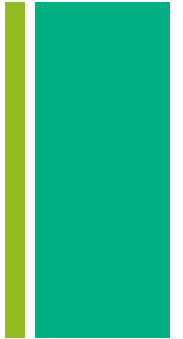




WHO process for generating estimates for road traffic fatalities for 2018 Global Status Report



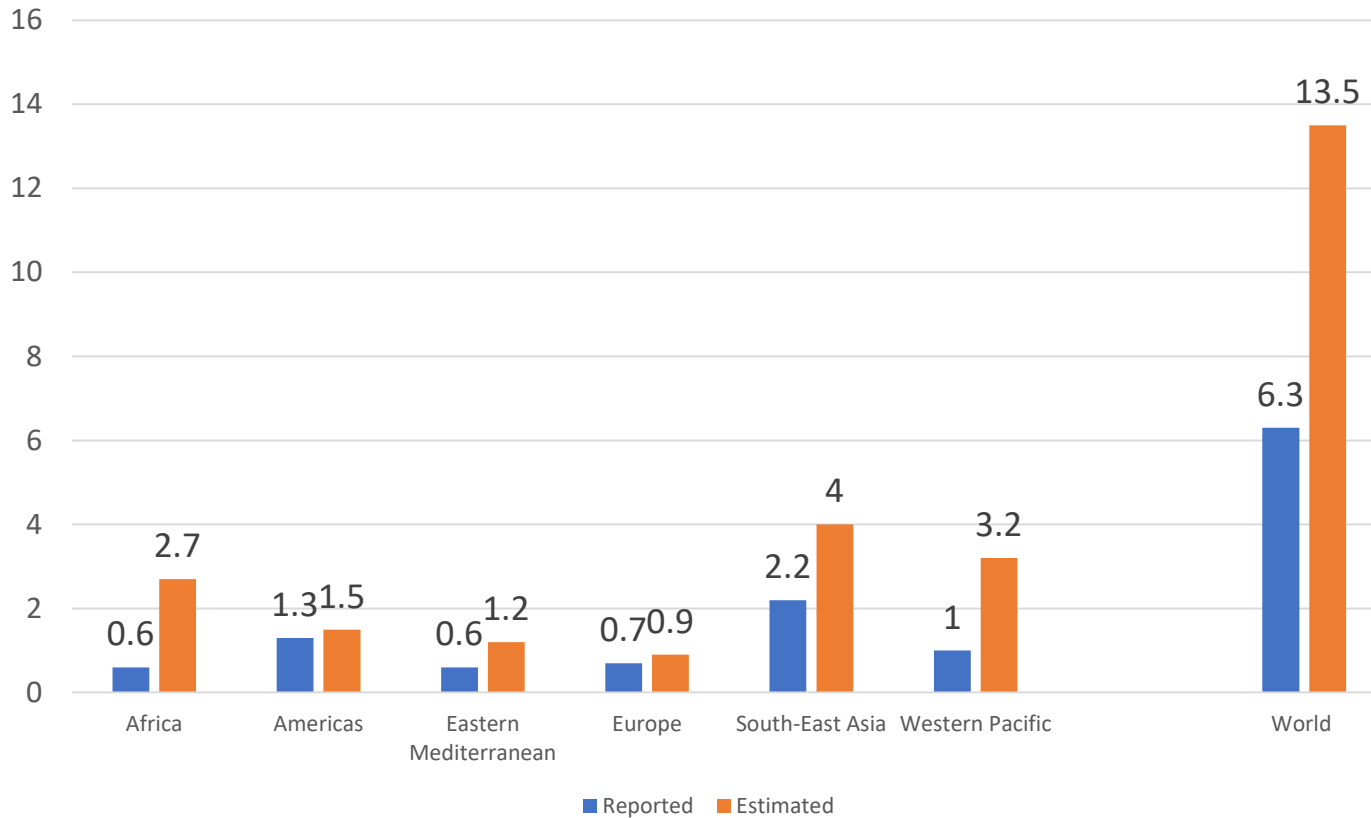
+ GSRRS Fatality Data



- 3 key data points for road traffic fatalities presented in GSRRS:
 - Data reported by member states (through consensus process), most often based on police data
 - WHO estimate based on CRVS/modelling (depending on availability of data)
 - Rate of road traffic deaths per 100,000 population (based on WHO estimate)



Number of road traffic deaths reported and estimated





Situation in ASEAN: Progress

2018 Global Status Report on Road Safety

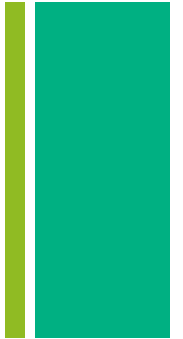


	GSRRS 3 (2015) Reported Deaths	GSRRS 4 (2018) Reported Deaths	Change since 2015
Cambodia	1950	1852	(-)98
Indonesia	26416	26181	(-)235
Lao PDR	910	1086	(+)176
Malaysia	6915	7152	(+)237
Myanmar	3612	4887	(+)1275
Philippines	1513	10012	(+)8499
Singapore	159	141	(-)18
Thailand	14059	21745	(+)7686
Viet Nam	9156	8417	(-739)



Situation in ASEAN: Progress

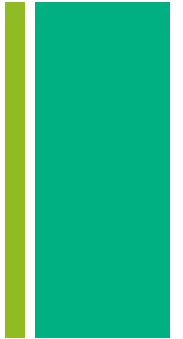
2018 Global Status Report on Road Safety



	GSRRS 3 (2015) Reported Deaths	GSRRS 4 (2018) Reported Deaths	GSRRS 4 (2018) WHO estimates	Change since 2015
Cambodia	1950	1852	2803	(-)98
Indonesia	26416	26181	31726	(-)235
Lao PDR	910	1086	1120	(+)176
Malaysia	6915	7152	7374	(+)237
Myanmar	3612	4887	7815	(+)1275
Philippines	1513	10012	12690	(+)8499
Singapore	159	141	155	(-)18
Thailand	14059	21745	22491	(+)7686
Viet Nam	9156	8417	24970	(-739)



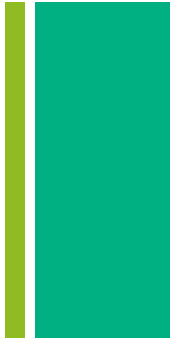
Why does WHO generate an estimate for road traffic fatalities?



- WHO generates estimates for all causes of death as part of its Global Health Estimates (GHE) that is produced by the Department of Information, Evidence and Research.
- The GHE is done every 2-3 years and enables comparisons of different causes of death (i.e. relative burden of road traffic deaths compared to deaths due to Malaria or Diabetes). This is the basis of rankings of leading causes of death which are used for priority setting.
- These estimates also enable comparisons across countries as a standardized definition of road traffic death is applied to all countries; this enables a global count of the number of deaths worldwide (1.35 million in 2016)



How does WHO generate the estimate for road traffic fatalities



- The GHE are based on civil registration and vital statistics (CRVS) data that is received from Member States
- CRVS data is used because it contains data on all causes of death and is not specific to anyone cause and it consolidates data from multiple sources within a country.
- Coding of causes of death in CRVS data is based on the International Classification of Diseases (ICD)



How does CRVS data compare to other data on road traffic deaths

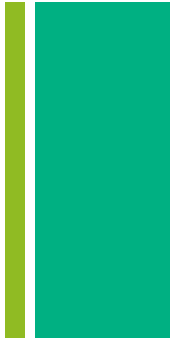


- In many countries, the number of deaths coded as road traffic death in CRVS is different than the number identified in police data

Country	Police data	CRVS_raw	Difference %	Year
Canada	1858	1965	5.8	2015
Chile	1675	2066	23.3	2016
Cuba	750	952	26.9	2016
Greece	824	995	20.8	2016
Hungary	607	768	26.5	2016
Japan	4867	5001	2.8	2015
Portugal	563	662	17.6	2016



Civil Registration & Vital Statistics



- The availability of CRVS/DR data varies greatly among countries and WHO has had to develop a methodology for generating estimates according to the availability of data

- 4 Groupings of countries :
 - GROUP 1: Countries with good CRVS/DR data (Russian Federation)
 - GROUP 2: Countries with alternative sources of death data
 - GROUP 3: Countries with populations of less than 150,000
 - GROUP 4: Countries without CRVS/DR data



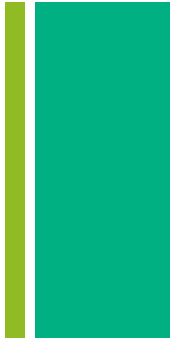
GSRRS GROUP 1 Countries



- Coverage estimated to be at 80% or more
- A slight adjustment made on reported CRVS numbers to account for unidentified deaths and coverage

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

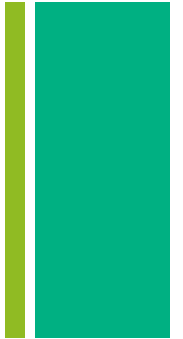
+ GSRRS GROUP 2 Countries



- Countries with alternative sources of death data or with coverage lower than 80%
- Projection made from previous results using existing trends
- India, Iran, Thailand and Vietnam



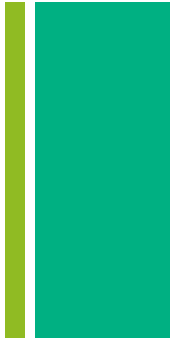
GSRRS GROUP 3 Countries



- Countries with small populations where the number of road traffic deaths is very low
- Reported data is used for WHO estimate
- Island states: Andorra, Antigua and Barbuda, Cook Islands, Dominica, Kiribati, Marshal Islands, Micronesia (Federated States of), Monaco, Palau, Saint Vincent and Grenadines, San Marino, Seychelles, Tonga



GRSSR GROUP 4 Countries



- Countries without eligible death registration data
- Negative binomial regression:

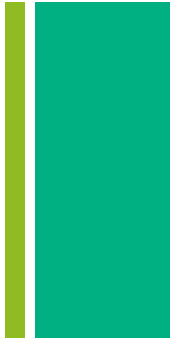
$$\ln N = C + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \ln Pop + \varepsilon$$

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	Description	Source of information	Included in models
ln(GDP)	World Development Indicators 2017) and WHO estimates of Gross Domestic Product (GDP) per capita (international dollars or purchasing power parity dollars, 2011 base)	World bank and WHO database	Models A, B, C
ln(vehicles per capita)	Total vehicles per 1000 persons	GSRRS surveys and WHO database	Models A, B, C
Road density	Total roads (km) per 1000 hectares	International Futures database	Models A, B, C
National speed limits on rural roads	The maximum national speed limits on rural roads (km/h) from WHO questionnaire	GSRRS survey	Models A, B, C
National speed limits on urban roads	The maximum national speed limits on urban roads (km/h) from WHO questionnaire	GSRRS survey	Models A, B, C
Health system access	Health system access variable (principal component score based on a set of coverage indicators for each country)	Institute for Health Metrics and Evaluation dataset	Models A, B, C
Alcohol apparent consumption	Liters of alcohol (recorded plus unrecorded) per adult aged 15+	WHO database	Models A, B, C
Population working	Proportion of population aged 15-64 years	World Population Prospects 2016 revision (UNDESA)	Models A, B, C
Percentage motorbikes	Per cent of total vehicles that are motorbikes	GSRRS survey	Model B
Corruption index	Control of corruption index (units range from about -2.5 to +2.5 with higher values corresponding to better control of corruption)	World Bank (Kaufmann et al 2009), International Futures database	Model B
National policies for walking /cycling	Existence of national policies that encourage walking and / or cycling	GSRRS survey	Model C
Population	Total population (used as offset in negative binomial regression)	World Population Prospects 2016 revision (UNDESA)	Models A, B, C



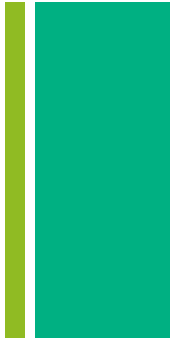
Factors that impact the WHO estimate for Group 1 countries including the Russian Federation



- The year for which CRVS data is available
- Proportion of unidentified or ill-identified causes of deaths
- The coverage of the CRVS data (how much of the population it covers)



Year for which data is available

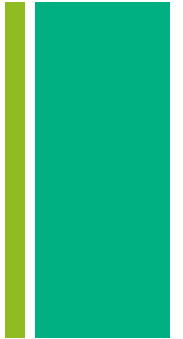


- If data is available for the year for which the estimate is being made, no additional work is done.
- If data is not available for the year for which the estimate is being made, a projection is made based on existing trends

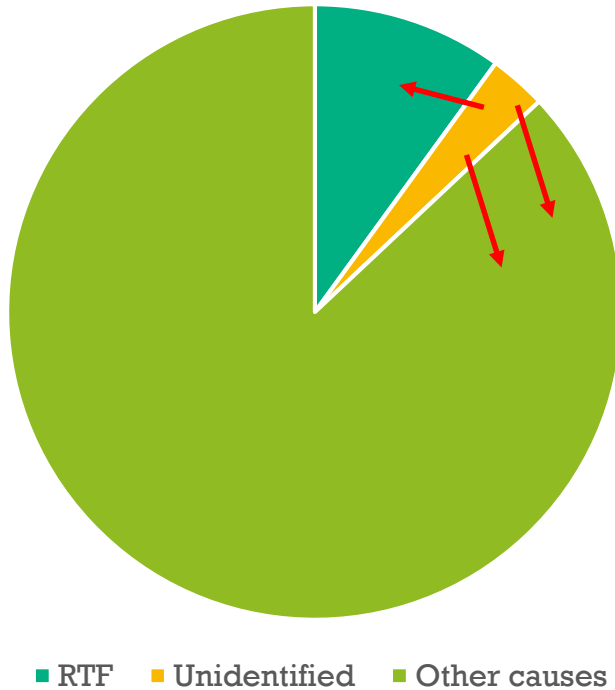
■ Ex:

2007	46676	2007	46676
2008	42262	2008	42262
2009	35937	2009	35937
2010	34099	2010	34099
2011	35051	2011	35051
2012		2012	35793
2013		2013	34558
2014		2014	34479
2015		2015	29557

+ Unidentified causes of deaths

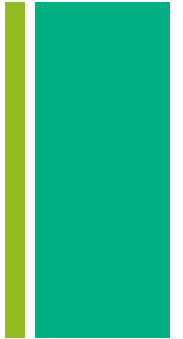


Road Traffic Deaths (CRVS)

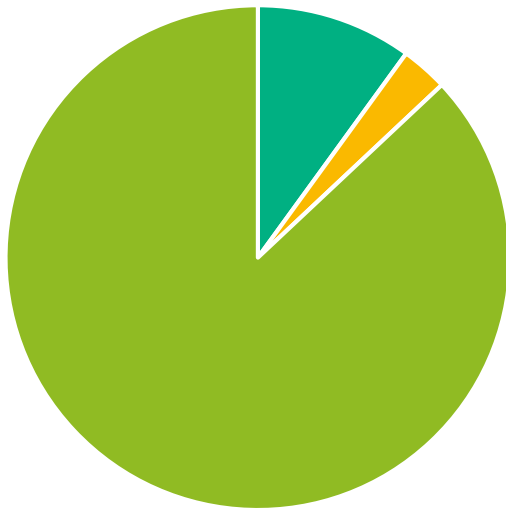


Deaths with unidentified causes need to be distributed among other causes, including road traffic

+ Unidentified causes of deaths

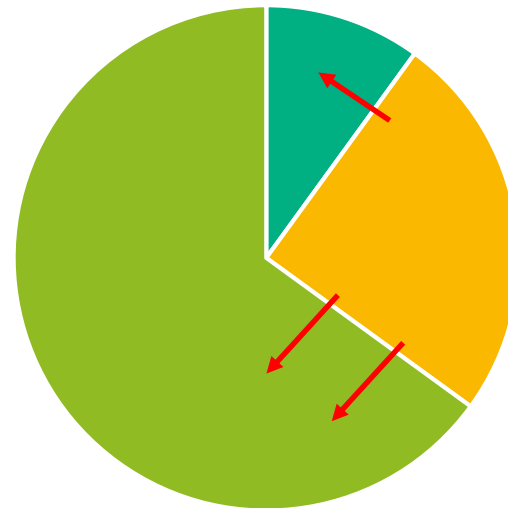


Road Traffic Deaths (CRVS)



■ RTF ■ Unidentified ■ Other causes

Road Traffic Deaths (CRVS)

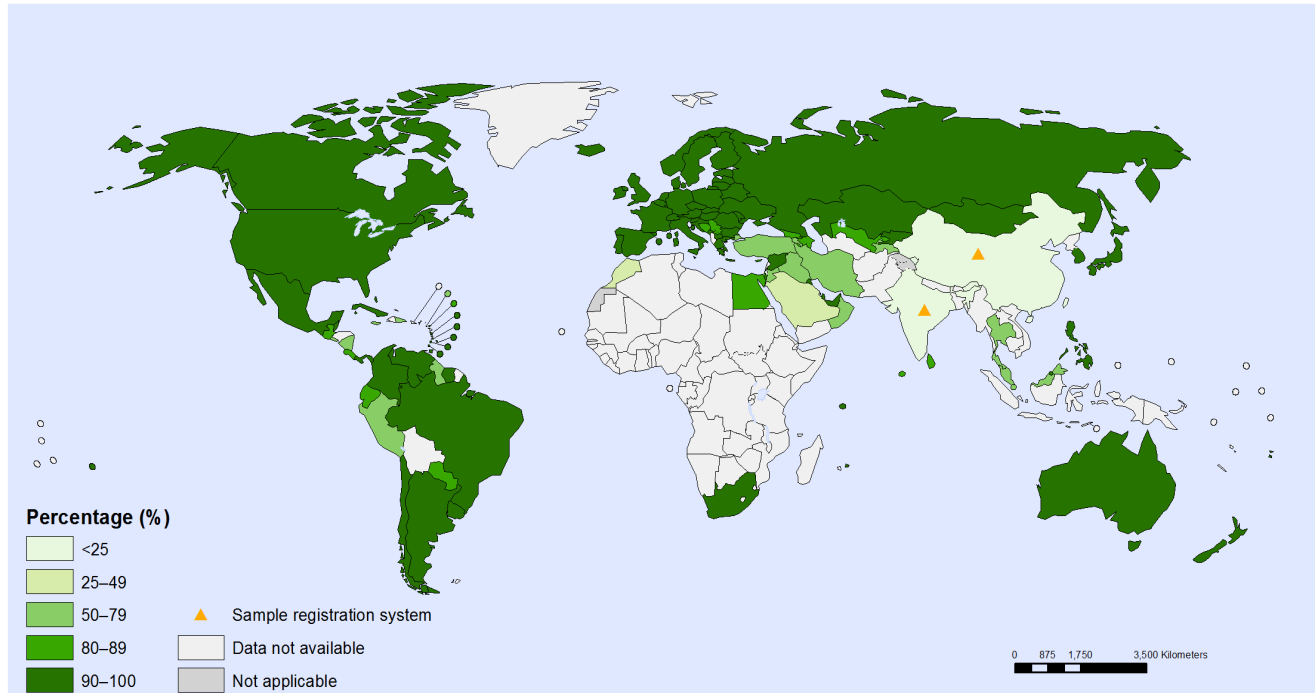
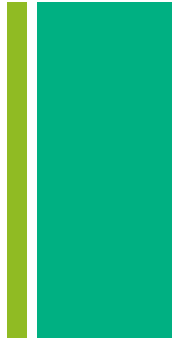


■ RTF ■ Unidentified ■ Other causes

The greater the number of deaths with unidentified causes, the greater the adjustment to the raw CRVS estimate



Coverage of CRVS



The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization



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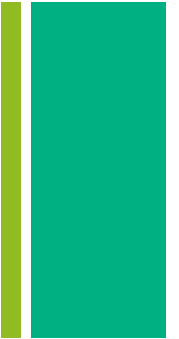
The higher the coverage of CRVS, the smaller the adjustment

+ Perfect scenario

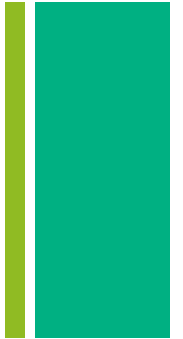
- Year of data = year of estimate: no projection
- Unidentified causes of death = 0: no adjustment
- Coverage of data = 100%: no adjustment



- The number of deaths coded as road traffic in CRVS data = WHO estimate for road traffic fatality



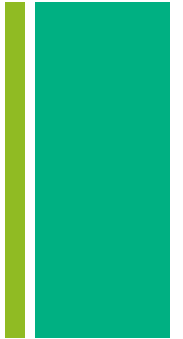
+ Example of Austria



	GSRRS 4 (2018) Reported	GSRRS 4 (2018) WHO estimate
	432	452
Austria	20	

- Year for which CRVS data available: 2016
- Unidentified deaths: ~ < 15%
- Coverage of CRVS data: ~ 98%

+ Example of Austria (2016)

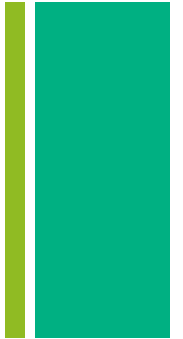


	GSRRS 4 (2018) Reported	GSRRS 4 (2018) WHO estimate
	432	452
Austria	20	

- 2016 CRVS Coded as Road Traffic Death (raw): (387)
- Adjustment factor for unidentified deaths: (1.147)
- Adjustment factor for completeness: (1.018)

Adjusted CRVS: $(387) * (1.147) * (1.018) = 452$

+ Example of Russian Federation

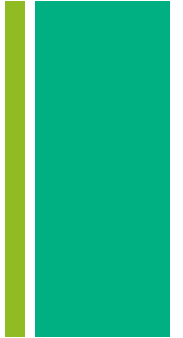


	GSRRS 4 (2018) Reported	GSRRS 4 (2018) WHO estimate
Russian Federation	20,308	25,969
	5,661	

- Year for which CRVS data available: 2011
- Unidentified deaths: ~ >15%
- Coverage of CRVS data: ~99%



Example of Russian Federation



- As CRVS data was only available through 2011, the estimate for 2016 was generated through 3 Steps:
 1. Generate estimate for 2011 using available CRVS data
 2. Generate trend using available police data
 3. Use trends to project number of deaths for years after 2011

+ Step 1: Generate estimate (adjusted CRVS) for 2011

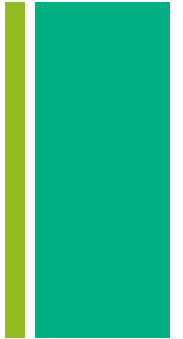
- Year for which CRVS data available: 2011
- Unidentified deaths: >15%
- Coverage of CRVS data: ~99%



- 2011 CRVS Coded as Road Traffic Death: 29,342
- Adjustment factor for unidentified deaths: (1.179)
- Adjustment factor for completeness: (1.013)

Adjusted CRVS for 2011: $(29,342) * (1,179) * (1,013) = 35,051$

+ Step 1: Generate estimate (adjusted CRVS) for 2007-2011

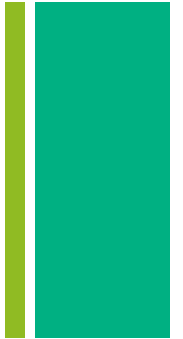


Year	CRVS Raw data *	Adjusted for undefined cases	Adjusted for completeness & undefined cases	Police Reported
2007	39138	46146	46676	33308
2008	35419	41761	42262	29936
2009	30107	35498	35937	27659
2010	28558	33671	34099	26567
2011	29342	34595	35051	27953

*Data received from the Russian Federation by WHO Department for Information, Evidence, and Research (IER); this is used to generate routine Global Health Estimates (GHE) for all causes of death



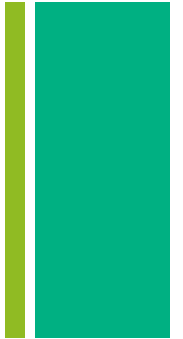
Step 2: Identify trend based on police data



Year	CRVS Raw data *	Adjustment for undefined cases	Adjustment for completeness & undefined cases	Police Reported
2007	39138	46146	46676	33308
2008	35419	41761	42262	29936
2009	30107	35498	35937	27659
2010	28558	33671	34099	26567
2011	29342	34595	35051	27953
2012				27991
2013				27025
2014				26963
2015				23114
2016				20308



Step 2: Identify trend based on police data



Year	CRVS Raw data *	Adjustment for undefined cases	Adjustment for completeness & undefined cases	Police Reported
2007	39138	46146	46676	33308
2008	35419	41761	42262	29936
2009	30107	35498	35937	27659
2010	28558	33671	34099	26567
2011	29342	34595	35051	27953

$$\text{Adj_coef} = (\text{RTD_VR_2009} + \text{RTD_VR_2010} + \text{RTD_VR_2011}) / (\text{Reported_2009} + \text{Reported_2010} + \text{Reported_2011})$$

$$(35,937 + 34,099 + 35,051) / (27,659 + 26,567 + 27,953) = 1.278747$$

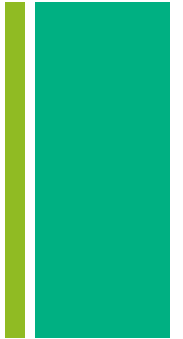


Step 2: Identify trend based on police data



Year	CRVS Raw data *	Adjustment for undefined cases	Adjustment for completeness & undefined cases	Police Reported	Historical trend
2007	39138	46146	46676	33308	
2008	35419	41761	42262	29936	
2009	30107	35498	35937	27659	
2010	28558	33671	34099	26567	
2011	29342	34595	35051	27953	
2012				27991	1.278747
2013				27025	1.278747
2014				26963	1.278747
2015				23114	1.278747
2016				20308	1.278747

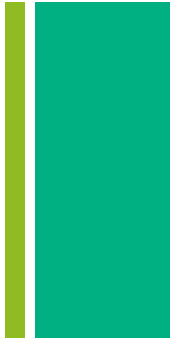
+ Step 3: use trend to project estimates for years for which data is not available



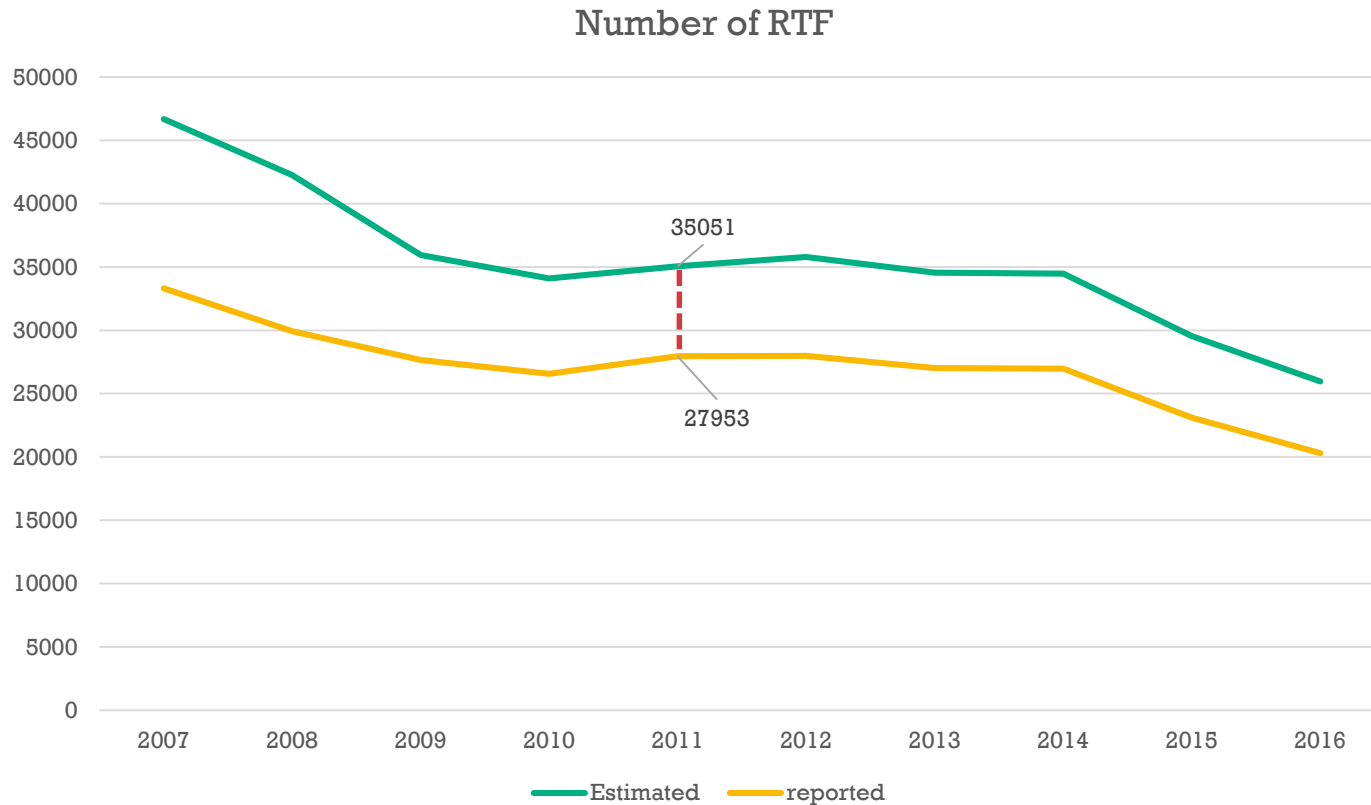
Year	CRVS Raw data *	Adjustment for undefined cases	Adjustment for completeness & undefined cases	Police Reported	Historical trend	Projection based on trend
2007	39138	46146	46676	33308		
2008	35419	41761	42262	29936		
2009	30107	35498	35937	27659		
2010	28558	33671	34099	26567		
2011	29342	34595	35051	27953		
2012				27991	1.278747	35793
2013				27025	1.278747	34558
2014				26963	1.278747	34479
2015				23114	1.278747	29557
2016				20308	1.278747	25969



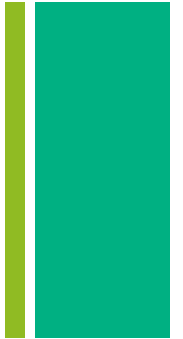
Example of Russian Federation



- Since no CRVS data was available beyond 2011, a projection using trends from the police reported data



+ Further Reflections



- Aim is to not to judge the validity of police data but to generate an estimate that enables comparisons with other causes of death
- Estimation processes for all models (IHME, GHE, GSRRS) rely on available data and is not perfect – as more data becomes available, estimates may be updated (change)
- Estimates should be taken as indicative of a range and not an exact figure – in the case of Russian Federation, what is more important is the downward trend showing significant reductions in the last decade which is consistent between police and the adjusted CRVS data



+ Thank you