Estimation of Road Traffic Fatalities for the Global Status Report on Road Safety

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Data collected had challenges

• Definitions of road traffic death used by countries differ

• Underreporting of fatalities in reported data

• Incompleteness of data from countries (e.g. some countries have data only from some geographical regions)

• Significant differences in data from vital registration vs. police and other types of data
So many data sources and definitions! I don't know which one to use for my model. I need help!

And how in the world am I supposed to know which variables to use.
Data sources on road traffic injuries and fatalities

- Data sources
  - Police records
  - Health facility records
  - Vital registration / death certification
  - Combine sources
  - Insurance

- Definitions used
  - Died at scene of crash
  - Died within 24 hours of crash
  - Died within 7 days of crash
  - Died within 30 days of crash
  - Died within a year of crash
  - Unlimited time period following crash
### Difference between Police and VR data

<table>
<thead>
<tr>
<th>Country</th>
<th>Police data</th>
<th>Vital registration data</th>
<th>Prop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>724</td>
<td>1014</td>
<td>40.1</td>
</tr>
<tr>
<td>Chile</td>
<td>1623</td>
<td>2116</td>
<td>30.4</td>
</tr>
<tr>
<td>Italy</td>
<td>3385</td>
<td>4192</td>
<td>23.8</td>
</tr>
<tr>
<td>Japan</td>
<td>4373</td>
<td>5971</td>
<td>36.5</td>
</tr>
<tr>
<td>Netherland*</td>
<td>570</td>
<td>650</td>
<td>14.03</td>
</tr>
<tr>
<td>Republic Korea</td>
<td>5092</td>
<td>6374</td>
<td>25.2</td>
</tr>
<tr>
<td>Spain*</td>
<td>1680</td>
<td>1915</td>
<td>13.9</td>
</tr>
<tr>
<td>Egypt</td>
<td>6700</td>
<td>11000</td>
<td>64.2</td>
</tr>
</tbody>
</table>
## Difference between Police and VR data

<table>
<thead>
<tr>
<th>Years</th>
<th>Morocco/Health</th>
<th>Police data/ministry of transport</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td></td>
<td>3776</td>
</tr>
<tr>
<td>2014</td>
<td></td>
<td>3489</td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td>3832</td>
</tr>
<tr>
<td>2012</td>
<td>781</td>
<td>4167</td>
</tr>
<tr>
<td>2011</td>
<td>589</td>
<td>4222</td>
</tr>
<tr>
<td>2010</td>
<td>514</td>
<td>3778</td>
</tr>
<tr>
<td>2009</td>
<td>519</td>
<td>4042</td>
</tr>
<tr>
<td>2008</td>
<td>477</td>
<td>4162</td>
</tr>
</tbody>
</table>
Sources of road traffic fatality data

- Reported health data
  - Vital Registration (VR)
- Reported data – through questionnaire
- Estimated to generate comparative estimates

WHO
(Global health estimates – for all causes of death)

GSRRS Questionnaire
DHIS2 complete national implementation:
Bangladesh, Burkina Faso, Gambia, Ghana, Kenya, Liberia, Mozambique, Nigeria, Rwanda, Sierra Leone, Tanzania, Uganda, Zambia, Zanzibar, Zimbabwe
Because of the typically observed lag of 18-14 months before countries report finalized latest data, it should not be inferred from these charts that reporting for the most recent years has decreased.
Because of the typically observed lag of 18-14 months before countries report finalized latest data, it should not be inferred from these charts that reporting for the most recent years has decreased.
Mechanism for cause-of-death data standardization and validation

Amro
- Requests all Amr countries
- Standardizes, validates and shares the data with HQ

Euro
- Requests eastern European countries

HQ
- Requests all countries of Afr, Emr, Sear, Wpr and some countries of Europe
- Follows up with each country following HQ call

Emro
- All data received are sent to HQ for standardization and validation – Regional offices liaise with countries to resolve inconsistencies
Improved coverage in countries

- **South Africa**: ~ 50% in 1990s → ~ 90% in 2014

- **Turkey**: ~ 50% in 2007 → ~ 85% in 2013

- **Iran**: ~ 40% in 2001 → ~ 70% in 2014
  (exclude Teheran province in 2014)
Improved reporting format in countries, but still……

- Kazakhstan now reports in detailed ICD-10
- Uzbekistan resumes reporting in detailed ICD-10

Russian Federation, Ukraine and Belarus still continue to report using the aggregated mortality list which show only deaths from "Transport accidents"
ICD-10 uses the victim’s mode of transportation as the main axis of classification and ends up with 9 categories:

- Pedestrian injured in transport accident (V01-V09)
- Pedal cyclist injured in transport accident (V10-V19)
- Motorcycle rider injured in transport accident (V20-V29)
- Occupant of three-wheeled motor vehicle injured in transport accident (V30-V39)
- Car occupant injured in transport accident (V40-V49)
- Occupant of pick-up truck or van injured in transport accident (V50-V59)
- Occupant of heavy transport vehicle injured in transport accident (V60-V69)
- Bus occupant injured in transport accident (V70-V79)
- Other land transport accidents (V80-V89)
Data comparability: issue with various coding lists, e.g. road traffic accident

- **ICD10 – 4 character:**


- **ICD10 – 3 character:**

  V01:V04, V06, V09:V80, V87, V89, V99

- **ICD10 – Mortality List 1 (condensed list)**
  - 1096 (V01:V99) Land transport accidents
BANG!

Wha--? Who are you? Where did you come from?

I'm Model man, I provide advice to statisticians in need. Don't be afraid.
How did we go about with the estimation?

Table 1. ECMT standardized 30-day road crash fatality adjustment factors

<table>
<thead>
<tr>
<th></th>
<th>30-DAY TOTAL</th>
<th>ADJUSTMENT FACTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON THE SCENE/1 DAY</td>
<td>77%</td>
<td>1.30</td>
</tr>
<tr>
<td>3 DAYS</td>
<td>87%</td>
<td>1.15</td>
</tr>
<tr>
<td>6 DAYS</td>
<td>92%</td>
<td>1.09</td>
</tr>
<tr>
<td>7 DAYS</td>
<td>93%</td>
<td>1.08</td>
</tr>
<tr>
<td>30 DAYS</td>
<td>100%</td>
<td>1.00</td>
</tr>
<tr>
<td>365 DAYS</td>
<td>103%</td>
<td>0.97</td>
</tr>
</tbody>
</table>
Classification of countries

Group 1: Countries with good vital registration/death registration data

Group 2: Countries with other sources of information or causes of death

Group 3: Countries with population less than 150,000

Group 4: Countries without eligible death registration data
Group 1: Countries/areas with good VR data

- Completeness for the year estimated at 80% or more

- Average completeness for the decade including the country-year was 80% or more.
Group 1: Countries/areas with good VR data

Argentina, Australia, Austria, Azerbaijan, Bahamas, Bahrain, Barbados, Belarus, Belgium, Belize, Brazil, Bulgaria, Canada, Chile, China (14, 15), Colombia, Costa Rica, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Estonia, Fiji, Finland, France, Georgia, Germany, Greece, Guatemala, Guyana, Hungary, Iceland, Ireland, Israel, Italy, Jamaica, Japan, Kazakhstan, Kuwait, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Maldives, Malta, Mauritius, Mexico, Montenegro, Netherlands, New Zealand, Norway, Oman, Panama, Paraguay, Philippines, Poland, Portugal, Qatar, Republic of Korea, Republic of Moldova, Romania, Russian Federation, Saint Lucia, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Suriname, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Trinidad and Tobago, Turkey, United Kingdom, United States of America, Uruguay, Uzbekistan, West Bank and Gaza Strip
Group 2: Countries with other sources of cause of death information

• For India, Iran, Thailand and Viet Nam, data on total deaths by cause were available for a single year or an earlier recent single year or group of years.
Group 3: Countries with population less than 150,000

- Andorra, Antigua and Barbuda, Cook Islands, Dominica, Kiribati, Marshall Islands, Micronesia (Federated States of), Monaco, Palau, Saint Vincent and Grenadines, San Marino, Seychelles, Tonga
Group 4: Countries without eligible death registration data

- Negative binomial regression

\[ \ln N = C + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \ln Pop + \epsilon \]
Group 4: Countries without eligible death registration data

Afghanistan, Albania, Algeria, Angola, Armenia, Bangladesh, Benin, Bhutan, Bolivia (Plurinational State of), Bosnia and Herzegovina, Botswana, Burkina Faso, Cabo Verde, Cambodia, Cameroon, Central African Republic, Chad, Congo, Côte d’Ivoire, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Honduras, Indonesia, Iraq, Jordan, Kenya, Lao People’s Democratic Republic, Lebanon, Lesotho, Liberia, Libya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Peru, Rwanda, Samoa, Sao Tome and Principe, Saudi Arabia, Senegal, Sierra Leone, Solomon Islands, Somalia, Sri Lanka, Sudan, Swaziland, Tajikistan, Timor-Leste, Togo, Tunisia, Turkmenistan, Uganda, United Arab Emirates, United Republic of Tanzania, Vanuatu, Yemen, Zambia, Zimbabwe
### Independent variables used

<table>
<thead>
<tr>
<th>Independent variables</th>
<th>Description</th>
<th>Included in models</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(GDP)</td>
<td>WHO estimates of Gross Domestic Product (GDP) per capita (international dollars or purchasing power parity dollars, 2011 base)</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>ln(vehicles per capita)</td>
<td>Total vehicles per 1000 persons</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>Road density</td>
<td>Total roads (km) per 1000 hectares</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>National speed limits on rural roads</td>
<td>The maximum national speed limits on rural roads (km/h) from WHO questionnaire</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>National speed limits on urban roads</td>
<td>The maximum national speed limits on urban roads (km/h) from WHO questionnaire</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>Health system access</td>
<td>Health system access variable (principal component score based on a set of coverage indicators for each country)</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>Alcohol apparent consumption</td>
<td>Liters of alcohol (recorded plus unrecorded) per adult aged 15+</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>Population working</td>
<td>Proportion of population aged 15-64 years</td>
<td>Models A, B, C</td>
</tr>
<tr>
<td>Percentage motorbikes</td>
<td>Per cent of total vehicles that are motorbikes</td>
<td>Model B</td>
</tr>
<tr>
<td>Corruption index</td>
<td>Control of corruption index (units range from about -2.5 to +2.5 with higher values corresponding to better control of corruption)</td>
<td>Model B</td>
</tr>
<tr>
<td>National policies for walking /cycling</td>
<td>Existence of national policies that encourage walking and / or cycling</td>
<td>Model C</td>
</tr>
<tr>
<td>Population</td>
<td>Total population (used as offset in negative binomial regression)</td>
<td>Models A, B, C</td>
</tr>
</tbody>
</table>
Reported deaths VS estimated deaths (per 100 000), 2013

<table>
<thead>
<tr>
<th>Region</th>
<th>Reported deaths</th>
<th>Estimated deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>2.5</td>
<td>1.2</td>
</tr>
<tr>
<td>Americas</td>
<td>1.5</td>
<td>1.3</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Europe</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>3.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>3.2</td>
<td>1.0</td>
</tr>
<tr>
<td>World</td>
<td></td>
<td>12.5</td>
</tr>
</tbody>
</table>

World Health Organization
Health statistics and information systems

Estimates for 2000–2015

CAUSE-SPECIFIC MORTALITY

The latest global, regional and country-level cause-specific mortality estimates for the year 2000, 2005, 2010 and 2015 are available for download below.


A summary of data sources and methods is available below. Due to changes in data and some methods, the 2000–2015 estimates are not comparable to previously-released WHO estimates.

Related links

- WHO methods and data sources for global causes of death, 2000–2015

GLOBAL AND BY REGION

Summary tables of mortality estimates by cause, age and sex, globally and by region, 2000–2015

- Global summary estimates: xls, 1.12Mb
- WHO regions: xls, 2.61Mb
- World Bank income groups: xls, 2.12Mb
- World Bank regions: xls, 2.86Mb
- SDG regions: xls, 2.15Mb
- MDG regions: xls, 2.43Mb
Health statistics and information systems

WHO Mortality Database

The WHO Mortality Database is a compilation of mortality data by age, sex and cause of death, as reported annually by Member States from their civil registration systems.

- Access the online database
  Number of deaths and age-standardized death rates by country, year, cause, sex and age are presented in a user-friendly application. Cause-of-death data coded according to the ICD-9 and ICD-10 are provided since 1979 to date. Population and live births are provided.

- Query the online database
  Cause of Death Query Online (CoDQL) is a user-friendly tool that allows users to extract easily cause-of-death data by country, year, sex and age. Data since 1950 to date as coded according to the ICD-7, 8, 9 and 10 are available. The tool also enables detailed causes of death to be aggregated to form broader cause-category according to the users’ need.

- Download raw data files
  Basic underlying raw data files, together with the necessary instructions, file structures, code reference tables, etc. These data can be used by institutions and organizations which need access at this level of detail, mainly for research purposes, AND have the required information technology (IT) resources to use this information.
Follow these steps:

Click on "Select parameters" to open dialogue window for selecting countries, indicators and time points. Click on a box with sign+ in front of indicator group title to access the list of indicators. Select required indicators, countries and years by ticking appropriate boxes in front of their titles and then click on OK.

Select required graphical or tabular data display option from the menu.

Repeat the above steps to select and display data on other indicators, countries or time points.

Click on Definitions to view definitions and notes on data quality and sources for selected indicators.

Check Help for more detailed instructions. Make sure that your browser allows popup windows from this web site.
Conclusion

• This multi-method approach has been used for three reports
• It is continuously being improved
• We welcome your feedback on how to make it better
References

- Global Status Report on Road Safety

- Global Health Estimates

- WHO Mortality Database
Thank you for your attention

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