Original article

Rates of intentionally caused and road crash deaths of US citizens abroad

Melissa K Sherry,[1] Mahmoud Mossallam,[1] Matthew Mulligan,[1,2] Adnan A Hyder,[3] David Bishai[1]

[1]Department of Population, Family, and Reproductive Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA
[2]Krieger School, Johns Hopkins University, Baltimore, Maryland, USA
[3]International Injury Research Unit and Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, USA

Correspondence to
Dr David Bishai, Department of Population, Family, and Reproductive Health, Johns Hopkins Bloomberg School of Public Health, Room E4622, 615 N. Wolfe St., Baltimore, MD 21202, USA; dbishai@jhsph.edu

ABSTRACT

Context Currently, little is known about rates of death by cause and country among US travellers. Understanding the risk by cause and country is imperative to risk communication and the development of risk reduction strategies.

Methods Publicly available data on non-natural deaths of US citizens abroad were gathered from January 2003 to December 2009 from the US Department of State's Department Bureau of Consular Affairs. Traveller information was gathered from the US Department of Commerce Office of Travel and Tourism for the same time period. Rates of death were calculated by dividing the number of non-natural deaths of US citizens abroad by the number of US outbound visits for each country.

Results A total of 5903 non-natural death events were retrieved between 2003 and 2009 from the US State Department. Intentionally caused death rates ranged from 21.44 per 1 000 000 visits in the Philippines to 0 per 1 000 000 visits in several countries; the majority of countries had fewer than five intentionally caused deaths per 1 000 000 visits. Rates of road traffic crashes were higher than rates of intentionally caused deaths in almost every instance. Thailand had the highest rate of deaths due to road traffic crashes (16.49 per 1 000 000), followed by Vietnam, Morocco and South Africa (15.12 per 1 000 000, 11.96 per 1 000 000 and 10.90 per 1 000 000, respectively). Motorcycle deaths account for most of the heightened risk observed in Thailand and Vietnam.

Conclusions The leading cause of non-natural deaths in US travellers abroad was road crashes, which exceeds intentional injury as the leading cause of non-natural deaths in almost every country where US citizens travel. Southeast Asia had the highest unintentional injury death rates for US citizens abroad due to the high rates of deaths from motorcycle crashes.

INTRODUCTION

Travel by US citizens to other countries has steadily increased over the last decade, with about 27 million US citizens visiting overseas annually.[1] Each year, $51.6 billion are spent by the US Department of State on foreign affairs to attend to US interests and to keep US citizens safe both at home and abroad.[2] While a substantial amount of money is being spent in order to protect Americans, there is little information available to measure the risk of non-natural deaths by cause and by country for Americans overseas for the purpose of allocating resources to where they can make the most impact. Information on the risk of death to Americans is often provided as case counts of various infectious diseases and conflicts overseas, but they are expressed without denominators that reflect the number of travellers to produce incidence rates of death by cause and location. Therefore, this information may not reflect the true risks to travellers in a given country. Several studies have examined the leading causes of death for travelling Americans and compared these with causes of death in the local residents to assess relative risk. However, this information cannot be used to effectively communicate risk information because it does not account for the number of outbound trips to the countries of interest.[2]

Previous work examining the leading causes of death for US travellers has found that injuries are a leading cause of traveller deaths, along with chronic diseases and suicides.[3] [4] Baker et al[3] showed that infectious diseases made up only 1% of traveller deaths, despite being a prominent focus for travel clinics and government agencies working to reduce risk abroad. MacPherson et al[5] examined risks of death for Canadian travellers and found that injuries and murder together made up 23% of all deaths abroad, while natural causes such as chronic illness constituted 73% of total deaths. For US citizens, injuries accounted for 2361 deaths abroad from 2004 to 2006, and among these, road traffic fatalities were shown to account for nearly a third of all injury deaths.[2] In a study of fatalities of US Peace Corps Volunteers, Nurthen and Jung (2008) concluded that 68% of all deaths occurring in Peace Corps volunteers abroad were due to unintentional injuries, and the second leading cause of death was homicide (17%).[6] A 1985 study done by Hargarten and Baker found that unintentional injuries accounted for 70% of all Peace Corps deaths during the period of 1962–1983. Because the analysis had estimates of Peace Corps field strength throughout the period, it could calculate death rates that ranged from 46.8 to 122.9 deaths per 100 000 over the period studied. Country-specific death rates could not be calculated given data limitations.[7] This information demonstrates the high burden of non-natural deaths in travellers abroad and indicates a need for creating preventive strategies to target injuries and homicides.

Several studies have focused on regional variation in injury deaths among American travellers abroad and found that the highest proportion of injury deaths occurred in Latin America, and in particular, Mexico, which accounted for 56.9% of all injury deaths in low income and middle income regions of the Americas.[2] [8] [9] However, this study fails to account for the distribution of American travellers and thus does not provide an accurate assessment of risk for US travellers.

To date, only the 1985 Peace Corps study has used a denominator of the number of visits by US travellers to calculate rates of death per unit of exposure by country or cause for US travellers.[2][7][10] Using counts of deaths alone may create misplaced emphasis about dangers of travel in certain areas. Mexico, for example, is commonly believed to be a dangerous place for US travellers. However, without data on American travellers' exposure to risk, which in this case is the number of trips Americans take to countries like Mexico, one cannot make accurate comparisons of risk. In this study, we seek to calculate rates of US traveller deaths abroad using a denominator that measures exposure of US travellers as the number of outbound trips in order to create rates of death by country for causes of non-natural deaths. In doing so we hope to better delineate the risk of death for American travellers by cause and destination.

METHODS

We calculated the rate of non-natural deaths of US citizens abroad per 1 000 000 US outbound visits for both intentionally caused deaths and deaths from road crashes. Data on suicides, air crashes, maritime crashes and other causes of non-natural deaths were not included in the analysis.

Information on deaths due to non-natural causes of US citizens abroad was obtained from the US Department of State's Bureau of Consular Affairs online website.[11] The US Department of State requires that deaths of all US civilian abroad are reported to a local US Embassy. Only those deemed due to non-natural causes are included in the database used for this analysis.[12] Data on non-natural deaths of US citizens abroad were obtained from January 2003 to December 2009. Data elements included the date of death, location of the death and cause of death. The types of non-natural causes of death included disaster, drowning, drug, execution, homicide, maritime crashes, terrorist action, vehicle crashes involving bus, car, motorcycle and pedestrians, train crashes, air crashes and others.

Traveller data on the number of outgoing trips of US citizens were available from the US Department of Commerce Office of Travel and Tourism.[12] Data were obtained from an online accessible report, which included the number of thousands of US outbound visits by country and year.[1] A limitation of using a measure of the number of outbound trips would be systematic variation in the duration of stay and intensity of road exposure of US travellers during a trip. On average, a US traveller spends 19.6 nights (median 11 nights) outside the USA during a trip.[1] Another limitation is that the Commerce Department data only report data on trips to 40 countries, as they excluded countries that had respondent sample sizes smaller than 400 from years 2006 to 2009 and smaller than 100 for 2003–2005.[12] The International Trade Administration's Office of Travel and Tourism Industries (OTTI) provides data on US outbound trips based on arrival counts of both foreigners and citizens provided by the Department of Homeland Security as well as the Survey of International Air Travelers (SIAT).[1] The SIAT is a monthly survey of air travellers that systematically covers all international air travellers with a sample size of 40 000. OTTI estimates counts of ground travel to Canada and Mexico based on published reports by Statistics Canada and Banco de Mexico.[13] Statistics Canada reports that US trip lengths are an average of 4.4 nights—much shorter than the 19 nights reported for international air travellers.[1][13]

The ideal denominator of exposure would be person-kilometres travelled by US citizens in country j. Our model of this exposure is given by

$$PK_j = (PK_j/D_j) \times (D_j/T_j) \times (T_j) \tag{1}$$

where PK is person kilometres travelled by all US citizens in country j in a year, D_j/T_j is the number of days of duration of a trip to country j and T_j is the number of trips to country j.

Obviously all three factors on the right-hand side of (1) will contribute to the total risk exposure, but data limitations force us to use T_j as a proxy for PK_j, assuming away the role of international variations in duration of stay and intensity of road exposure. In interpreting the results of this analysis, one will have to remember this strong assumption. The SIAT does not publish data on trip duration by country, so we know that there is an average duration of 19.6 nights for foreign air travel and 4.4 nights for travel to Canada.[13] The likely variation in trip length between countries would make it unwise to try to convert death rates per trip to death rates per unit of time exposed to a particular country.

Annualised rates of death per country were calculated by dividing the total number of non-natural deaths of US citizens abroad January 2003 to December 2009 by the number of US outbound visits for each country. Death rates are reported as the number of deaths of US citizens abroad divided by 1 000 000 US visits. Death rates were calculated separately for both intentionally caused deaths and deaths due to road crashes. Intentionally caused deaths were defined as deaths due to terrorist action, homicide and execution. Deaths due to road crashes comprised deaths from vehicle crashes involving cars, bicycles, buses, motorcycles and pedestrians.

RESULTS

A total of 5417 non-natural death events from 2003 to 2009 were recorded by the US State Department. The deaths were recorded from 160 countries, and Mexico accounted for the highest number of deaths (27%). Iraq (4%) accounted for the second highest number of deaths, and Costa Rica, Thailand, Haiti, Germany and the Dominican Republic each accounted for 3% of the total deaths.

The rates of intentionally caused deaths are reported by country in table 1. Intentionally caused death rates ranged from 21.44 per 1 000 000 trips in the Philippines, to 0 per 1 000 000 trips in several countries, with the majority of countries having fewer than five intentionally caused deaths per 1 000 000 trips. The Philippines had the highest rates of intentionally caused deaths per 1 000 000 trips, but the total counts of homicides in the Philippines were numerically low. In the Philippines, there were 9 homicides in 2005, 12 in 2006, 7 in 2007 and 11 in 2008 with 5 or fewer in other years.

Colombia and the Dominican Republic had the second and third highest rates of intentionally caused deaths per 1 000 000 trips, respectively (13.98 per 1 000 000 and 10.5 per 1 000 000), but total homicide counts in either country did not exceed 13 per 1 000 000 trips. Homicide counts in Philippines, Colombia and Dominican Republic were double digits in multiple years, a pattern that is inconsistent with a single anomalous event.

The 40 countries with the highest rates of deaths per 1 000 000 visits due to road crashes are reported in table 2. These road death rates for each country were, with one exception, higher than the rates of intentionally caused deaths in all countries, and 15 countries had death rates due to road crashes

Table 1 Rate of intentionally caused deaths of US citizens abroad (deaths per 1 000 000 visits)

Country	Rate
Philippines	21.44
Colombia	13.71
Dominican Republic	11.00
Thailand	5.55
Morocco	5.49
South Africa	4.66
Malaysia	2.91
Brazil	2.86
Egypt	2.43
Russia	2.28
Israel	2.23
Mexico	1.97
Jamaica	1.91
India	1.81
Czech Republic	1.71
Greece	1.37
Poland	1.02
Vietnam	0.76
China (PRC)	0.70
Germany	0.66
Hong Kong	0.58
Bahamas	0.52
Australia	0.48
South Korea	0.43
Japan	0.36
Spain	0.26
Italy	0.20
France	0.14
United Kingdom	0.13
Canada	0.04
Indonesia	0.00
New Zealand	0
Cayman Islands	0
Austria	0
Taiwan	0
Netherlands	0
Turkey	0
Switzerland	0
Ireland	0

above 5 per 1 000 000 trips. Of the countries in this sample, Thailand and Vietnam had the highest death rates from road crashes. Morocco and South Africa had the third and fourth highest rates of death due to road crashes, respectively (11.96 per 1 000 000 trips and 10.90 per 1 000 000 trips). All other countries reported road death rates ranging from 10.04 per 1 000 000 trips to 0.15 per 1 000 000 trips.

The high rates of road crash deaths in Thailand and Vietnam were notable for being largely due to motorcycle crash deaths. Motorcycle-related deaths accounted for 56% and 58% of the road deaths in these countries, respectively, reflecting a threat to Americans abroad that is especially high in developing areas where motorcycles are often more prevalent than cars. In contrast, other countries with high rates of road traffic deaths such as Morocco and South Africa did not report any motorcycle-related deaths among visitors from the USA.

DISCUSSION

The most dangerous country for road crash deaths in our analysis was Thailand with 16.49 deaths per million trips. Without knowing how long each US visitor to Thailand spends, it is impossible to say what the death rate is per person year. However, as a check on range of magnitude, one can briefly assume that trips to Thailand last as long as the global median of 11 nights. This would translate to 54.7 deaths per 100 000 person years (=$365/11 \times 16.49 \times 0.1$), which is close to the rate of 58.9 deaths per 100 000 person-years observed in all Peace Corps volunteers in the late 1960s.[8] The 1985 Peace Corps study was able to produce an overall death rate for all Peace Corps volunteers but did not estimate country-specific death rates. Other studies have relied on counts of deaths and proportionate mortality to make judgements about the safety of visiting various countries.[7] That type of methodology focuses on numerators and does not take into account any variation in exposure, and therefore does not give an accurate picture of the

Table 2 Road crash death rate of US citizens abroad (deaths per 1 000 000 trips)

Country	Rate
Thailand	16.49
Vietnam	15.12
Morocco	11.96
South Africa	10.90
Indonesia	10.04
Philippines	9.07
Egypt	8.85
Dominican Republic	8.48
Greece	7.28
Poland	7.27
Australia	6.82
Israel	5.70
Spain	5.41
Colombia	5.25
New Zealand	5.08
Brazil	4.82
India	4.77
Malaysia	4.20
Czech Republic	4.17
Mexico	3.63
China (PRC)	3.48
Germany	3.28
Italy	2.31
South Korea	2.24
Cayman Islands	2.03
Austria	2.00
Taiwan	1.76
Russia	1.69
Japan	1.56
Jamaica	1.39
United Kingdom	1.18
Bahamas	1.11
Netherlands	0.86
France	0.70
Turkey	0.54
Switzerland	0.29
Canada	0.22
Ireland	0.21
Hong Kong	0.15

risk for travellers visiting each country. Mexico, for example, accounts for the highest proportion of total deaths (27%) among US citizens who travel there, but when ranked by rate of death per 1 000 000 trips for intentional injuries and road traffic crashes, it ranks 12th and 20th, respectively. (These data predate Mexico's wave of drug cartel-related violence from 2010 onwards.) Thailand, on the other hand, ranked high in rates of both road traffic fatalities and intentionally caused deaths, and yet it is not commonly considered to be a dangerous country by American travellers and accounted for only 3% of total US traveller deaths from non-natural causes.

Additionally, the use of rates to understand traveller risk abroad can help in the allocation of tax dollars by the US government to protect Americans abroad, and by travel clinics, public health officials and preventive medicine doctors when communicating risks to travellers. Historically, the focus of advice for travellers has been on preventing infectious disease.[14] However, the rates calculated in this study demonstrate the sizeable risk posed by non-natural injury deaths for travellers.

Another finding of this study was that road traffic crashes pose a higher risk of death to travellers than violent crime in every instance with one exception: the high rate of deaths from violent crime in the Philippines (21.44 per 1 000 000). The high rates of deaths that are due to road traffic crashes should be considered by policymakers who could do more to address road and vehicle safety abroad. $1.6 billion are spent by the US State Department annually on strengthening infrastructure abroad, but currently many of these funds are spent on embassy construction rather than road safety or improvements that could potentially save American lives.[2] [15] US Agency for International Development health and development investments seldom address road safety, although this potentially represents an area of US interest that is shared with foreign partners.[16] Road safety technologies also reflect an area where high US expertise could be shared for mutual benefit, as demonstrated by road safety interventions conducted in Eastern Europe that successfully increased seatbelt use and improved road safety by addressing visibility in areas with high crash rates.[16]

One specific factor that the study identified was the high motorcycle-related death rate for US travellers in Thailand and Vietnam. This demonstrates an important new threat to Americans, especially in East Asia, where up to 95% of registered vehicles are 2–3 wheelers.[17] This threat is further increased by the number of individuals riding without appropriate helmets. Helmet laws that prohibit riding motorised vehicles without protection have proven to be an effective intervention.[17] Yet helmets are often forgotten, especially by young drivers who make up the majority of the deaths from motorcycle crashes in East Asia.[18] Ensuring that helmet laws are enacted and enforced, and improving road conditions, can help reduce the number of motorcycle-related deaths in these countries for US citizens travelling abroad as well as the citizens of these countries themselves. In addition, counselling travellers on the risks of driving motorcycles in countries with high rates of motorcycle-related deaths and providing travellers to these countries with information on how to better protect themselves from road traffic injuries could help save lives and prevent injury.

This study represents a preliminary analysis of death rates in travellers by country and by cause, and is only the first step in examining the risk of non-natural deaths in US travellers abroad. This study has several limitations. While the data from the US Department of Commerce Office of Travel and Tourism provided the number of outbound trips for US travellers, the data did not take into account the length of stay for each trip.

Length of time in a country greatly affects risk of death from injury, as longer trips mean a longer period of risk for a traveller. The denominator used in this study also does not account for Americans who may be living abroad, who may have been counted in the numerator if they died from a non-natural injury. The data gathered from the US Department of State on deaths from injury may also be underreported. Delayed death from a prior injury may not always be reported within the country where the injury occurred, and even when reported, the cause may not be accurate due to variation in reporting systems and death certificate information. This may be especially true in countries closer to the USA, such as Mexico, and could result in an underestimate of deaths in some countries. Variations in reporting across State Department staff could lead to inaccurately estimated rates of traveller deaths abroad by country. Information on risk by age, sex, race or other variables such as involvement of alcohol or drugs at the time of death that affect the risk of death from non-natural injuries was also not available for this study.[12] The results also do not account for the type or intent of travel in which an individual engaged in, thus the risk rates calculated here may vary substantially based on other factors. The numerator data represent the entire universe of non-natural deaths, and so there is no sampling error that could be used to test hypotheses about differences between countries using CI-based tests.

Understanding the risk of death for travellers by country allows for better informed decisions on ways to prevent deaths in travelling US citizens. This study both demonstrates the high risk of death for Americans travelling abroad from intentional causes and road crashes and calls for greater attention to both issues. Modifying existing travel advice, promoting use of safety equipment (such as helmets) and integrating injury prevention into tutorials for young travellers would help address this burden. The 2011–2020 Decade of Action for Global Road Safety makes it an opportune time for the USA to pay further attention to these causes and join the global community in protecting its own citizens as it helps improve safety around the world.

What is known on this subject

- ▶ There is a high burden of unintentional injury deaths among travellers.
- ▶ Road traffic injuries are a significant proportion of all unintentional deaths among travellers.
- ▶ Latin America and Mexico accounted for particularly high proportions of deaths among US travellers.

What this study adds

- ▶ Provides a denominator (number of visits by US travellers) to calculate rates of death per unit of exposure by country or cause to understand incidence of mortality instead of proportions.
- ▶ Calculates and compares death rates for top countries where US travellers visit to help understand traveller risk.
- ▶ Recognises motorcycle related crashes as a leading cause of death among US travellers in East Asian countries.

Contributors DB and AAH conceived and supervised the study. MM and MM pulled the data and completed the analysis. MKS assisted with data interpretation and writing. DB and AAH are responsible for the overall content as guarantors. All authors have seen and are responsible for the final version of the manuscript.

Competing interests None.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement The authors take full responsibility for the integrity of the data presented here as well as the accuracy of the data analysis.

REFERENCES

1 U.S. Department of Commerce International Trade Administration. Profile of U.S. resident travelers visiting overseas destinations: 2011 outbound. http://tinet.ita.doc.gov/outreachpages/download_data_table/2011_Outbound_Profile.pdf. Updated 2011 (accessed 21 Aug 2013).

2 Tonellato DJ, Guse CE, Hargarten SW. Injury deaths of U.S. citizens abroad: new data source, old travel problem. *J Travel Med* 2009;16:304–10.

3 Baker TD, Hargarten SW, Guptill KS. The uncounted dead: American civilians dying overseas. *Public Health Rep* 1992;107:155–9.

4 World Health Organization. International travel and health: 2007. http://whqlibdoc.who.int/publications/2007/9789241580397_eng.pdf. Updated 2007 (accessed 21 Aug 2013).

5 MacPherson DW, Gushulak BD, Sandhu J. Death and international travel—the Canadian experience: 1996 to 2004. *J Travel Med* 2007;14:77–84.

6 Nurthen NM, Jung P. Fatalities in the Peace Corps: a retrospective study, 1984 to 2003. *J Travel Med* 2008;15:95–101.

7 Hargarten SW, Baker SP. Fatalities in the Peace Corps. a retrospective study: 1962 through 1983. *JAMA* 1985;254:1326–9.

8 Guptill KS, Hargarten SW, Baker TD. American travel deaths in Mexico causes and prevention strategies. *West J Med* 1991;154:169–71.

9 Hargarten SW, Baker TD, Guptill K. Overseas fatalities of united states citizen travelers: an analysis of deaths related to international travel. *Ann Emerg Med* 1991;20:622–6.

10 Guse CE, Cortés LM, Hargarten SW, *et al*. Fatal injuries of U.S. citizens abroad. *J Travel Med* 2007;14:279–87.

11 U.S. Department of State. Death of U.S. citizens abroad by non-natural causes. http://www.travel.state.gov/law/family_issues/death/death_600.html (accessed 31 May 2012).

12 U.S. Department of Commerce International Trade Administration. 2009 United States resident travel abroad. http://tinet.ita.doc.gov/outreachpages/download_data_table/2009_US_Travel_Abroad.pdf. Updated 2009 (accessed 21 Aug 2013).

13 Canadian Tourism Commission. Where we market Canada: U.S. http://en-corporate.canada.travel/markets/where-we-market-canada/us (accessed 26 Aug 2013).

14 Wadhwaniya S, Hyder AA. Pre-travel consultation without injury prevention is incomplete. *J Travel Med* 2013;20:217–20.

15 U.S. Department of State. State and USAID—FY 2013 budget. http://www.state.gov/r/pa/prs/ps/2012/02/183808.htm (accessed 30 May 2012).

16 Hyder AA, Aggarwal A. The increasing burden of injuries in Eastern Europe and Eurasia: making the case for safety investments. *Health Policy* 2009;89:1–13.

17 World Health Organization. Road safety in Viet nam. http://www.who.int/violence_injury_prevention/road_traffic/countrywork/vnm/en/index.html (accessed 13 Sep 2012), 2012.

18 World Health Organization. Helmets: A road safety manual for decision-makers and practitioners, 2006.

IP

Rates of intentionally caused and road crash deaths of US citizens abroad

Melissa K Sherry, Mahmoud Mossallam, Matthew Mulligan, et al.

Updated information and services can be found at:
http://injuryprevention.bmj.com/content/early/2013/10/29/injuryprev-2013-040923.full.html

These include:

References	This article cites 10 articles http://injuryprevention.bmj.com/content/early/2013/10/29/injuryprev-2013-040923.full.html#ref-list-1
P<P	Published online December 3, 2013 in advance of the print journal.
Email alerting service	Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Topic Collections	Articles on similar topics can be found in the following collections Press releases (16 articles)

Notes

Advance online articles have been peer reviewed, accepted for publication, edited and typeset, but have not not yet appeared in the paper journal. Advance online articles are citable and establish publication priority; they are indexed by PubMed from initial publication. Citations to Advance online articles must include the digital object identifier (DOIs) and date of initial publication.

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/