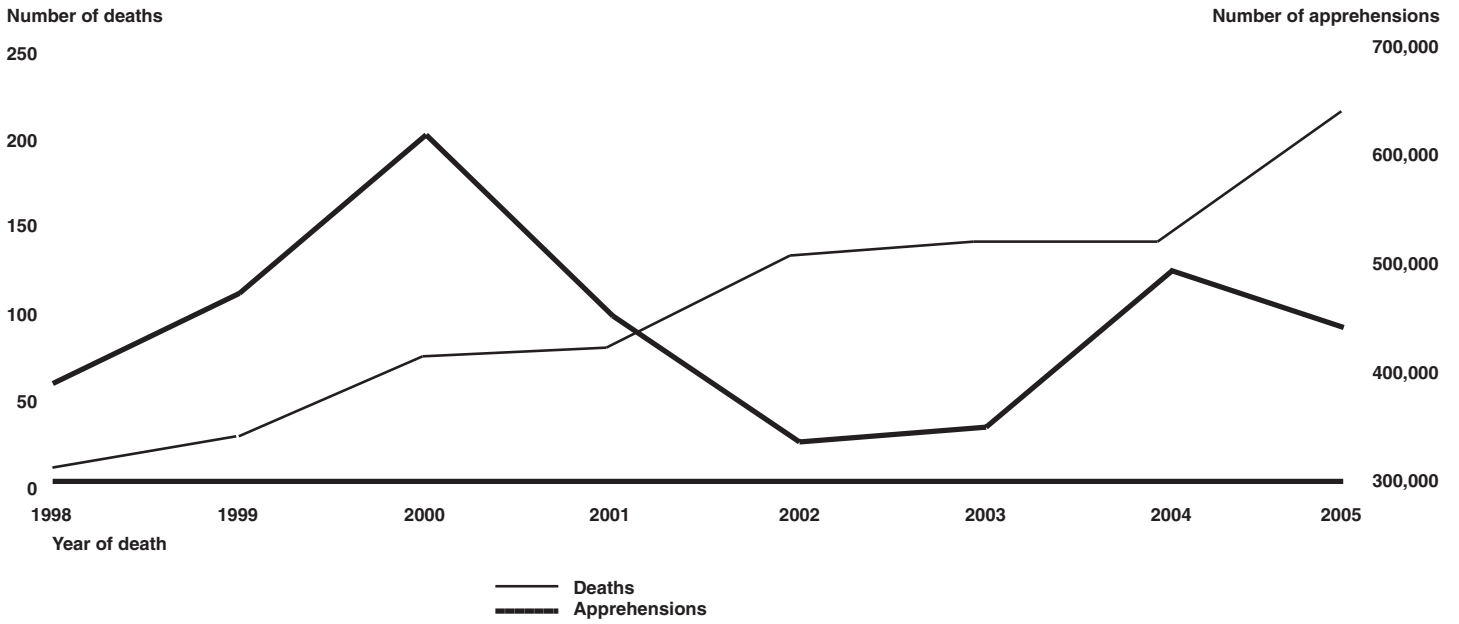
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## Risk Associated with Border Crossing Appears to Have Increased in Recent Years

The risk associated with attempting to cross the border illegally also appears to have increased between 1998 and 2004. While the number of migrant border-crossing deaths approximately doubled over this period, estimates of undocumented migration into the United States—whether based on U.S. census data or based on the number of Border Patrol apprehensions of migrants attempting illegal entries—do not show a corresponding increase. For example, estimates of illegal entries into the United States indicate that from 1998 through 2004, the estimated number of such entries has declined by 16 percent. Similarly, the number of apprehensions of persons attempting illegal entry has declined by 25 percent over this same period. At the same time, our analysis of the BSI data shows that the number of border-crossing deaths increased by about 29 percent from 254 in 1998 to 328 in 2004. (See app. I for a discussion of our methodology.) An examination of the increase in the number of deaths in relation to declines in the estimated number of illegal entries suggests that the risk associated with crossing the border has increased in recent years.

This apparent increase in risk associated with attempting to cross the border illegally also appears to be concentrated in the Tucson Sector. The increase in the number of border-crossing deaths from 1998 through 2005 was generally independent of changes in the number of apprehensions of migrants attempting illegal entries within the sector, especially during the decline in apprehensions that occurred between 2000 and 2002 (see fig. 6). In other sectors, the number of apprehensions generally correlated with the number of deaths: as apprehensions increased, deaths show a corresponding increase, and conversely, as apprehensions declined, deaths generally also declined, although the amount of change in deaths and apprehensions between years differed (see fig. 7).

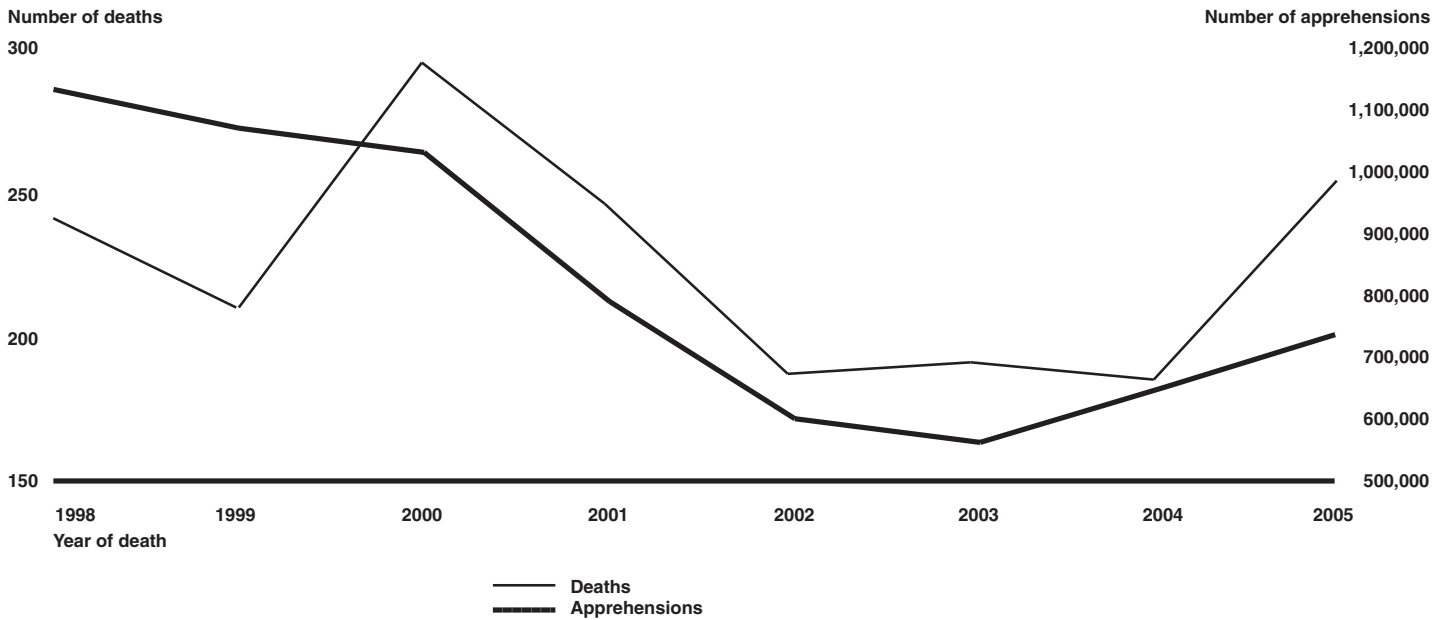
**Figure 6: Migrant Border-Crossing Deaths and Apprehensions in the BSI Target Zone Occurring within the Tucson Sector, Fiscal Years 1998 through 2005**



Source: GAO analysis of BSI and U.S. Border Patrol data.

Note: Data are for fiscal years beginning October 1.

**Figure 7: Migrant Border-Crossing Deaths and Apprehensions in the BSI Target Zone Occurring within All Sectors except Tucson, Fiscal Years 1998 through 2005**



Source: GAO analysis of BSI and U.S. Border Patrol data.

Note: Data are for fiscal years beginning October 1.

While there are limitations to using the number of apprehensions as a measure of attempted illegal entries into the United States, we previously reported that changes in apprehensions can provide some evidence of shifting illegal migration patterns.<sup>18</sup> However, to the extent that apprehensions can be used as an indication of attempted illegal entries into the United States, unlike other estimates of illegal entries, these data have the advantage of being sector-specific and, therefore, allow for comparisons between sectors in estimating attempted illegal entries and deaths. In the Tucson Sector, apprehensions increased from 1998 to 2000 and then generally declined from 2000 to 2005, with some year-to-year fluctuations. While apprehensions generally declined, the number of border-crossing deaths in the Tucson sector continued to increase over the same period. To the extent that an increased number of apprehensions

<sup>18</sup>For a discussion of limitations, see GAO, *Illegal Aliens: Despite Data Limitations, Current Methods Provide Better Population Estimates*, GAO/PEMD-93-25 (Washington, D.C.: August 1993). For a discussion of apprehensions as evidence for shifting migration patterns, see GAO-01-842.

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generally can be assumed to represent an increased number of migrants attempting illegal entry, the inverse relationship between apprehensions and deaths in Tucson suggests that deaths have increased despite the fact that there has not been a corresponding increase in the number of people attempting to cross in that sector.

The reasons for this phenomenon are unclear. There are a number of factors that may make the desert in and around Tucson a particularly dangerous region for migrants to navigate, including the difficulty of the terrain, extreme summer temperatures, and the increased use of smugglers in the sector. While there is evidence that increasing numbers of migrants have employed smugglers to help them cross the border illegally across all nine southwest Border Patrol sectors in recent years, smuggling may be especially dangerous in the Tucson Sector. Border Patrol officials reported that migrants who are unable to keep up with smugglers may be left behind in extreme desert temperatures without sufficient food or water. Alternatively, the inverse relationship between apprehensions and deaths in the Tucson Sector could arise if apprehending migrants has become more difficult in Tucson than in other sectors. This could result from a number of factors such as changes in the number of agents assigned to patrol the sector or the number of migrants who are able to evade apprehension by attempting to cross in particularly remote areas of the sector.

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### **While the Majority of Border-Crossing Deaths Occur among Men, the Increase in Deaths among Women Occurred Largely in the Tucson Sector**

According to our analysis of the NCHS data, males comprised more than 78 percent of the border-crossing deaths occurring between 1990 and 2003, and persons between 15 and 44 years of age comprised 79 percent of all deaths. The trends over time in these respective shares of deaths were relatively constant with some minor, year-to-year fluctuations. Our analysis of the BSI data shows similar trends between 1998 and 2005, with males accounting for 83 percent of all deaths, and persons between the ages of 15 and 44 comprising 88 percent of all deaths. This was true across all sectors with trends remaining relatively constant across years. While deaths among women were consistently much lower than men, there was an increase in the overall number of female deaths that occurred between 1998 and 2005—the number of female deaths increased from 22 to 90, or from 9 percent to 21 percent of all deaths. Our analysis of the BSI data shows that, between 1998 and 2005, the increase in deaths among females in the Tucson Sector accounted for 57 percent of the total increase in deaths among women across all sectors. Similarly, our analysis of the NCHS data shows that from 1990 to 2003, the increase in deaths among

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females in the Tucson Sector accounted for 96 percent of the total increase in deaths among women across all sectors.<sup>19</sup>

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## The Border Patrol's Approach to Tracking and Recording Deaths Has Not Been Implemented Consistently across Sectors

The BSI's methodology for collecting data on border-crossing deaths provides a framework for gathering and recording data on the number of migrant deaths that occur in each sector. While the Border Patrol has taken steps to improve the collection of its data over time, differences remain among the nine BSI sector coordinators in how each has implemented the methodology, and these differences could result in incomplete counts of border-crossing deaths in any given year. Additionally, because of inherent uncertainties associated with determining whether some migrant deaths are border-crossing deaths, an exact count of all deaths may not be possible to obtain.

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## Differences in the Implementation of the BSI Methodology across Sectors May Result in Incomplete Counts of Border-Crossing Deaths

The BSI methodology specifies that each sector coordinator should track all migrant deaths occurring within the sector, including those deaths that may have first come to the attention of local authorities by obtaining and sharing information with county coroners or medical examiners. However, BSI sector coordinators have the latitude to decide how to implement this outreach. Some coordinators reported regularly scheduled contact with local authorities, while others stated that communication was informal and infrequent. Some coordinators also reported that the nature and methods for communicating with local authorities had changed from one year to the next. For example, local medical officials in one county where a relatively large number of deaths occurred reported that Border Patrol officials in the Tucson Sector only began contacting them in 2005 to request information on border-crossing deaths. As a result, the BSI data prior to that year may not have included records of those border-crossing deaths that were discovered by local authorities but that did not come to the attention of Border Patrol officials. To the extent that they may not include data on all border-crossing deaths recorded by local officials, the BSI data may represent an undercount of the total number of border-crossing deaths in that sector. These undercounts may affect the Border Patrol's ability to understand the scale of the problem in each sector and

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<sup>19</sup>Children appear to only represent a small share of deaths along the border. Our analysis of the BSI data shows that persons under the age of 15 comprised less than 2 percent of all deaths from 1998 to 2005. This was true across all sectors with trends remaining relatively constant from year to year. Our analysis of the NCHS data shows that persons under the age of 15 comprised about 3 percent of all deaths from 1990 to 2003.

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also impact its ability to continue to make accurate resource allocations along the southwest border.

Since January 2005, the National BSI Coordinator has taken steps to further clarify the methods that sector coordinators should use to collaborate with local officials in collecting BSI data. However, the revised BSI methodology does not specify the frequency with which sector coordinators are to conduct this outreach nor does it outline the methods that coordinators should use to share information about migrant deaths with county coroners or local medical examiners. While all coordinators reported some degree of contact with local authorities, communication remains informal in some sectors. As a result, Border Patrol officials in these sectors may not learn about all cases of migrant deaths, particularly in smaller counties where border-crossing deaths occur with less frequency. Border Patrol officials in those sectors reporting informal or infrequent communication stated that they did not believe that these omissions would likely have a significant impact on the total number of deaths recorded in the BSITS database. While our analysis of the NCHS data confirms these sectors have had relatively few deaths in recent years, those trends have the potential to change in the future. For example, our analysis of the BSI data shows only 11 deaths in the Tucson Sector in 1998. However, as migration shifted from the San Diego Sector to the Tucson Sector following the implementation of the Southwest Border Strategy, the number of deaths in Tucson increased significantly. By 2005, Tucson accounted for nearly half of all deaths recorded across all nine sectors, with a total of 216 deaths. Since the current BSI methodology gives each sector coordinator the latitude to determine how to approach communication with local authorities about border-crossing deaths, differences between sectors in implementing the BSI methodology may ultimately affect the Border Patrol's counts of border-crossing deaths in the future. In addition, the nature and frequency of each sector's contact with local officials could potentially change each time a new sector coordinator is assigned.

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### Identifying Border-Crossing Deaths May Be Difficult in Some Cases

Another factor that may affect the extent to which the Border Patrol records the precise number of border-crossing deaths is the uncertainty that arises in those cases involving bodies discovered in the desert or other remote areas. In some of these instances both Border Patrol agents and local medical examiners must use their professional judgment in determining whether circumstantial evidence is sufficient to classify a decedent as a migrant who died while in furtherance of an illegal entry. Both Border Patrol officials and local medical examiners with whom we

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spoke reported relying on such evidence as the type of clothing worn by the decedent, whether or not the person was carrying water jugs (as evidence that the person intended to travel some distance on foot), as well as any personal documents or identification that might indicate country of origin. Border Patrol officials and others also reported that, in many cases where the decedent had no identification or only skeletal remains were found, they may conclude that the decedent was a migrant attempting illegal entry because the remains were found in a remote area that was a known migrant-crossing corridor.

Further, determining when a migrant has arrived at his or her destination and is no longer in furtherance of an illegal entry can involve making judgments about the length of time a decedent was in the United States at the time of death. In most cases of border-crossing deaths, when decedents are found on known border-crossing trails or the deaths were reported by other migrants attempting illegal entry, such determinations can be made with some degree of certainty. However, in other circumstances, the determination about how long a migrant had been in the United States may be more difficult. For example, Border Patrol officials reported cases of migrants who worked on a farm for a period of a few weeks or even a month after arriving in the United States—to earn funds to complete their migration—only to die while en route to their final destination. Also, in cases involving skeletal remains, the determination regarding whether to record the case as a border-crossing death may be more difficult. Border Patrol officials and others generally reported that they rarely encountered ambiguous cases where there was little or no circumstantial evidence that provided some indication that the decedent was a migrant who died while trying to cross the border. However, all reported that, in the absence of being able to confirm the decedent's identity, they must use their best judgment to make an informed decision about whether the death should be considered a border-crossing death. Finally, the fact that a number of bodies may remain undiscovered in the desert also raises doubts about the accuracy of counts of migrant deaths. While local medical officials who track border-crossing deaths reported that they do not believe that there are a large number of undiscovered bodies that would add significantly to counts of border-crossing deaths, the total number of bodies that have not been found is ultimately unknown.



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## Evaluating the Effectiveness of the BSI and Other Border Patrol Efforts to Reduce Border-Crossing Deaths Presents Measurement Challenges

A number of measurement challenges and data limitations inhibit a comprehensive evaluation of federal efforts to prevent border-crossing deaths. In particular, because multiple factors may affect the numbers and locations of migrant deaths, the effectiveness of the Border Patrol's efforts to prevent such deaths cannot be measured only by changes in the number of deaths over time. Factors such as the number of people attempting to cross the border in any given year, weather conditions, and the use of smugglers may all affect the number and location of migrant deaths from one year to the next. Similarly, clear cause and effect relationships between migrant crossings, the Border Patrol's enforcement efforts, and prevention initiatives such as the BSI are difficult to determine. A decline in deaths might incorrectly be associated with BSI activity. Some migrants may be deterred by the Border Patrol's enforcement efforts and not attempt to cross at all, while others may attempt to cross in more dangerous areas in an effort to avoid apprehension. In addition, because Border Patrol agents typically carry out search and rescue activities related to the BSI at the same time they carry out enforcement and apprehension functions, it is difficult to isolate the impact that prevention efforts may have had on the number of deaths.

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## A Number of Factors Would Need to Be Considered in Order to Assess Cause and Effect Relationships between Migrant Crossings, Border Enforcement, the BSI, and Related Efforts

Because multiple factors beyond the efforts of the BSI may potentially affect the number of border-crossing deaths in any given year, the influence of each would need to be taken into account and measured in relation to the number of migrant deaths in order to accurately assess the impact of the BSI. Measuring the effectiveness of the BSI in reducing border-crossing deaths would require a comparison of changes in the number of migrant deaths with changes in other causal factors—such as the Border Patrol's enforcement efforts, the number of migrants attempting to cross the border illegally, and weather conditions, as well as changes in how and where the BSI is implemented over time. Without correcting for these factors, cause and effect relationships are difficult to determine. For example, changes in the Border Patrol's enforcement efforts might lead to shifts in the locations where migrants attempt to cross. If migrants attempt to cross in more dangerous areas of the desert in order to avoid detection, this may lead to an increase in the number of deaths. In this scenario, the BSI may in fact have prevented deaths through its search and rescue operations, even though the number of deaths rose as a result of more migrants crossing in the harsh desert terrain. Alternatively, increased enforcement efforts may result in migrants being apprehended before they are in danger or in need of rescue. Similarly, a number of factors may also affect the number of migrants that attempt to cross the border. For example, the dynamics of how many people attempt

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to cross the border each year may be driven by the relative strength of the U.S. labor market in relation to the Mexican labor market. In addition, the number of migrants that make repeated attempts to cross the border until they are successful may also change over time. Previous research suggests that increased enforcement and harsh conditions have made crossing the border more difficult; consequently, many migrants now pay smugglers to help them cross.<sup>20</sup> The increased difficulty and expense in crossing may also result in fewer migrants making repeated attempts to cross the border. Additionally, those who succeed in crossing may choose to stay permanently in the United States rather than crossing back and forth for seasonal employment as was the case in years past.

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### The Border Patrol Does Not Maintain Detailed Data on BSI Operations

If detailed data were available on the extent of the BSI's efforts by sector, it would be possible to more clearly isolate the program's effects on trends in deaths, while controlling for other factors that may affect deaths such as increased enforcement efforts or weather fluctuations. However, the Border Patrol does not maintain detailed data on where the BSI was used over time that would be needed to conduct such an evaluation. Specifically, the Border Patrol does not maintain historical data on the number of hours agents dedicated exclusively to BSI activities or historical data on apprehensions made by those agents who were operating in their search and rescue capacity at the time of apprehension. These data would provide necessary information about where the BSI was used over time and allow for more precise measurements of the BSI's implementation across sectors. Because the Border Patrol's primary function is enforcement, agents typically carry out search and rescue operations simultaneously with ongoing enforcement activities. As a result, the extent to which the Border Patrol can isolate and record the number of line hours and resources dedicated exclusively to BSI-related activities is limited.

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<sup>20</sup>Roberto Corando and Pia M. Orrenius, "The Effect of Illegal Immigration and Border Enforcement on Border Crime Rates," Research Department, Federal Reserve Bank of Dallas, 2003.

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## The Impact of Additional Border Patrol Programs in Reducing Migrant Deaths Has Not Been Demonstrated

Border Patrol has claimed that the Interior Repatriation Program (IRP) resulted in a decrease in migrant deaths and that the decrease in deaths was due, in part, to a lower recidivism rate among program participants when compared with those migrants who did not participate in the program.<sup>21</sup> Border Patrol's claims that the IRP contributed to reductions in deaths were based upon a decline in the number of exposure deaths recorded in the BSI data between 2003 and 2004. However, this simple correlation does not constitute sufficient evidence of a causal effect of the IRP on deaths. First, because participation in the program is voluntary, it is not possible to determine the program's impact on recidivism rates and deaths with certainty. Those migrants who choose to be repatriated to their hometowns in the interior of Mexico may be less motivated to attempt reentry than those who elect not to participate in the program, instead choosing to be returned to an entry point along the border. These migrants may opt out of the program specifically because they intend to try to cross the border again in the hopes of avoiding detection on their next attempt. Further, in the second year of the IRP, the number of deaths increased. If changes in the number of deaths were again used as the only indication of the program's effectiveness, the implication could be that the IRP caused a corresponding increase in deaths between 2004 and 2005. However, as we previously discussed, multiple factors in addition to the Border Patrol's efforts may affect the number of deaths in any given year. For example, increased temperatures in the summer of 2005 may have contributed to an increase in deaths when compared with the number of deaths recorded for the same time frame in 2004.

A recent House of Representatives Appropriations Committee report suggests that the Arizona Border Control Initiative (ABCI) was responsible for 27 fewer deaths in the Tucson Sector between March 16, 2004, and September 30, 2004—a 26-percent reduction in such deaths when compared with the same location and time frame in 2003 prior to the ABCI's implementation.<sup>22</sup> However, as we previously discussed, a number of other factors such as changes in desert temperatures may also affect the number of deaths from one year to the next. Like the Border Patrol's conclusions about the IRP, measuring changes in the number of deaths between 2004 and 2005, without considering other factors, could imply that the program resulted in an increase in deaths in 2005. Border Patrol

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<sup>21</sup>U.S. Customs and Border Protection, *Interior Repatriation Program 2005 After Action Report*, (Washington, D.C.: Nov. 14, 2005).

<sup>22</sup>H.R. Rep. No. 109-079, at 29 (2005).

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officials acknowledged that attributing reductions in exposure deaths to the ABCI and IRP in 2004 was an overly simplistic correlation and that many factors in addition to enforcement operations may contribute to the number of deaths in any given year. Officials pointed to the fact that, in 2005, BORSTAR patrols began targeting illegal immigration corridors that were experiencing high death rates. They reported that one result of BORSTAR's operations was that rescues of migrants in distress significantly increased. However, officials also reported that, because BORSTAR agents were operating in high-risk areas, they may have discovered more bodies in the course of their patrols, also contributing to an increase in Border Patrol's total counts of deaths. Additionally, Border Patrol officials recognized that their data collection methodologies may also affect conclusions about the cause and effect relationships between their efforts and migrant deaths. Officials stated that, because they improved their methodology for collecting data on deaths starting in 2005, deaths recorded by local coroners that were not routinely included in their 2004 counts may have also contributed to an increase in the number of deaths they reported for the Tucson Sector in 2005.

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## Conclusions

Although the BSI data have some limitations and may undercount the exact number of border-crossing deaths, the overall trends shown in the data are corroborated by trends in both the NCHS data as well as the state-level vital registry data reported by CIR. The consistency in trends identified in all three sources of data, as well as our assessment of the BSI methodology, indicates that the BSI data can be used to provide valuable information on trends in the numbers, locations, causes, and characteristics of migrant border-crossing deaths over time. These trends are particularly important for better understanding the scale of the problem of migrant deaths and can provide useful information for making key resource allocation decisions.

Although our analysis of the BSI data shows trends in border-crossing deaths that are consistent with trends derived from other, independent sources of data, we also note that not all BSI sector coordinators consistently implemented the BSI methodology, and these differences can contribute to incomplete counts of deaths. Some sectors have only informal and infrequent communication with local authorities, while others have regularly scheduled contacts with local medical examiners or coroners about migrant deaths that may have occurred in the sector. Because both the NCHS and BSI data indicate that the problem of migrant border-crossing deaths has been growing in recent years, it is important to continue to improve the available data about these deaths by refining

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methods for tracking and recording deaths, including procedures for communicating with local authorities in order to share information about all potential cases of border-crossing deaths that occur within the BSI target zone. The inconsistencies in the implementation of the BSI methodology highlight opportunities to improve the quality of the Border Patrol's data on border-crossing deaths. Although there have been relatively few deaths in the two sectors in which BSI coordinators use informal methods to contact local authorities, these trends have the potential to change. If patterns of undocumented migration were to shift, as occurred in the Tucson Sector between 1998 and 2005, these informal methods for contacting local officials could result in larger numbers of unreported deaths. Similarly, since BSI sector coordinators currently have the latitude to determine how they approach communication with local officials, personnel changes could also result in changes in how each sector implements the BSI methodology from one year to the next and consequently affect counts of deaths.

Finally, the Border Patrol and others should be cautious about believing assertions about the effectiveness of its prevention efforts, given the difficulties involved in measuring the effects of such efforts. Claims about cause and effect relationships are limited by the fact that multiple factors affect the number of migrant border-crossing deaths from one year to the next. While we recognize that the Border Patrol's ability to measure BSI activities separately from ongoing enforcement functions may be limited, unless explicit controls are introduced to take into account the effects of these factors, the effectiveness of prevention efforts cannot be demonstrated.

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## Recommendations for Executive Action

In order to improve the consistency across Border Patrol sectors in the implementation of the BSI methodology and the completeness of data on deaths in any given year, we recommend that the Commissioner of Customs and Border Protection take steps to ensure that BSI sector coordinators follow a consistent protocol for collecting and recording information about border-crossing deaths and that all coordinators follow established procedures for maintaining and documenting regular contacts with local authorities to obtain timely information about all border-crossing deaths within the BSI target zone.

In order to better demonstrate the effectiveness of the Border Patrol's efforts to reduce migrant deaths, we recommend that the Commissioner of Customs and Border Protection assess the feasibility and cost-

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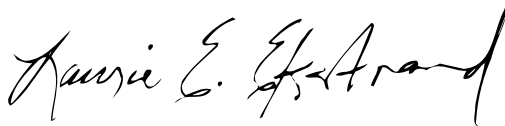
effectiveness of using multivariate statistical approaches to enhance estimates of impacts of the initiatives.

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution of it until 30 days from the date of the report. At that time, we will then provide copies of the report to other interested Congressional parties, the Secretary of Homeland Security, the Secretary of Health and Human Services, the Secretary of State, and the Assistant Attorney General for Administration for the Department of Justice, and will make copies available to others upon request. In addition, the report will be available at no charge on GAO's Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-2758 or [ekstrandl@gao.gov](mailto:ekstrandl@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix VI.

Sincerely yours,



Laurie E. Ekstrand  
Director, Homeland Security  
and Justice

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# Appendix I: Objectives, Scope, and Methodology

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This appendix describes our scope and methodology used in responding to the three objectives addressed in this report: (1) How do the Border Patrol's data on trends in the numbers, locations, causes, and characteristics of border-crossing deaths compare to other sources of data on these types of deaths? (2) What differences, if any, are there in how the Border Patrol has implemented the BSI methodology across its sectors? (3) To what extent do existing data allow for an evaluation of the effectiveness of the BSI and other Border Patrol efforts to prevent border-crossing deaths?

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## Overview of Our Approach and Methodology

To address our objectives, we obtained and analyzed data for the years 1990 through 2005 from the two sources of federal data on border-crossing deaths—BSI data from the Border Safety Initiative Tracking System (BSITS) and mortality data collected by the National Center for Health Statistics (NCHS) as part of the national vital statistics system. We analyzed data on border-crossing deaths occurring in the United States within the Border Patrol's identified BSI target zone—45 counties within 9 Border Patrol sectors on or near the southwest border with Mexico. Prior to analyzing the data, we assessed the reliability of each data source and found the data to be sufficiently reliable for the purposes of our report. We analyzed both sets of data in order to arrive at several estimates of the number of border-crossing deaths that have occurred annually from 1990 to 2005 and to draw conclusions about the strengths and weaknesses of each estimate. To understand what each of the federal sources of data reveals about the trends associated with the numbers, locations, causes, and characteristics of deaths along the border, we compared each of the two datasets over time. We examined common trends that were reflected in both datasets including increases or decreases in the total numbers of deaths, changes in the locations of deaths, and demographics of decedents in order to draw conclusions about overall patterns that may have occurred over time. In addition, we compared trends in each of the two datasets to data generated by Karl Eschbach and his colleagues at the University of Houston's Center for Immigration Research (CIR) who used state-level vital registry data to generate estimates of border-crossing deaths between 1985 and 1998. To understand how deaths among migrants compare to deaths in the general U.S. population living within the BSI target zone, we compared each group's share of the causes of death most commonly associated with border-crossing. Finally, to determine the extent to which existing data allow for an evaluation of the BSI and other federal efforts to prevent deaths, we interviewed Border Patrol officials about any established performance measures and reviewed available information from the Border Patrol on program outputs and outcomes,

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including the extent to which the Border Patrol collects information about the resources dedicated to the BSI such as the number of agent hours spent on BSI-related activities or the time agents dedicate to search and rescue operations. We also reviewed previous efforts to evaluate the effectiveness of the BSI and related federal efforts to reduce deaths.

We conducted our work between August 2005 and June 2006 in accordance with generally accepted government auditing standards.

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## Methods to Determine the Reliability of Sources of Data on Border-Crossing Deaths

We assessed the reliability of BSI and NCHS data and reviewed the methods used by CIR for identifying cases of border-crossing deaths in the state vital registry data.

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### BSI Data

BSITS is a client-server database that serves as a central repository for collecting, managing, and disseminating migrant incident data in support of the BSI including the volume and types of rescues and the number and types of migrant deaths that occur in each of the nine Southwest Border Patrol sectors. Specifically, BSITS records the number of deaths and rescues, followed by type, disposition, location (through GPS coordinates), and information on the subject or victim. In order to ensure data integrity, BSITS tracks record creation at the sector and user level. The BSI does not allow records created outside the user's sector to be modified in BSITS. The system is monitored by a system security administrator who monitors all user login and usage in order to maintain a security audit trail. Access permissions to the system are managed by the system security administrator through a security management tool, and users may only log into the system using a secure user ID and password, which is stored in encrypted binary format. Additionally, BSITS is subject to a number of requirements that have been established for all sensitive DHS automated data processing systems: it is required to develop internal security procedures to restrict access of critical data items to only those access types required by users; to develop audit procedures to meet control, reporting, and retention period requirements for operational and management reports; to allow for application audit trails to dynamically audit retrieval access to designated critical data; to use standard tables for requesting or validating data fields; to verify processes for additions, deletions, or upgrades of critical data; and to be able to identify all audit



information by user identification, network terminal identification, date, time, and data accessed or changed.

The Border Patrol provided us an electronic spreadsheet consisting of one record, or entry, per incident in the BSITS database for all incidents, including both rescues and deaths, recorded in the system from the program's inception in 1998 through December 21, 2005. In order to protect the confidentiality of the information, the Border Patrol omitted names from the data. In order to accurately interpret the data, we reviewed definition tables provided by Border Patrol for each of the variables in the database, system administration manuals, and a copy of the query used to produce the data for our request. After completing preliminary analysis of the data, we asked the Border Patrol to confirm the number of subjects on which data was provided, to clarify the meaning and values of several key fields in the database, and to provide additional information about any missing or out of range values. To further assess the reliability of the BSI data, we reviewed the written BSI methodology for tracking and recording deaths for logic and consistency and interviewed Border Patrol officials in Washington, D.C., as well as each of the nine BSI sector coordinators in the field who have responsibility for implementing the methodology and inputting data into BSITS. To determine the extent to which the methodology has been implemented consistently across sectors and over time, we asked officials about established methodologies for tracking and recording deaths in BSITS, any changes to those methodologies that may have occurred over time, and any methods Border Patrol officials have used at both the national and local level to assess whether the BSI methodology has been implemented fully and consistently across sectors.

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## NCHS Data

NCHS collects and disseminates information on national vital statistics through the National Vital Statistics System. The data are collected through contracts between NCHS and vital registration systems operated in the various jurisdictions responsible for the registration of vital events including births, deaths, marriages, divorces, and fetal deaths. The authority for the registration of these events resides individually with each of the 50 states, 2 cities (Washington, D.C., and New York, N.Y.) and 5 territories (Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands). The death certificate is the source for state and national mortality statistics, and NCHS provides standard forms for the collection of the data and model procedures to ensure the uniform registration of deaths. NCHS also produces training and instructional material as well as an automated mortality medical data

system for coding and classifying cause of death information from death certificates. The NCHS data include records of all death certificates filed in the United States regardless of the decedent's country of origin. In order to assure the objectivity of its statistical and analytic information products, i.e., that they are accurate, reliable, and unbiased, NCHS obtains these data through accepted statistical theory and practice. NCHS statistical and analytic information products are derived using generally acceptable statistical practices and methodologies, which enable responsible statisticians and analysts outside NCHS to replicate the NCHS statistical methods and obtain results consistent with those obtained by NCHS. NCHS assures the security of its statistical and analytic information products through the enforcement of rigorous controls that protect against unauthorized access to the data, revision or corruption of the data, or unauthorized use of the data. Some of the major controls used at NCHS include access control, user authentication, encryption, access monitoring, provision of unalterable electronic content, and audit trails. Dissemination of data also follows generally recognized guidelines in terms of defining acceptable standards regarding minimum response rates, maximum standard errors, cell size suppression, quality of coding, and other processing operations. NCHS also maintains staff expertise in areas such as concept development, survey planning and design (including questionnaire development and testing), data collection, data processing and editing, data analysis, evaluation procedures, and methods of dissemination.

We based our data request to NCHS on several key fields in the death certificate including residence, birthplace, and cause of death in order to identify likely cases of border-crossing deaths. The CDC Medical Examiners and Coroner Handbook on Death Registration provides detailed instructions on the registration of deaths and guidance on completing the U.S. Standard Certificate of Death. According to the handbook, the residence of a decedent (state, county, city, and street address) is the place where the decedent's household is located, the place where the decedent actually resided, or where the decedent lived and slept most of the time. If the decedent was not a resident of the United States, the country of residence should be entered into the residence field of the death certificate. If the decedent's residence is not known, "unknown" is entered into the residence field. The guidance also specifies that, for decedents who were not born in the United States, the country of birth should be entered into the death certificate, regardless of whether the person was a U.S. citizen at the time of death. CDC's specifications further state that the underlying cause of death listed on the death certificate should be the disease or injury that initiated the chain of events that led

directly and inevitably to death. The underlying cause of death is defined as “the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury.” Reported causes of death are then translated into codes through a classification structure outlined in the International Classification of Diseases (ICD) developed by the World Health Organization. The ICD is used to classify diseases and other health problems recorded on many types of health and vital records including death certificates and hospital records. In 1999, a revision of the ICD was implemented. The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), established revised codes for classifying mortality data and revised rules for selecting the underlying cause of death. ICD-10 replaced classification codes and rules outlined in the previous version of the manual, the International Classification of Diseases, Ninth Revision (ICD-9). The codes outlined in the 9th revision (ICD-9) apply to all deaths registered between 1979 and 1998, while the 10th revision (ICD-10) applies to all deaths from 1999 to the present.

In order to identify migrant deaths recorded in the NCHS main mortality file—which contains records of all deaths occurring in the United States—we requested that NCHS provide us with aggregate, county-level data on migrant border-crossing deaths by applying a set of specifications to the data in the main mortality file.<sup>1</sup> Our specifications included the following: (1) a death must have occurred within 1 of the 45 counties in the BSI target zone; (2) the death must have occurred in years beginning with 1990 and going through 2003, the most recent year for which NCHS data were available at the time we did our work; and (3) deaths must be limited to decedents who were foreign born, had a place of residence outside the United States at the time of death, and died from one of the causes of death that we associated with border-crossing deaths. We provided NCHS a list of causes of death from the codes contained in the ICD codes—which, as described above, are used to classify the underlying cause of death reported on the death certificate by public health officials such as medical examiners and county coroners—and asked that NCHS officials select those cases that matched one of the underlying causes of death on our list. By requesting data over the period from 1990 to 2003, we identified both ICD-9 and ICD-10 codes. We selected cause of death codes

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<sup>1</sup>NCHS mortality data provided by Robert Anderson, Chief, Mortality Statistics Branch, Division of Vital Statistics, and Jiaquan Xu, NCHS/CDC.

that were associated with migrant border-crossing deaths used in the CIR studies, the causes of migrant deaths identified by the Border Patrol, as well as causes most commonly used by county medical examiners, advocacy groups, and academic researchers. These include dehydration, heat exposure, drowning, cold exposure, homicide, and traffic accidents among others. Our data specifications also requested that NCHS provide us with separate counts of decedents with unknown places of birth. NCHS provided separate datasets for each year. The datasets also contained counts of migrant deaths by age group and gender. After receiving the data from NCHS, we reviewed the programming code as well as the statistical output in order to verify that the results matched our initial specifications.

Because the place of residence listed on the death certificate is not necessarily the same as the decedent's home state, voting residence, mailing residence, or legal residence, our counts of border-crossing deaths may include some decedents who were either legal visitors or legal residents of the United States but who were residing in another country when they legally crossed the border and subsequently died. Additionally, NCHS officials reported that if a body is discovered and the body is unable to be identified, the person may be assumed to be a U.S. resident. As a result, our counts may have excluded unidentified migrants who were presumed to be U.S. residents by public health officials completing the death certificate. Similarly, we requested that NCHS only provide data on those cases where the underlying cause of death was a death commonly associated with border-crossing. Focusing on the underlying cause of death could result in undercounts of border-crossing deaths; cases could be missed if the commonly associated causes are not reported when appropriate or if they are reported incorrectly out of sequence. For example, heat exhaustion may precipitate a heart attack. If heat exhaustion is not reported at all or if it is not reported correctly as the cause of the heart attack, then the heart attack would be coded as the underlying cause, and the case would be excluded because the NCHS data did not include heart attacks in the list of commonly associated causes of border-crossing deaths. Alternatively, the NCHS data could also represent an overcount of deaths if cause of death categories were defined too broadly and resulted in the inclusion of deaths that were not directly related to border-crossing.

In order to determine the reliability of the NCHS data for identifying trends in deaths, we interviewed NCHS officials responsible for maintaining vital registry mortality data and reviewed published NCHS guidance on the completion of death certificates. We conducted interviews with NCHS researchers, academic experts, and county medical examiners

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familiar with the vital registry data about the data's strengths and limitations for accurately capturing data on border-crossing deaths. We also reviewed NCHS documentation about the methods for collecting and analyzing death certificate data in preparing the main mortality files.

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## CIR Data

In order to understand the methods and data compiled by CIR, we conducted interviews with Karl Eschbach, the lead author of the studies,<sup>2</sup> about his methods for collecting and analyzing the data and also conducted a GAO internal review of CIR methods.

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## Methods Used to Identify Trends in Federal Data on the Numbers, Locations, Causes, and Characteristics of Border-Crossing Deaths

We analyzed specific data elements in the BSI data that were relevant to our analysis of border-crossing deaths. These included the number of deaths, the types or causes of death—such as exposure to heat/cold, motor vehicle accidents, drowning, and others—the location of deaths including the county, sector, and GPS coordinates, and demographic information on the decedent including age, gender, and country of origin. We imported the data from the spreadsheet provided by the Border Patrol into a statistical software package and analyzed counts of BSI-related deaths by year, sector, and cause of death for fiscal years 1998 through 2005. Based on discussions with Border Patrol officials and the criteria outlined in Border Patrol's 2005 BSI Methodology Manual, we identified border-crossing deaths as those deaths occurring within the 45 counties in the BSI target zone and only included those entries designated by Border Patrol as migrants who were in furtherance of an illegal entry at the time of death. We also analyzed counts for characteristics of decedents including gender and age.

Our analysis of the BSI data is based only on those deaths included in BSITS as of December 21, 2005. We selected cases from fiscal year 1998 through fiscal year 2005 in which border-crossing deaths were recorded as having occurred within one of the 45 counties in the BSI target zone while the decedent was in the furtherance of an illegal entry into the United States. Our methodology is consistent with the BSI definition of a border-crossing death, but it differs from the methodology that Border Patrol uses to calculate the total number of border-crossing deaths that occur each year. According to Border Patrol officials, the Border Patrol generates its reported annual death totals by selecting those cases recorded in the BSITS database that occurred within any one of the Border Patrol stations

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<sup>2</sup>Eschbach, et al., 2001 and Eschbach, et al., 2003.

located within the BSI target zone or outside of the target zone if Border Patrol was directly involved in the incident. In our analysis of the BSI data, we only included deaths occurring within one of the 45 BSI counties and did not select deaths that may have occurred outside of the target zone. As a result, our total counts may not match the total numbers reported by the Border Patrol. Additionally, our sector-level counts of border-crossing deaths may also differ from Border Patrol's. Border Patrol classifies deaths into sectors based on the Border Patrol station that recorded the death. Using the criteria outlined in the 2005 BSI Methodology Manual, we instead used data regarding the county in which the death occurred to classify deaths into sectors. Furthermore, 3 of the 45 counties in the BSI target zone straddle the dividing line between two different Border Patrol sectors. In these cases, our analysis may have identified deaths in these counties as occurring in one sector, while the Border Patrol's reports may have counted the deaths as occurring in another sector. These differences in methods of classification primarily affect reported totals for the El Centro and Yuma sectors.

### Methods Used to Compare Border-Crossing Deaths to Deaths in the General Population

To understand how the distributions of causes of migrant border-crossing deaths compare to the general population, we analyzed relevant BSI and NCHS data on the numbers and causes of death. From NCHS we requested aggregate, county-level datasets for the years from 1990 through 2003 of the number of U.S. residents who died each year in the 45 counties in the BSI target zone and the numbers who died from the causes of death we used to identify border-crossing deaths. We followed procedures similar to those we followed in requesting and obtaining the NCHS data on migrant deaths. We also compared counts of U.S. resident deaths by year, sector, and county, including the total numbers and causes of death with migrant border-crossing deaths between 1990 and 2003.

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### Assessing Change in Risk Associated with Attempted Illegal Entries

To assess whether the apparent risk associated with migrant border-crossing deaths has changed over time, we compared data on border-crossing deaths to data on the estimated number of illegal entries reported in a published study by Jeffrey Passel at the Pew Hispanic Center<sup>3</sup> as well as to data on the number of apprehensions recorded by Border Patrol. Passel's estimates are based upon the residual methodology. We used data on apprehensions that the Border Patrol provided us. We calculated the percentage change over the period from 1998 through 2004 in the

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<sup>3</sup>Jeffrey S. Passel and Roberto Suro, "Rise, Peak, and Decline: Trends in U.S. Immigration 1992-2004," Pew Hispanic Center (Washington, D.C.: Sept. 27, 2005).

estimated number of undocumented entries, the number of apprehensions, and the number of border-crossing deaths, and we compared these percentage changes to determine if the change in the number of deaths over this period exceeded the change in the estimated number of undocumented entries and the number of apprehensions (see table 2).

**Table 2: Estimated Undocumented Entries, Apprehensions, and Deaths**

Year	Estimated number of undocumented entries		Number of apprehensions along the southwest border	Number of BSI deaths
	Total	Mexico		
1998	668,000	507,000	1,516,680	254
1999	656,000	496,000	1,537,000	241
2000	667,000	530,000	1,643,679	372
2001	549,000	437,000	1,235,717	328
2002	450,000	378,000	929,809	322
2003	451,000	369,000	905,065	334
2004	562,000	459,000	1,139,282	328
Percent change from 1998 to 2004	-15.9%	-9.5%	-24.9%	29.1%

Sources: Passel and Suro, 2005; U.S. Border Patrol; and GAO analysis of BSI data.

### Review of Models Used to Estimate the Number of Migrants Attempting to Cross the Border

Because data are not available on the actual number of migrants that illegally attempt to cross the border in any given year, we used estimates of the number of border-crossers or undocumented migrants that enter the United States each year. We previously reported on some of the data limitations involved in estimating the illegal immigrant population as well as the strengths and weaknesses of the available methods for estimating the flow of illegal migrants across the border.<sup>4</sup> We reviewed a number of models that have been developed in recent years by researchers and academic experts working in the arena of immigration issues. We conducted an analysis of each model and assessed the methods used by each in order to draw a conclusion about the most reliable estimates of illegal entries.

### Residual Method

Robert Warren and Jeffrey Passel employ a method for estimating the number of unauthorized migrants using both data from the decennial

<sup>4</sup>GAO/PEMD-93-25.

Census and counts from alternate government sources, such as DHS.<sup>5</sup> This method counts the number of foreign born individuals in the United States, as enumerated in the Census or the Current Population Survey (CPS), and then subtracts the number who have become naturalized or who are legal resident aliens,<sup>6</sup> which was obtained from the alternate government source. The difference should be the number of undocumented aliens. Because this method involves subtraction, it is sometimes called the “residual method.”

**Table 3: The Residual Method for Estimating the Number of Unauthorized Migrants**

Estimated number of undocumented aliens counted in the census	=	Foreign born population counted in the census	-	Estimated naturalized U.S. citizens in the United States	-	Estimated legally resident aliens in the United States
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Source: Warren and Passel, 1987.

Using a method similar to this one, Passel estimated that there were 10.3 million unauthorized migrants in the United States in 2004. Using annual applications of this method, he estimated that between 400,000 and 700,000 unauthorized migrants have entered the United States each year since 1992.

A drawback to using this methodology for measuring the number of unauthorized migrants at risk for border-crossing deaths is that Census Bureau data, such as the CPS, only count migrants who have been in the United States for a sufficient amount of time for government census takers to locate them. Migrants who only come to the United States for a short period of time and then return to their home country would be less likely to be included in this count. Further, this methodology cannot be used to measure different rates of crossing by sector since the migrants may live in different areas from where they crossed the border. Ultimately, this method would not only count those individuals who crossed the border illegally, but also those individuals whose status changed from authorized to unauthorized, due to a visa expiring, for example.

<sup>5</sup>Robert Warren and Jeffrey S. Passel, “A Count of the Uncountable: Estimates of Undocumented Aliens Counted in the 1980 United States Census,” *Demography*, Vol. 24, No. 3, August 1987.

<sup>6</sup>Legal resident aliens include permanent resident aliens, students, refugees, and other aliens who would be considered residents by U.S. census rules.



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## Apprehensions Data

An alternate method for estimating the total number of illegal border crossings is to calculate entries based on the number of apprehensions recorded by the Border Patrol. From 1994 through 2004, Border Patrol records indicate that between 0.9 and 1.7 million migrants were apprehended in the nine southwest Border Patrol sectors each year, peaking in 2000. However, apprehensions are partially determined by the level of Border Patrol enforcement activity. Therefore, even if the level of migration remained the same, the number of apprehensions might fluctuate if the level of enforcement changes. More specifically, apprehensions are not a direct measure of successful undocumented migration, but rather they are an indication of *unsuccessful* undocumented migration.

Unlike the residual method, because the Border Patrol maintains records of apprehensions by sector, this method can be used to estimate entries by sector. Border Patrol data indicate that, from 1992 to the present, there was a large shift in apprehensions from the San Diego Sector to the Tucson Sector.

In addition, the number of apprehensions is not the same as the number of apprehended migrants, since many migrants attempt to cross the border a number of times until they are able to cross successfully. Katharine M. Donato reports survey evidence that shows that many migrants will continue to attempt to cross the border until they are able to get through undetected.<sup>7</sup>

## Repeated Trials

Another method for estimating undocumented migration uses the number of people who have been apprehended previously to translate apprehensions into an estimate of the number of undocumented migrants crossing into the country. A version of this method is employed by Thomas J. Espenshade in his 1995 study examining the use of INS data to measure the flow of undocumented migration.<sup>8</sup> Espenshade shows that the ratio of apprehensions and undocumented flow is equal to the odds of being apprehended on any given attempt to enter the United States illegally. It follows then that the flow of undocumented migrants can be calculated by

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<sup>7</sup>Katharine M. Donato, et al., "Stemming the Tide? Assessing the Deterrent Effects of the Immigration and Control Act," *Demography*, Vol. 29, No. 2, May 1992.

<sup>8</sup>Thomas J. Espenshade, "Using INS Border Apprehension Data to Measure the Flow of Undocumented Migrants Crossing the U.S.-Mexico Frontier," *International Migration Review*, Vol. 29, No. 2, 1995.

dividing the number of apprehensions by those odds. Espenshade estimates that the estimated gross volume of undocumented migration generally exceeded the level of apprehensions by 2.2 in the period between 1977 and 1988. While this factor varies over time, Espenshade concludes that the two series track each other well, as the linear correlation between them is 0.90.

However, there are some questions about using Espenshade's model to estimate the current number of illegal crossings. For one, the specific factor may be different today; Espenshade's figures are based on calculations over an 11-year period, beginning almost 30 years ago. As noted previously, the geographic pattern of migration was much different then, with a larger number of crossings occurring in the San Diego area, whereas today a more significant number of crossings occur in the desert area of Arizona. Moreover, Gordon Hanson and Antonio Spilimbergo have empirically demonstrated that as the level of border security increases, a greater number of unauthorized migrants will be apprehended.<sup>9</sup> Either of these factors—a differential pattern of crossing or an increased level of Border Patrol enforcement—may affect the ability of the Border Patrol to apprehend migrants, thus affecting the extent to which Espenshade's estimate of 2.2 crossings per apprehension can be accurately applied to current circumstances.

In addition, a key assumption of Espenshade's model is that migrants will attempt to enter repeatedly until they are successful, even if all entries were attempted within a single month. However, the plausibility of this assumption is unclear; for example, it may not be reasonable to assume that a migrant will attempt to cross the border as many as 7 times in a given month. Additionally, there are a number of other factors that may make the assumption even less plausible today than it was in the period of Espenshade's study. Border Patrol apprehension data indicate that increasing numbers of migrants are attempting to cross in the Tucson Sector. However, due to high temperatures and rugged terrain, the desert is often more difficult for migrants to navigate than urban areas. As a result, increasing numbers of migrants hire smugglers, or "coyotes," to help them cross. This is a large expense, and it is not clear that the coyotes refund the money if the crossing is not successful. In addition, the Border

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<sup>9</sup>Gordon Hansen and Antonio Spilimbergo, "Illegal Immigration, Border Enforcement, and Relative Wages: Evidence from Apprehensions at the U.S.-Mexico Border," *The American Economic Review*, December 1999.

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Patrol has started returning migrants to the interior of Mexico through the IRP in order to deter repeat attempts. Given the amount of time it might take a migrant to travel from the interior of the country back to the border, it seems likely that a migrant would be able to make fewer attempted crossings within a single month.

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## Methods to Determine the Extent to Which the BSI Can Be Evaluated

In order to determine the extent to which existing data allow for an evaluation of the effectiveness of the BSI and related Border Patrol efforts, we interviewed Border Patrol officials in Washington, D.C., about how they measure the BSI including any information on established performance goals and measures. We requested any available information on BSI resources, personnel, and equipment in order to determine the extent to which the Border Patrol tracks and records information on resources in relation to established performance goals and measures. We also reviewed a number of other federal data sources on the Border Patrol's program goals and outcome measures including documents published by the Office of Management and Budget and CBP's annual budget submission. We reviewed and analyzed available information from the Border Patrol on program outcomes including a study on the BSI conducted in July 2004 that examined the efforts of the BSI to reduce the overall number of migrant deaths, the effectiveness of individual components of the BSI to deter crossings, and the effect of specially trained BORSTAR units, as well as the Lateral Repatriation Program, on the number of deaths.

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## The Border Safety Initiative: Evaluation, Assessment, and Recommendations

In an effort to better measure the impact of the BSI, the Border Patrol commissioned researchers at Rutgers University to evaluate the efforts of the program.<sup>10</sup> As one of its objectives, the study examined the effectiveness of specialized BORSTAR agents in reducing migrant deaths when compared with Border Patrol line agents. BORSTAR agents are often deployed to high-threat areas or areas more likely to have deaths and rescues. Rather than attempt to estimate the effect of the BORSTAR agents on the number of deaths in a sector where they are deployed, the study estimates the effect of an agent's BORSTAR training on whether an intervention results in a death or a rescue of a migrant. The researchers applied a multivariate logistic regression that corrects for the migrant's

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<sup>10</sup>Ronald V. Clarke and Rob T. Guerette, *The Border Safety Initiative: Evaluation, Assessment and Recommendations for Strategic Action, Phase 1 Report*, July 2004.

age, gender, and the number of accompanying migrants. Using existing data provided by the Border Patrol, they found that the probability of a death is 88 percent less when a BORSTAR agent responds, as opposed to a non-BORSTAR Border Patrol agent.

The study's findings present an argument for BORSTAR's effectiveness. If BORSTAR agents have training that allows them to better treat injuries, it follows that more rescued migrants will survive. However, it is unclear whether findings from this analysis can be used as an evaluation of the BSI as a whole without additional research. BORSTAR agents are only one component of the BSI with a total of 164 BORSTAR agents deployed in the 9 sectors along the southwest border as of October 2005. In order to understand the effectiveness of the program as a whole, it would be necessary to examine the impact of other components of the program including the use of rescue beacons, the impact of the media campaign to discourage migrants from attempting to cross the border illegally, and the effectiveness of other non-BORSTAR Border Patrol agents that may rescue migrants in need of assistance.

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## 2005 Report on the Interior Repatriation Program

In 2005, the Border Patrol issued a report on the outcomes of the Interior Repatriation Program (IRP), an effort initiated as part of the ABCI. The Border Patrol reports that the IRP was intended to break the ties between migrants attempting to cross the border and the smuggling organizations that move people across the border. Program participants are migrants who are apprehended while attempting to illegally cross the border; the IRP offers them the option to be voluntarily repatriated to their hometown, rather than being returned to a land port of entry along the border where they might be more likely to attempt to cross again. The program claimed a number of successes including a decrease in the total number of exposure related deaths between 2003 and 2004 in Arizona, as well as a lower recidivism rate among program participants. However, exposure related deaths in the Tucson and Yuma Sectors actually increased between 2004 and 2005. While the Border Patrol claims that the IRP was responsible for reducing the number of deaths in Arizona between 2003 and 2004, they do not similarly tie the increase in deaths between 2004 and 2005 to the program. Rather, Border Patrol officials point out that increased desert temperatures and improved data collection methods may have contributed to the increase in recorded deaths. Similarly, they state that increased numbers of deployed BORSTAR agents may have increased the likelihood that agents would find deceased migrants in the course of their patrols. Factors discussed in this report point out that changes in the number of deaths alone cannot serve as a

reliable indicator for the success of the BSI or the IRP. As the Border Patrol correctly notes, any number of factors beyond the efforts of the Border Patrol may affect the number of deaths from one year to the next. Just as the increase in recorded deaths between 2004 and 2005 may have been affected by any one of a number of factors including increased temperatures, increased patrols, or improved data collection, the decline in deaths between 2003 and 2004 may have also been affected by a number of factors independent of the IRP. Similarly, the report points to the decreased recidivism rate among program participants, noting that the reentry rate was lower among program participants than illegal aliens that were returned to land border ports of entry. However, currently participation in the IRP is voluntary, and those migrants who elect to participate may be less likely to attempt to cross the border again. Conversely, those migrants who intend to continue to attempt to cross until they are successful may be less likely to participate in the IRP.

# Appendix II: Deaths by Sector

**Figure 8: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the San Diego Sector, 1985 through 2005**

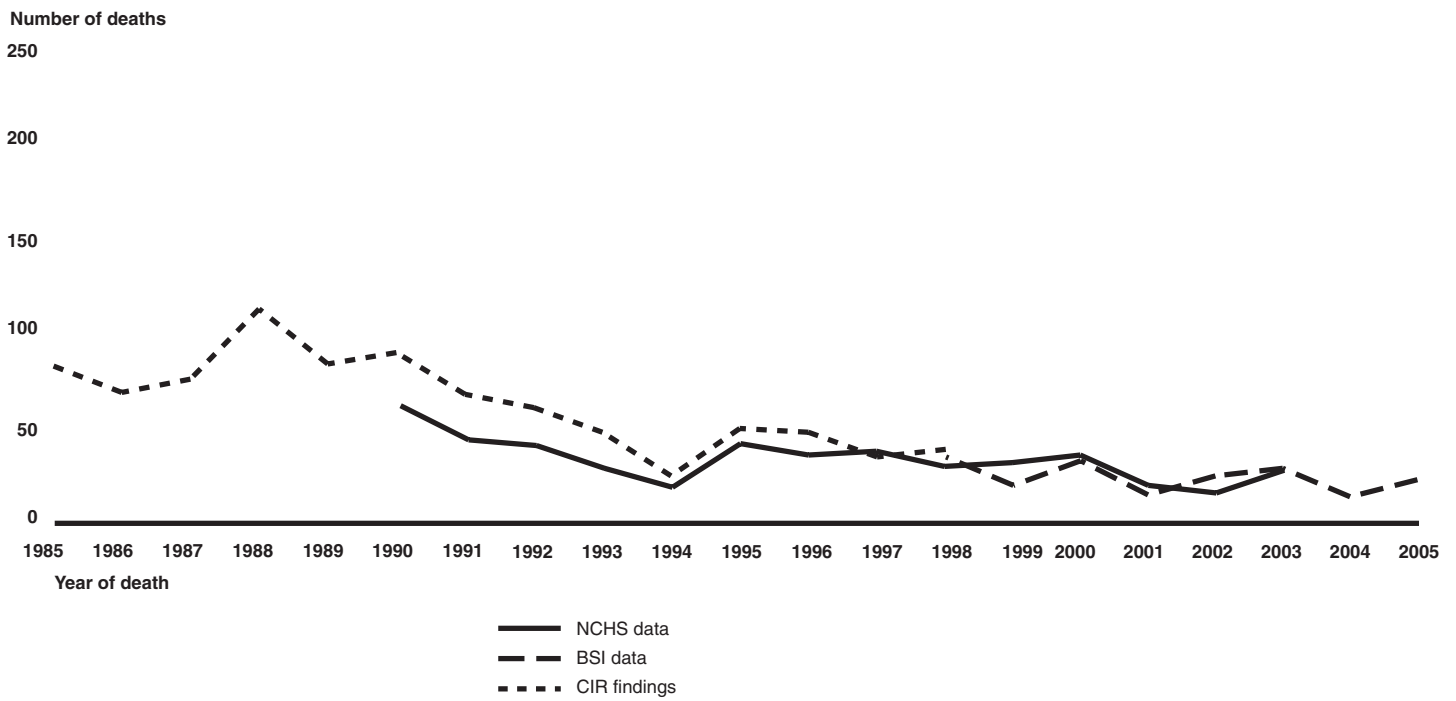


Figure 9: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the El Centro Sector, 1985 through 2005

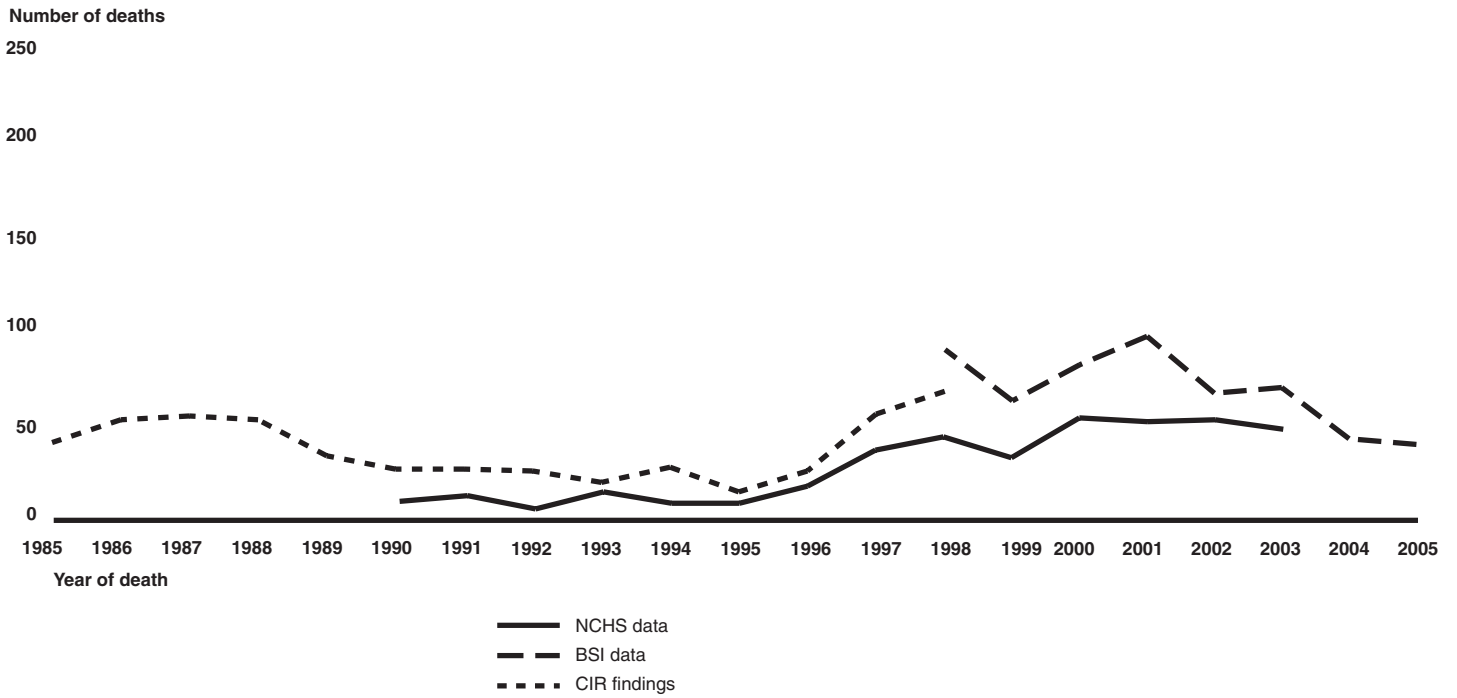


Figure 10: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Yuma Sector, 1985 through 2005

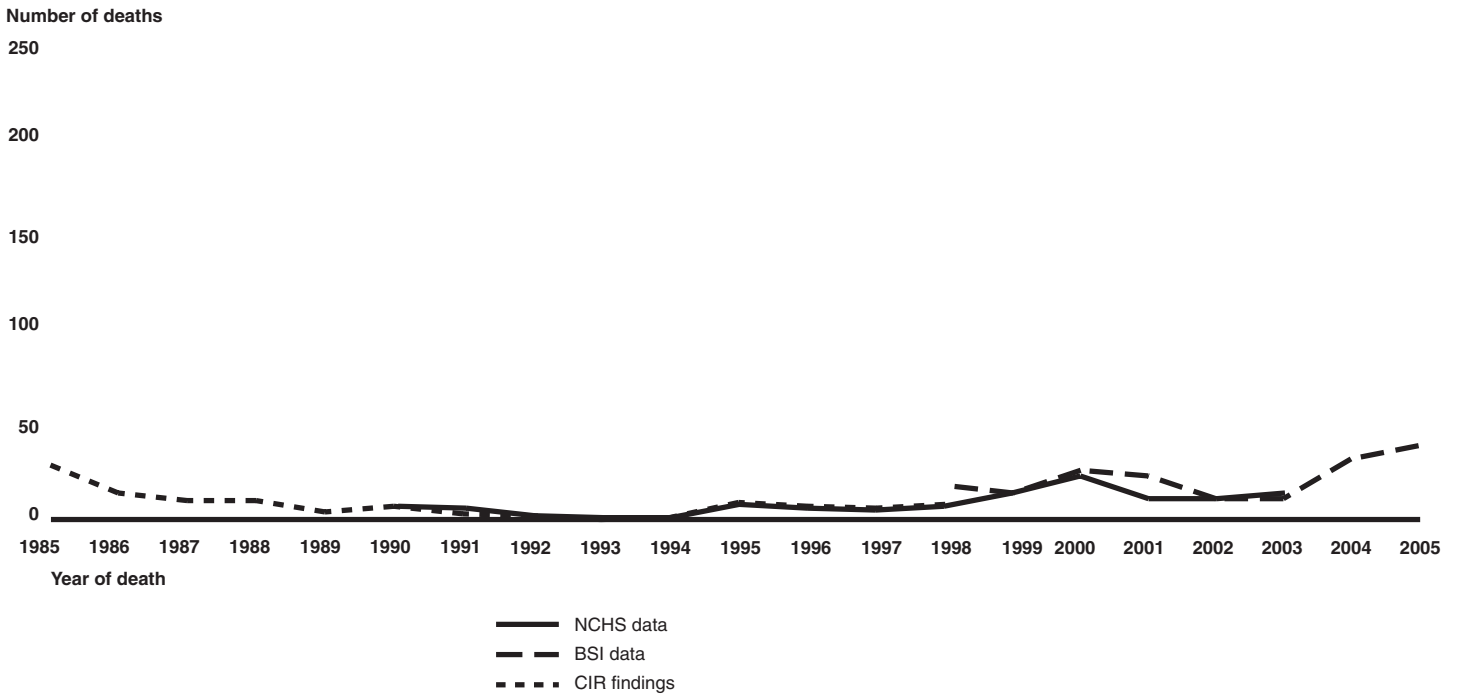




Figure 11: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Tucson Sector, 1985 through 2005

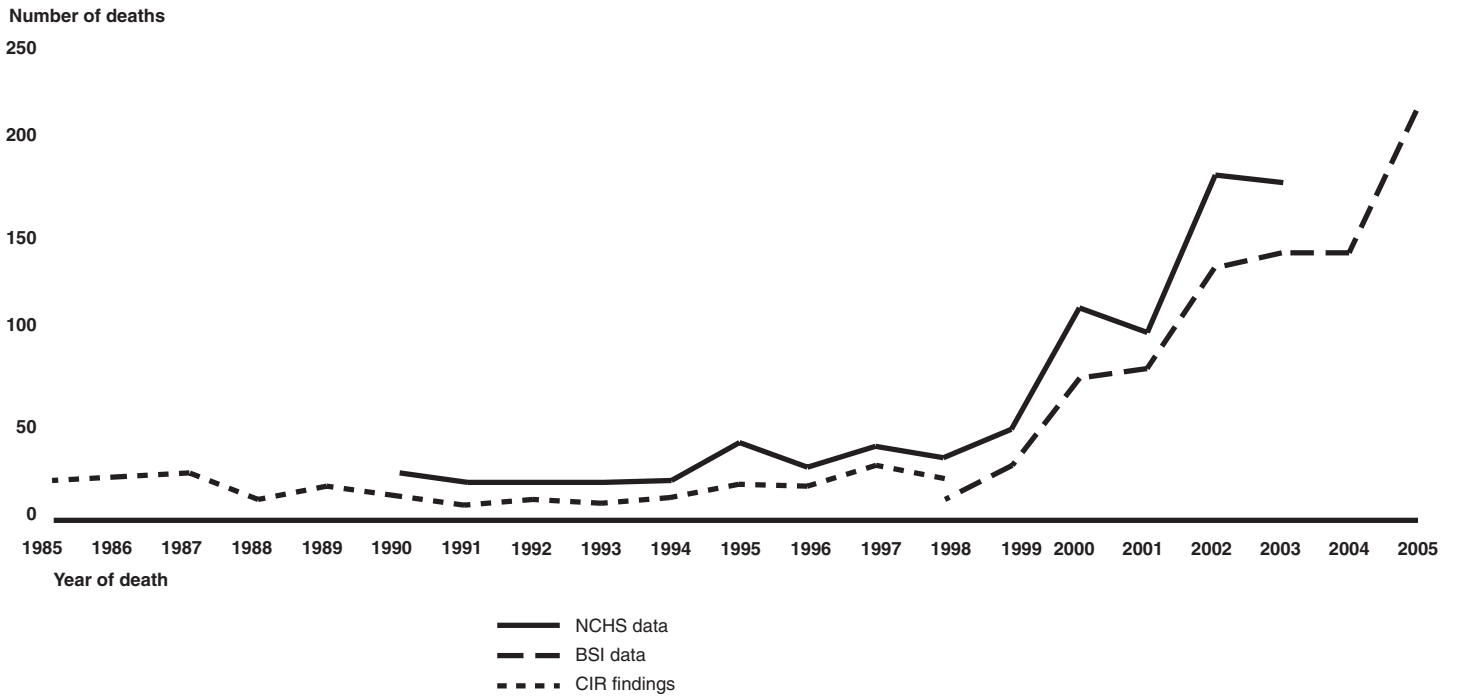


Figure 12: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the El Paso Sector, 1985 through 2005

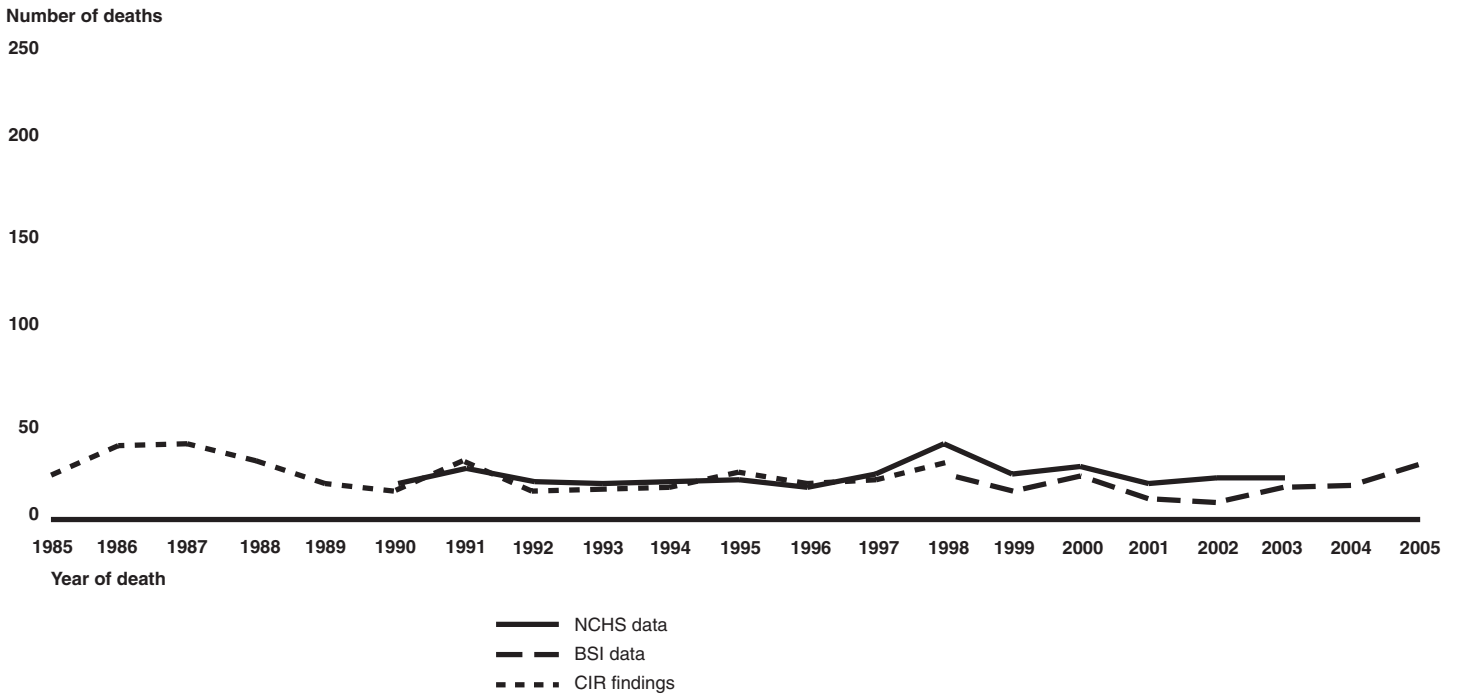


Figure 13: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Marfa Sector, 1985 through 2005

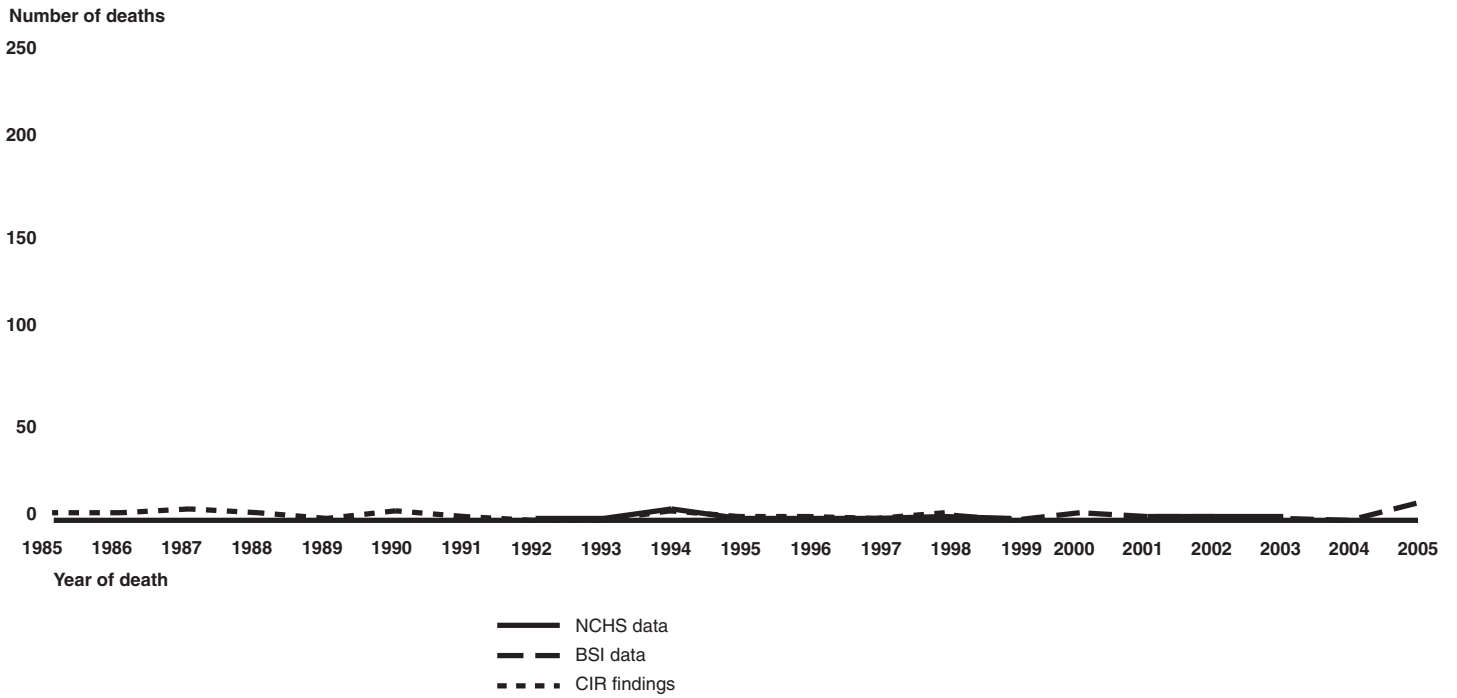


Figure 14: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Del Rio Sector, 1985 through 2005

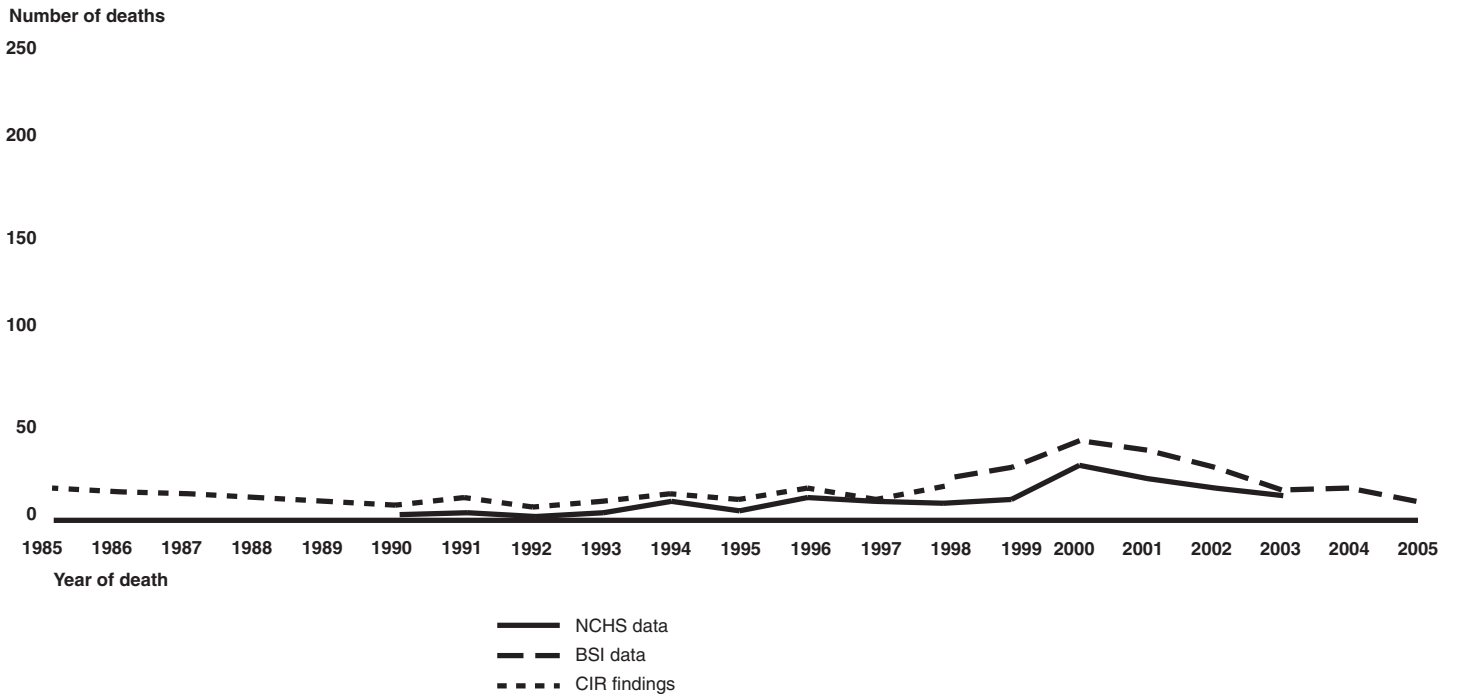
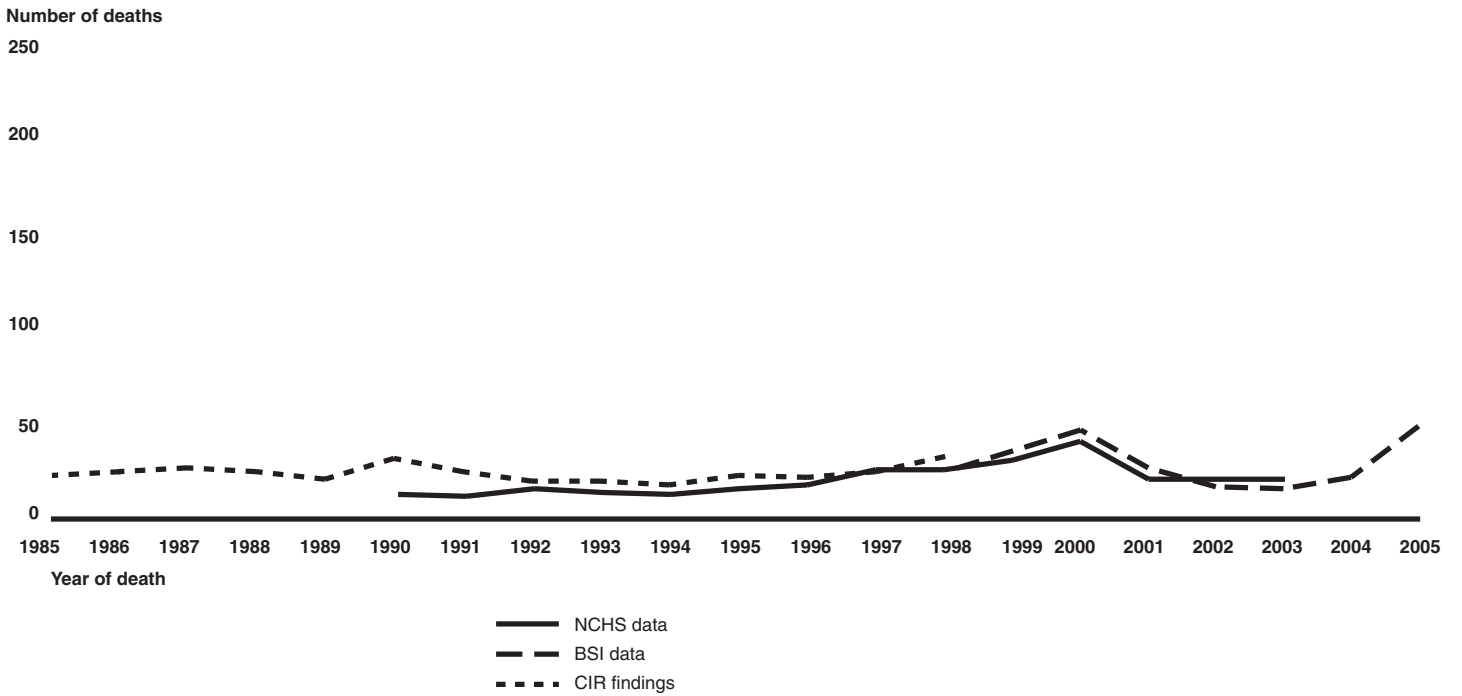
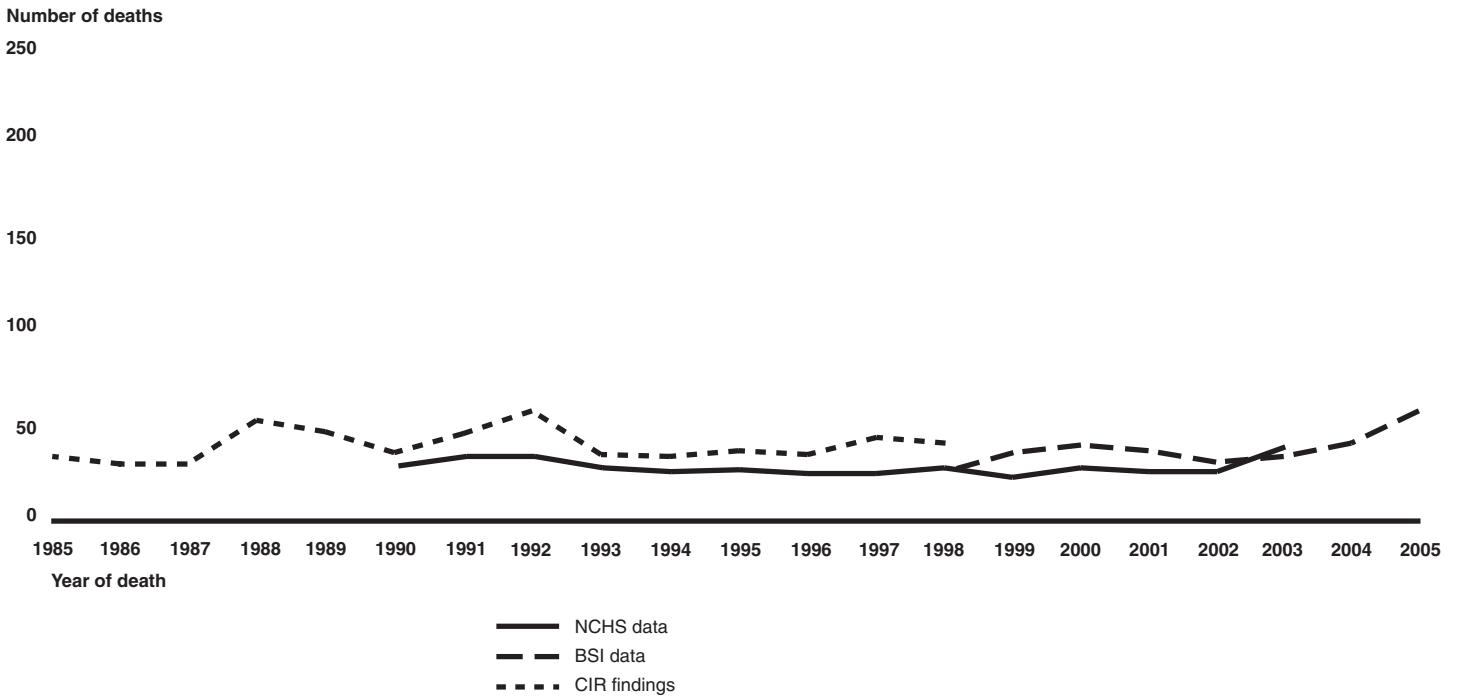


Figure 15: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Laredo Sector, 1985 through 2005



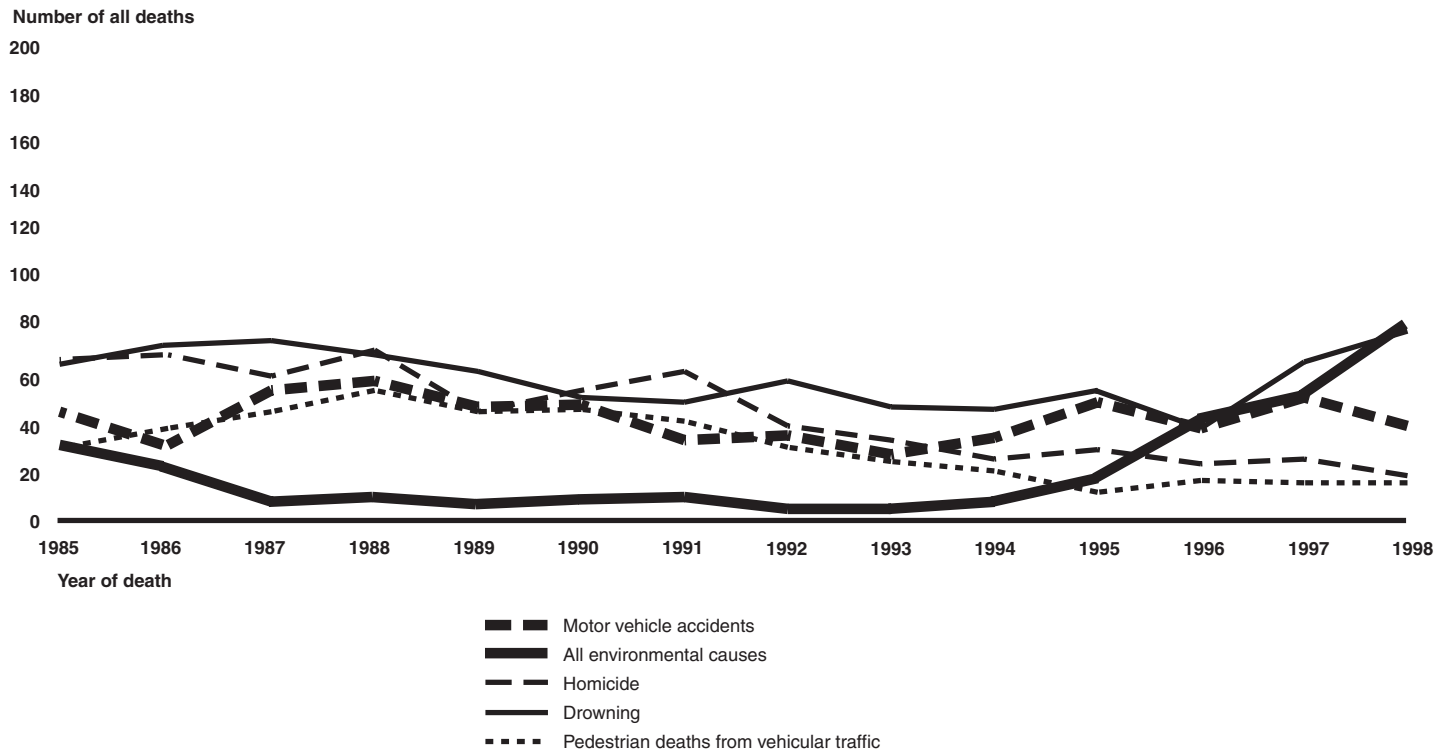
**Figure 16: Migrant Border-Crossing Deaths in the BSI Target Zone Occurring within the Rio Grande Valley Sector, 1985 through 2005**



Source: GAO analysis of BSI and NCHS data; CIR findings, as reported in Eschbach, et al., 2001, 24-61.

# Appendix III: Causes of Death

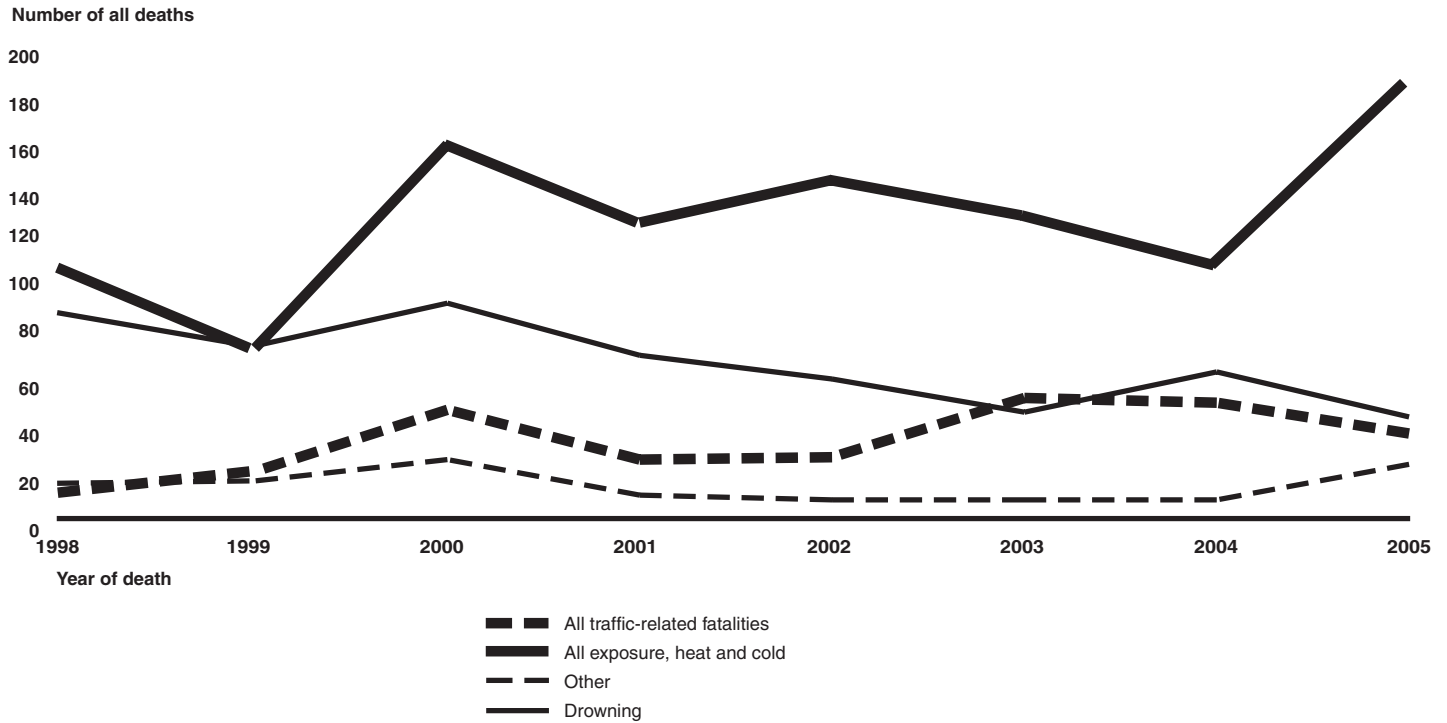
**Figure 17: Migrant Border-Crossing Deaths, by Cause of Death, CIR Findings, 1985 through 1998**



Source: CIR findings, as reported in Reyes, et al., 2002, 68.

Notes: Number of deaths based on cause of death counts as reported in Reyes, et al., 2002, 68. CIR findings include data from 55 counties. Environmental causes include heat-related causes, hypothermia, and other environmental conditions. See figure 5 for causes of death according to our analysis of NCHS data.

**Figure 18: Migrant Border-Crossing Deaths, by Cause of Death, BSI Data, 1998 through 2005**



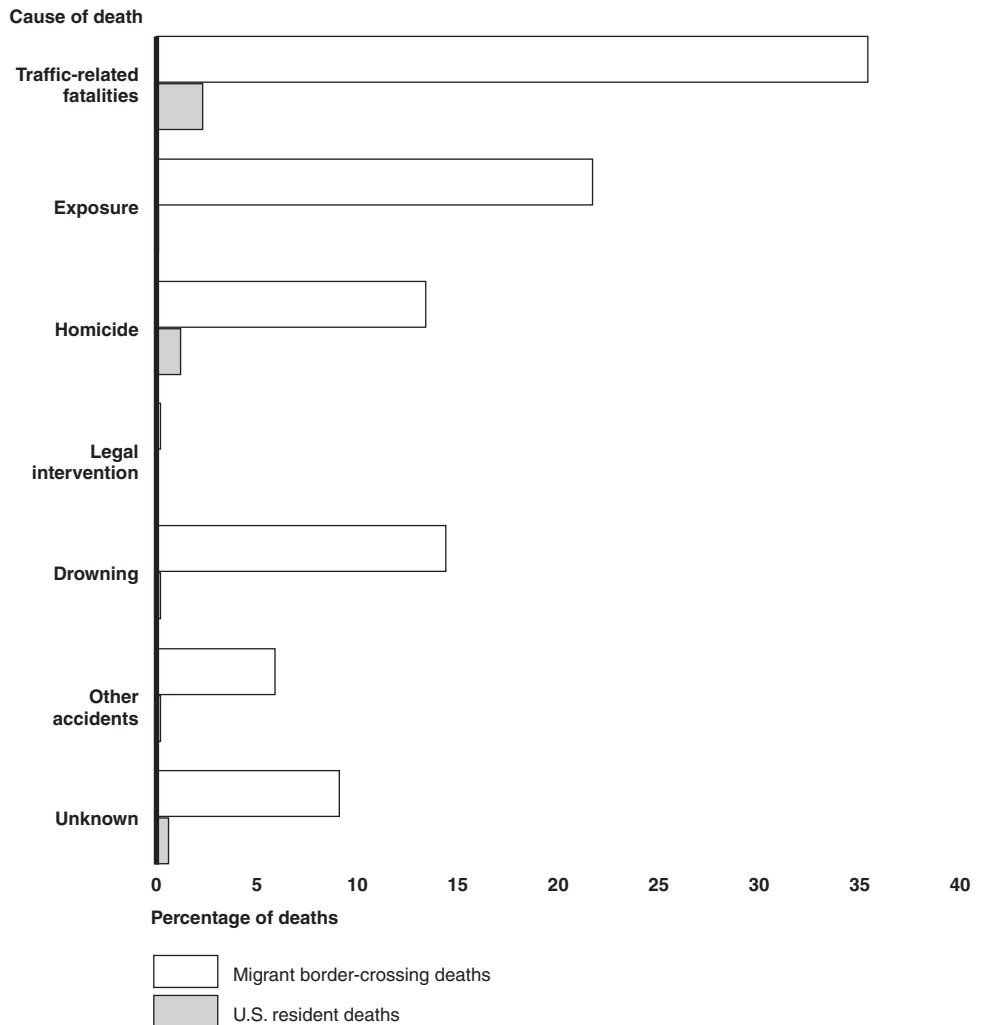
Source: GAO analysis of BSI data.

Notes: Other deaths include homicide, suicide, and Border Patrol shootings. All traffic-related fatalities include motor vehicle accidents and pedestrian deaths from vehicular traffic. See figure 5 for causes of death according to our analysis of NCHS data.



# Appendix IV: Causes of Death for U.S. Residents and Migrants within the BSI Target Zone

**Figure 19: Percentage Distribution of Deaths among U.S. Residents and Migrant Border-Crossers, by Cause of Death, All Years Combined, 1990 through 2003**



Source: GAO analysis of NCHS data.

Notes: Our analysis of the NCHS data shows that between 64,000 and 87,100 U.S. residents died annually from any cause of death in the counties in the BSI target zone over the period from 1990 through 2003. Of these, nearly 5 percent died from the causes of death that are commonly associated with border-crossing deaths, such as exposure to heat, traffic accidents, environmental causes, and homicide.

# Appendix V: Comments from the Department of Homeland Security

U.S. Department of Homeland Security  
Washington, DC 20528



**Homeland  
Security**

July 20, 2006

Ms. Laurie Ekstrand  
Director  
Homeland Security and Justice  
U.S. Government Accountability Office  
441 G Street, NW  
Washington, DC 20548

Dear Ms. Ekstrand:

Thank you for the opportunity to review and comment on the Government Accountability Office's (GAO's) draft report entitled *BORDER-CROSSING DEATHS: Deaths Have Doubled Since 1995 and Border Patrol's Evaluations of Its Safety Initiatives Need Improving* (GAO-06-770). Technical comments have been provided under separate cover.

The Department appreciates the opportunity to review and comment on the draft report. The U.S. Customs and Border Protection (CBP) concurs with the overall substance and findings of the draft report but must note that the Office of Border Patrol (OBP) is an enforcement agency. Border Patrol Agents exercise daily border safety functions by virtue of carrying out their mission of securing our nation's borders. Therefore, apprehending illegal aliens before they come into distress diminishes the risk involved with illegally crossing into the United States. Additionally, through well-resourced enforcement, the border area will be secure and should assist in reducing border deaths.

CBP concurs with the recommendations outlined in the report and is taking action to address these issues, as described below:

**Recommendation 1:** GAO recommends that the Commissioner of CBP take steps to ensure that sector coordinators follow a consistent protocol for collecting and recording information about border-crossing deaths and that all coordinators follow established procedures for maintaining and documenting regular contacts with local authorities to obtain timely information about all border-crossing deaths within the Border Safety Initiative (BSI) target zone.

[www.dhs.gov](http://www.dhs.gov)

**Response:** CBP concurs with this recommendation. OBP will schedule BSI assessments at each sector to evaluate the protocols for collecting migrant death data from local authorities and ensure that all sectors are complying with the BSI Methodology. OBP expects to implement this recommendation by January 31, 2007.


**Recommendation 2:** GAO recommends that the Commissioner of CBP assess the feasibility and cost-effectiveness of using multivariate statistical approaches to enhance estimates of impacts of its initiatives.

**Response:** CBP concurs with this recommendation. OBP has established a workgroup to develop performance measures to ensure the effectiveness of the BSI and other efforts in preventing border-crossing deaths. The first working group session was held on July 19, 2006 to identify potential performance measures and develop an implementation plan. OBP expects to implement this recommendation by January 31, 2007.

CBP appreciates the opportunity to work with the auditors in constructing a balanced and accurate document. We place great value in resolving the issues discussed in this review which reiterates the importance of establishing regular liaison with our law enforcement partners, Government of Mexico officials, and county medical examiners.

Thank you again for the opportunity to comment on this draft report and we look forward to working with you on future homeland security issues.

Sincerely,



Steven J. Pecinovsky  
Director  
Departmental GAO/OIG Liaison Office

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# Appendix VI: GAO Contacts and Staff Acknowledgments

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## GAO Contact

Laurie E. Ekstrand (202) 512-2758

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## Acknowledgments

In addition to the contact named above, William J. Sabol, Samantha Goodman, Benjamin Bolitzer, Chad M. Gorman, David Alexander, Amy Bernstein, Frances Cook, Ignacio Yanes, Jerry Seigler, Christopher Ferencik, and Stephen Rossman made key contributions to this report.

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