



Injury Deaths of US Citizens Abroad: New Data Source, Old Travel Problem

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Background. Global travel continues to increase, including among US citizens. The global burden of injuries and violence, accounting for approximately 5 million deaths worldwide in 2000, is also growing. Travelers often experience heightened risk for this biosocial disease burden. This study seeks to further describe and improve our understanding of the variable risk of travel-related injury and death.

Methods. Information on US civilian citizen deaths from injury while abroad was obtained from the US Department of State Web site. This information was categorized into regional and causal groupings. The groupings were compared to each other and to injury deaths among citizens in their native countries.

Results. From 2004 to 2006, there were 2,361 deaths of US citizens overseas due to injury. Of these US citizen injury deaths, 50.4% occurred in the Americas region. Almost 40% (37.8%) of US citizen injury deaths in the low- to middle-income Americas were due to vehicle crashes compared to about half that (18.9%) (proportional mortality ratio [PMR] = 1.72, 95% confidence interval [CI] 1.59–1.62) for low- to middle-income Americas citizen injury deaths. Similar differences between US citizen injury death abroad and the in-country distributions were also found for vehicle crashes in Europe (35.9% vs 16.5%, PMR = 2.17, 95% CI 1.78–2.64; $p < 0.0005$), for drowning deaths in the Americas (13.1% vs 4.6%, PMR = 2.67, 95% CI 2.29–3.11) and many island nations (63.5% vs 3.5%, PMR = 11.38, 95% CI 8.17–15.84), and for homicides in the low- to middle-income European countries (16.9% vs 10.5%, PMR = 1.52, 95% CI .90–2.57).

Conclusions. US citizens should be aware of regional variation of injury deaths in foreign countries, especially for motor vehicle crashes, drowning, and violence. Improved knowledge of regional variations of injury death and risk for travelers can further inform travelers and the development of evidence-based prevention programs and policies. The State Department Web site is a new data source that furthers our understanding of this challenging travel-related health issue.

Global travel for business and pleasure is growing, including among US citizens. In 2006, 30,148,000 Americans made international trips, including 24,752,000 (82.1%) trips for pleasure.¹ More than 6.6 million Americans now live abroad, a number larger than the population of Denmark or Norway.^{2,3} Additionally, record numbers of US students are studying abroad, increasingly in nontraditional countries.⁴

Injuries accounted for approximately 5 million deaths worldwide in 2000.⁵ Injury deaths are expected to increase in the next decade,⁵ emerging as a major biosocial disease burden and public health challenge. The risk of injury to international travelers has been recognized by the World Health Organization (WHO)⁶ and by the Centers for Disease Control (CDC).⁷ Several studies have described

the epidemiology of injuries of US citizens abroad.^{8–12} Prior studies have shown that injury is the second most common cause of death of those away from their home country, after cardiovascular disease.^{10,13–15}

A recent study by Nurthen and Jung¹⁶ studied fatalities among Peace Corps Volunteers, finding that injuries were by far the most common cause of death.

Injuries to international travelers from other nations have also been described.^{13–15,17–19} Several studies have concentrated on tourist deaths within a specific country.^{20–25} These studies are informative for exploring types of traveler injury and risk. However, business and pleasure travelers may visit several countries and encounter regional variations in infection and injury risk. Guse and colleagues recently described proportional injury death ratios for US citizens abroad relative to US citizens in the United States and demonstrated regional variations for motor vehicle-related deaths, drowning, and homicide. Additional studies are needed to broaden our understanding of risk as well as regional variations in travel-related injury death risk.

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The intent of this study was to analyze the regional variations in injury deaths of US citizens abroad, using a relatively new data source that provides timely information on US citizen injury deaths. The US Department of State collects and anonymously reports US citizen deaths from unnatural causes (injuries) while abroad (http://travel.state.gov/law/family_issues/death/death_600.html). As mandated by the Foreign Relations Authorization Act for Fiscal Year 2003, “the Department of State (is required to) collect and make available on the Department’s Bureau of Consular Affairs Internet web site certain information with respect to each United States citizen who dies in a foreign country from a non-natural cause.”²⁶ Previously, information on injury deaths of US citizens abroad could only be collected by sorting through death reports from the US passport office.^{9–12} However, limited details on unnatural cause death reports are now publicly available on the US Department of State Web site.²⁶ To our knowledge, the first publication to examine this data source was a descriptive monograph focused on road traffic crashes, disseminated in 2007 by the Global Partnership on Road Safety.²⁷

This study is the first to use the Department of State Web site to analyze regional variations of US citizen injury deaths abroad and compare the distribution of these injury deaths to the injury death distributions of natives of the countries where US citizens died.

Methods

The US Department of State Web site reports each death anonymously in a separate entry, organized by country. Included in each entry is: (1) location of death, including country and locality; (2) date of death; and (3) cause of death. No identifying data, such as age, sex, or race, or other information were available. Injury deaths of military personnel were not included. The information for 2004 to 2006 was downloaded from the US Department of State Web site and deposited into Stata²⁸ to be analyzed. Injury events that occurred to US citizens outside the United States and resulted in death upon return to the United States are not included.

The data were sorted by region and cause of death. The terminology used to indicate cause of death was similar across entries, resulting in consistent classification by cause of death (Table 1). All but two of these deaths could be classified. The countries were clustered by region, according to the six regions of the WHO.²⁹ Each region’s countries were also sorted into two additional regions according to World Bank definitions of income.³⁰ This categorization process formed 11 regions, with Africa and Southeast Asia having only low- to middle-income countries (Table 2). There were a limited number of countries in which deaths occurred but which did not fall into a WHO region. These countries were placed into a “Not Classified” category. The number of deaths for each cause of death was tabulated by region. These totals were then divided by the total number of injury deaths per region to form a percentage. This percentage was the main finding used to determine injury death variability for US citizens among specific regions.

Table 1 Cause of death categories

Causes of death
Air accident
Disaster
Drowning
Drug-related
Homicide
Other accident
Fall
Maritime accident
Suicide
Terrorist action
Vehicle accident—auto
Vehicle accident—bus
Vehicle accident—train
Vehicle accident—pedestrian
Vehicle accident—other
Vehicle accident—motorcycle

Numbers of injury deaths and their percent distribution for citizens in their home countries were also tabulated. The WHO mortality database, a data retrieval tool available from the WHO’s Statistical Information System, was used to acquire statistics on the number of registered deaths in each country.³¹ The most current year for which statistics were available was used for each country, which reported mortality statistics to the WHO. Depending on the most current year available, the injury deaths were categorized by either International Classification of Diseases, 9th Edition E-codes (ICD-9) or International Classification of Diseases, 10th Edition codes (ICD-10).³² Data for homicides, suicides, drowning, vehicle crashes, and total injury deaths were obtained for each country, which reported these statistics to the WHO. Because disease codes were not included in the data on deaths of US citizens abroad, a generalization was made about which ICD codes would be assigned to which classifications made by Department of State officials (Table 3). The same regional categories used to sort countries where US citizens died, as defined by the WHO and World Bank, were used to sort home country citizen deaths. Total injury deaths and the percent allocation were tabulated for each region by adding the injury deaths of each country within the region. The same procedure was used to tabulate total deaths per region due to homicides, suicides, drowning, and vehicle crashes. These totals were then divided by the total injury deaths per region to obtain percentages comparable to those obtained from the data on US citizen injury deaths abroad.

The proportional mortality ratio (PMR) statistic was used to describe the difference between injury mortality ratios between US citizens and native citizens.³³ To determine the PMR, the percentage of injury deaths from a specific injury in a specific region for US citizens was divided by the corresponding percentage for native citizens in the same region. This method has been previously described.¹² In addition, the chi-square test was used for significance testing between the two groups.

Table 2 Region/income definitions

Region, income	Countries
1. Africa, low- to middle-income	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Côte d'Ivoire, Democratic Republic of the Congo, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, South Africa, Swaziland, Togo, Uganda, United Republic of Tanzania, Zambia, Zimbabwe
2. Americas, high-income	Bahamas, Canada (United States excluded)
3. Americas, low- to middle-income	Antigua and Barbuda, Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, Venezuela
4. Eastern Mediterranean, high-income	Bahrain, Kuwait, Qatar, United Arab Emirates
5. Eastern Mediterranean, low- to middle-income	Afghanistan, Djibouti, Egypt, Iran (Islamic Republic of), Iraq, Jordan, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Pakistan, Saudi Arabia, Somalia, Sudan, Syrian Arab Republic, Tunisia, Yemen
6. Europe, high-income	Andorra, Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Monaco, Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland, United Kingdom (includes Northern Ireland, Scotland, Wales)
7. Europe, low- to middle-income	Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Malta, Moldova (Republic of), Poland, Romania, Russian Federation, Serbia and Montenegro, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan, Ukraine, Uzbekistan
8. Southeast Asia, low- to middle-income	Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Hong Kong, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste
9. Western Pacific, high income	Australia, Brunei Darussalam, Japan, New Zealand, Republic of Korea, Singapore
10. Western Pacific, low- to middle-income	Cambodia, China, Cook Islands, Fiji, Kiribati, Lao People's Democratic Republic, Malaysia, Marshall Islands, Micronesia (Federated States of), Mongolia, Nauru, Niue, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Viet Nam
Unclassified	American Samoa, Anguilla, Aruba, Bermuda, British Virgin Islands, Cayman Islands, Christmas Island, Cocos (Keeling) Islands, Falkland Islands (Malvinas), Faroe Islands, French Guiana, French Polynesia, Gibraltar, Greenland, Guadeloupe, Guam, Guernsey, Holy See, Isle of Man, Jersey, Johnston Atoll, Liechtenstein, Martinique, Mayotte, Midway Islands, Montserrat, Netherlands Antilles, New Caledonia, Norfolk Island, Northern Mariana Islands, Occupied Palestinian Territory, Pitcairn Island, Puerto Rico, Réunion, Saint Helena, Saint Pierre and Miquelon, Svalbard and Jan Mayen Islands, Taiwan, Tokelau, Turks and Caicos Islands, United States Virgin Islands, Wake Island, Wallis and Futuna, Western Sahara; in transit, at sea, on cruise ship

Not classified includes countries that are not World Health Organization (WHO) members, are not classified by the World Bank, or lack data for WHO purposes.

Results

From 2004 to 2006, there were 2,361 deaths of US citizens abroad due to injury. Vehicle crashes and homicides were the most common causes of injury death (Figure 1). Injury deaths were most common in the low- to middle-income Americas, followed by high-income Europe

and the low- to middle-income Eastern Mediterranean (Figure 2). We determined that 50.4% (1,191/2,361) of US citizen injury deaths occurred in the Americas (Figure 2), with 93.4% (1,112/1,191) of these deaths occurring in low- to middle-income countries. Of the injury deaths in low- to middle-income Americas, 56.9% (633/1,112) occurred in Mexico.

Table 3 Correspondence between ICD codes and state department cause of death categories

ICD-9 E-code classification	ICD-10 classification	Corresponding name
E800–E999	V-01–Y-89	Total injury deaths
E800–E829	V-02–04, 9, 12–14, 19–79, 86–89	Vehicle accidents (auto, bus, motorcycle, train, pedestrian, other)
E910.0–E910.9	W65–71	Drowning
E950–E959	X60–84	Suicide
E960–E969	X85–Y09	Homicide

Source: International Classification of Diseases (ICD), 9th Revision, 3rd Edition: Clinical Modification and World Health Organization International Classification of Diseases.

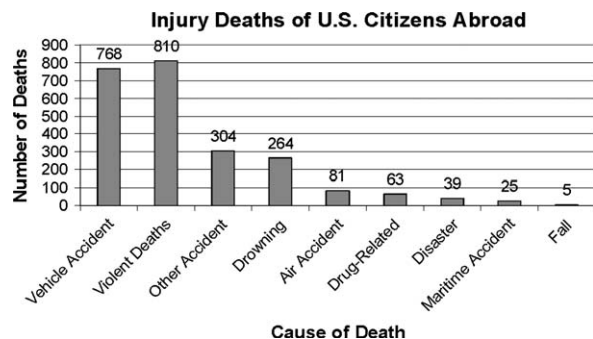


Figure 1 Number of US citizen deaths abroad by category, 2004 to 2006. Violent injuries include homicide, suicide, and terrorist action.

Overall, we found that 33% (768/2,361) of US citizen injury deaths abroad were due to vehicular crashes, which is significantly higher than citizen injury deaths due to vehicular crashes, 20% (215,704/1,097,472; PMR = 1.66, 95% confidence interval (CI) 1.56–1.75). Vehicular crashes are a more common cause of injury death among US citizens than citizens in their home countries in 7 of the 10 regions studied (Figure 3). We found that vehicular crashes had significant PMRs in six regions: low- to middle-income Americas (1.99, 95% CI 1.85–2.15), high-income Europe (1.72, 95% CI 1.48–2.00), low- to middle-income Europe (2.86, 95% CI 2.10–3.88), high-income Eastern Mediterranean (2.11, 95% CI 1.51–2.96), high-income Western Pacific (1.71, 95% CI 1.28–2.27), and low- to middle-income Western Pacific (1.44, 95% CI 1.13–1.83). In each of these regions, US citizens who die of injuries have a greater proportion of injury mortality due to vehicular crashes than native citizens do. A significantly higher percentage of fatal US citizen injuries (35.9%; 134/373) was attributed to vehicular crashes in European countries combined, while only accounting for 16.5% (65,902/398,721) of fatal injuries to European citizens in their home countries (PMR = 2.17, 95% CI 1.78–2.64). In the unclassified countries, US citizens had a significantly lower proportion of injury deaths from motor vehicle crashes (MVCs) (PMR = 0.43, 95% CI 0.20–0.91). In the

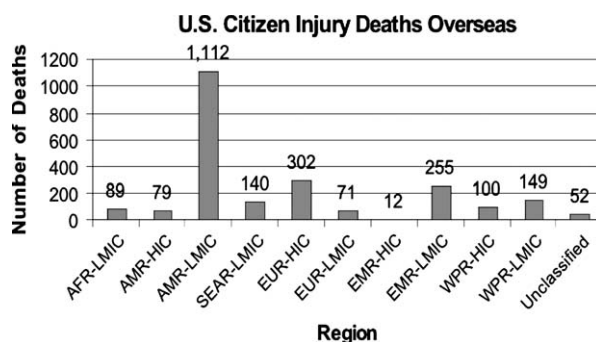


Figure 2 Number of US citizen deaths abroad by region.

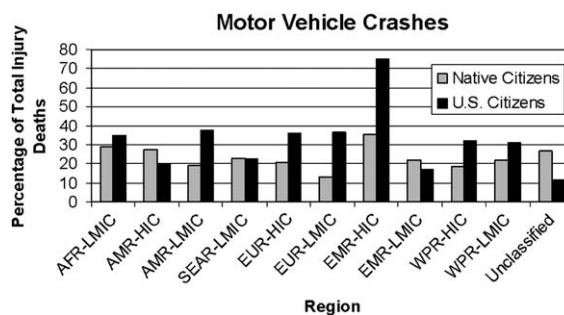


Figure 3 Comparison of native and US citizen motor vehicle deaths by region.

remaining regions, PMRs for vehicular crashes were not statistically significant.

MVCs accounted for a higher percentage of injury deaths among US citizens abroad (32.53%, 768/2,361) than among US citizens who died of injury deaths within the United States (26.98%, 45,113/167,184).³⁴ Within the MVC deaths of US citizens abroad category, we were able to further characterize the specific type of MVC (train, automobile, bus, motorcycle, pedestrian, and other). The majority (71.4%, 548/768) of MVC deaths of US citizens abroad were automobile crashes. However, in two regions, low- to middle-income Southeast Asia and low- to middle-income Western Pacific, motorcycle crash deaths accounted for more than 30% of US citizen MVC deaths (51.6%, 16/31 and 30.4%, 14/46, respectively). Comparatively, motorcycle crash deaths represented 9.4% (4,296/45,520) of MVC deaths among US citizens in the United States.³⁴

Drowning is another frequent cause of injury death in US citizens abroad. In the low- to middle-income Americas, drowning accounts for 13.1% (146/1,111) of injury deaths of US citizens but only 4.6% (14,721/313,146) of injury deaths of native citizens, a significant PMR of 2.80 (95% CI 2.40–3.25). Similarly, drowning comprises 17.7% (14/79) of US citizen injury deaths in the high-income Americas but only 2.3% (3,785/164,734) of injury deaths of native citizens, PMR of 7.71 (95% CI 4.79–12.42). Drowning remains the leading cause of injury death to US citizens in unclassified countries (Table 2). These unclassified countries are almost exclusively island nations. All unclassified countries in which there was a US citizen death were island nations. US citizens died of drowning much more frequently in these unclassified countries (63.5%, 33/52) than did citizens of their respective countries (3.5%, 97/2,745) (PMR = 17.96, 95% CI 13.52–23.86).

US citizens are less likely to die of violent deaths (homicide, suicide, and terrorist action) in most regions than the citizens of those regions (Figure 4). However, injury deaths due to homicide are somewhat more common among US citizens in low- to middle- and high-income Europe than are injury deaths due to homicide among native inhabitants of Europe (16.90%; 12/71 vs 10.50%; 58,331/555,393; PMR = 1.61, 95% CI .96–2.70 and

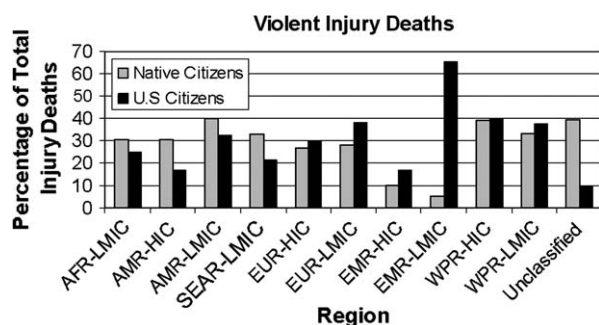


Figure 4 Comparison of Native and US citizen violent injury deaths by region. Violent injuries include homicide, suicide, and terrorist action.

3.31% vs 2.05%, PMR = 1.62, 95% CI .88–2.98, respectively), but these differences are not significant.

US citizen deaths due to terrorism (homicide) were overwhelmingly concentrated in the low- to middle-income Eastern Mediterranean countries (Table 2). Ninety-six percent of US citizen foreign terrorist action deaths occurred in this region, commonly referred to as the Middle East. In the low- to middle-income Eastern Mediterranean region, 62.4% of US citizen injury deaths were due to terrorist action, making it the most prevalent cause of injury death in any region.

Discussion

The total number of injury deaths of US citizens abroad continues to grow, with 2,361 deaths reported in 2004 to 2006, compared to the total for the years 1998, 2000, and 2002, in which there were 2,011 deaths due to injury.¹² The high number of deaths in the low- to middle-income Americas is likely due largely to the popularity of these countries, and Mexico in particular, as a travel and retirement destination for US citizens. Similarly, we see the second highest number of injury deaths in the high-income European countries, which are again popular destinations for US citizens. The present study further describes significant regional differences for injury deaths of US citizens abroad. US citizens are dying of selected causes of injury at a higher proportion than region native inhabitants, especially for MVCs, drowning, and homicides.

Vehicular crashes continue to represent a travel risk for most US citizens. US tourists are often less well suited to drive in foreign countries due to unfamiliarity with foreign roadways and different driving laws. Previous studies have further described the risks of vehicular crashes in foreign countries.^{22,23} No separate license or permit besides a US driver's license is required to operate a motor vehicle in most foreign countries. This study also suggests that there may be an increased risk for US citizens riding motorcycles in certain regions. Information for US citizens about the different hazards they may encounter while on the road in a foreign country is

available³⁵ but requires continual revision and benefits from the best available research and evidence. These regional variations in PMRs might also reflect the well-documented variations in the provision of emergency medical services (EMS) and emergency care.^{36,37} Recently, EMS services were recognized by the WHO as an essential service that is a right for everyone. More uniform EMS and emergency care, including the care of the injured, would have a broad effect of improving both traveler and native health and contribute toward a global reduction of injury deaths.³⁸

Often, when travelers receive pretravel health advice from health professionals or other sources, it contains little or no mention of injury death but rather emphasizes infectious disease and the consumption of safe food and water, generally a source of travel-related morbidity but not mortality.³⁹ Integrating the best available information for all travel risks would strengthen advisories and inform academic and corporate programs and policies. The results of research on injury deaths abroad, such as is found in this study and is hoped for in future studies, need to find their way into pretravel advice offered to the pleasure and business traveler through travel medicine clinics, into the travel planning and policies of schools and corporations and into recommendations for US citizens planning a permanent move to a country abroad.

Currently, it is more accurate to draw conclusions about international injury risk and provide corresponding travel advice based on regional information rather than on an individual country basis because of gaps in country mortality data and denominator data for US citizens abroad. This study suggests an increased risk to US citizens of dying in MVCs in Europe compared to native Europeans, whereas Guse and colleagues showed a possible reduced injury risk to US citizens in Europe compared to US citizens.¹² This result illustrates the importance of further examination of risk comparisons between citizens in their native countries and US citizens traveling abroad. Nurthen and Jung's examination of Peace Corps Volunteer deaths also showed increased injury danger to US citizens abroad from MVCs and homicides.¹⁶ However, the most important finding from their survey was that injury is a significant risk abroad, especially to members of the 20- to 39-year-old age-group.

Limitations

The data regarding deaths of US citizens abroad provided on the Department of State Web site include only date of death, place of death, and cause of death. It may be incomplete. The Department of State Web site notes in part: "In some instances, it does not occur to surviving family members to inform the nearest U.S. embassy or consulate of the death. The report may not include some deaths of U.S. military or U.S. government officials."²⁶ There are no age, sex, or other identifying data, as there have been in previous analyses of deaths of US citizens abroad.⁸⁻¹² This lack of information

limits the types of analyses that can be done. No comment can be made about whether or not the pattern of males dying of injury more often than females among citizens abroad has continued. Furthermore, it is unknown whether youths have differing PMRs than middle-aged adults or the elderly for different injury events. However, the data provided by the US Department of State remains useful for more precise causal information and to inform regional variations of injury deaths for US citizens.

Many nations, especially in Africa, either do not report injury death data to the WHO or report data that is incomplete.⁴⁰ Because of the variable data, it is challenging to make definitive statements about the differences between the causes of death for US citizens and natives in some regions.

Reliable denominator data on the number of US citizens traveling and/or living abroad are not available. Rates of death for US citizens abroad could not be calculated. This current study was limited to comparing the percent distribution of injury deaths by different types of injury between US citizens and native citizens (PMRs). These PMRs are an important comparison of risk between US citizens and native citizens and their exposures to differing regional environments. PMRs can be informative for illuminating the risk potential of a specific region, and how they compare among citizens and visitors.

Natives of a region and US citizens, especially those engaged in pleasure travel, may engage in different activities or have different exposure levels to certain risks, which may explain the different patterns of injury death seen in this study. In some underdeveloped countries, the workplace may still be unsafe, causing frequent occupational injury deaths,^{41,42} whereas tourists may be involved in other high-risk activities, such as those that can result in death by drowning.²¹ In such a case, the proportional mortality for the native population would be dominated by the occupational injuries and other types of injury proportions would be diminished in contrast. This may help explain the higher proportion of drowning by US citizens in some locales in contrast to the native population, especially poor island nations.

Deaths to US citizens abroad due to terrorist action cannot be reliably compared to deaths of native citizens due to of terrorist action because the WHO does not provide a separate classification for these deaths. Also, many due to these US citizen deaths may be more properly classified as war-related deaths (which are not included on the Department of State Web site) because they may be deaths of US citizen contractors operating in a military support capacity in selected countries such as Iraq and Afghanistan.

The Department of State Web site provides a useful and accessible information source for future studies to build on. Additionally, the Web site has descriptions that are far more uniform than previous data methods, which should result in more comparable studies and limited trend analyses.

Conclusions

The burden and regional risk variation of travel-related injury death continues to be a challenging problem. The science of injury prevention and control and this new data source can provide a useful platform for travel medicine providers and researchers to inform travelers and reduce risk, death, and disability.⁴³ Studies that further describe regional risk to travelers can help inform policies and programs for corporations and universities that have significant numbers of employees and students working and studying abroad. Better knowledge of infectious disease variable risk has resulted in more informed prevention strategies based on destination. This study further contributes to our understanding of regional injury risk and can be used to provide more focused, evidence-based advice regarding injury.

The US Department of State should consider collaborating with the CDC's National Center for Injury Prevention and Control, US AID (US Agency for International Development), and other international organizations to formulate, implement, and evaluate policies to reduce injury deaths of travelers.

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Declaration of Interests

The authors state that they have no conflicts of interest.

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