ROAD TRAFFIC CRASH DATA Management Systems: International Best practices and recommendations for India

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Introduction

The need for evidence based strategies to address the growing public health burden of RTIs

➢ The Road Accidents impose a huge social and economic cost in terms of untimely deaths, injuries, disabilities and loss of potential income

➢ 1,54,732 persons were killed and 4,39,000 people were injured in 2019 in the Country (MoRTH 2020).

➢ Estimates by : Global Burden Disease : 254,000

➢ Estimates by World Health Organization: 299,100

➢ Need to review and improve the collection of relevant and reliable information of road traffic crashes
National Trend
MoRTH, NCRB

Persons Killed
1,54,732 (2019)
1,51,417 (2018)
147,913 (2017)
150,785 (2016)

Persons injured
4,39,000 (2019)
4,70,975 (2017)
4,94,624 (2016)
probably an underestimate for injuries, not all injuries are reported to the police.

Fatalities?
The extent of underreporting of road traffic deaths in India is not well understood.

- Global Burden of Diseases, Injuries, and Risk Factors Study, estimated that in 2017, 218,876 deaths (95% UI 201,734 to 231,141) due to road injuries occurred in India.

- A National Burden Estimates study estimates RTI deaths in 2017 in India to be 275,000. These two estimates are 45% and 82% higher than the MoRTH number.

- The official estimate of non-fatal RTI in 2016 was 494,624 which probably underestimates injuries requiring hospitalization by a factor of 5 and all injuries by a factor of 20.
Disaggregate data for targeted policies

Under reporting pedestrians
Motorcyclists

MoRTH (2018) data

Hsiao, M. et al. (2013) estimate

IIT Delhi estimate

Dandona et al. estimate (2017)
Highest number of fatal crashes amongst big states are in Uttar Pradesh, Maharashtra, Tamil Nadu and less fatal crashes are observed in Jharkhand, Kerala.
Fatalities in hilly states

Highest number of fatal crashes amongst hilly states are in Assam and very less Fatal crashes in Nagaland, Mizoram, Sikkim, Manipur.
Fatalities in UTs

Delhi has the highest number of Fatal Crashes among all the UT’s
Highest number of Fatalities per thousand population among big states are observed in Tamil Nadu, Haryana, Punjab and less Fatalities in Bihar.
Fatalities per 100 thousand population in hilly States

Highest number of Fatalities per 100 thousand population among hilly States are observed in Himachal Pradesh and Sikkim.
Fatalities per 100 thousand population in UTs

Highest number of Fatalities per 100 thousand population among the UT’s are observed in Goa and Puducherry.
Chennai has highest number of Fatal crashes followed by Bengaluru and Lucknow and Amritsar has lowest number of Fatal crashes
Fatalities per 100 thousand Population in million plus cities

Highest number of Fatalities per 100 thousand population is observed in Allahabad followed by Kanpur, Agra and Meerut and least in Kolkata and Mumbai.
## Total number of persons killed in road accidents on National Highway in States

<table>
<thead>
<tr>
<th>State</th>
<th>NH length (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>uttar pradesh</td>
<td>8,711</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>5,381</td>
</tr>
<tr>
<td>maharashtra</td>
<td>15,437</td>
</tr>
<tr>
<td>Karnataka</td>
<td>6,761</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>7,906</td>
</tr>
<tr>
<td>Bihar</td>
<td>4,839</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>6,286</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>7,884</td>
</tr>
<tr>
<td>Gujrat</td>
<td>5,017</td>
</tr>
<tr>
<td>West Bengal</td>
<td>2,998</td>
</tr>
<tr>
<td>Haryana</td>
<td>2,641</td>
</tr>
<tr>
<td>Punjab</td>
<td>2,769</td>
</tr>
<tr>
<td>Telangana</td>
<td>854</td>
</tr>
<tr>
<td>Odisha</td>
<td>4,837</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>3,232</td>
</tr>
<tr>
<td>Kerela</td>
<td>1,782</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>2,661</td>
</tr>
</tbody>
</table>

### Bar Chart

The bar chart shows the total number of persons killed in road accidents on National Highway in different states over the years 2015 to 2019. The length of the bars represents the number of deaths, with a color code for each year from 2015 to 2019.
Total number of persons killed in road accidents on National Highway in Hilly States

<table>
<thead>
<tr>
<th>State</th>
<th>NH (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Himanchal Pradesh</td>
<td>2,643</td>
</tr>
<tr>
<td>Sikkim</td>
<td>463</td>
</tr>
<tr>
<td>Arunanchal Pradesh</td>
<td>2,537</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>2,842</td>
</tr>
<tr>
<td>Assam</td>
<td>3,845</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>2,601</td>
</tr>
<tr>
<td>Mizoram</td>
<td>1,422.5</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>1,204</td>
</tr>
<tr>
<td>Tripura</td>
<td>3,786</td>
</tr>
<tr>
<td>Manipur</td>
<td>1,746</td>
</tr>
<tr>
<td>Nagaland</td>
<td>1,547</td>
</tr>
</tbody>
</table>
Highest number of fatal crashes amongst big states are Uttar Pradesh, Maharashtra and Tamil Nadu among hilly states are Assam, Himachal Pradesh and among UTs are Delhi and Goa.

Considering Fatalities per 100 thousand population highest number of Fatal crashes in big States are Tamil Nadu, Haryana, Punjab among hilly states are in Himachal Pradesh and Sikkim and among UTs are in Goa and Puducherry.

In National Highways highest number of Fatal crashes amongst big states are Uttar Pradesh and Tamil Nadu and in hilly states highest number of Fatal crashes are in Himachal Pradesh and Sikkim and among Uts are in Delhi.

In State Highways highest number of Fatal crashes in big cities are in Uttar Pradesh and Tamil Nadu and in hilly states are in Assam and Uttarakhand.
Data discrepancy
Proportion of road traffic fatalities by road user type in 6 Indian cities (IITD study) vs NCRB

<table>
<thead>
<tr>
<th>City</th>
<th>Per cent pedestrian fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agra</td>
<td>0</td>
</tr>
<tr>
<td>Amritsar</td>
<td>0</td>
</tr>
<tr>
<td>Bhopal</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Delhi</td>
<td>5</td>
</tr>
<tr>
<td>Ludhiana</td>
<td>3</td>
</tr>
<tr>
<td>Mumbai</td>
<td>10</td>
</tr>
<tr>
<td>Vadodara</td>
<td>6</td>
</tr>
<tr>
<td>Vishakhapatnam</td>
<td>17</td>
</tr>
</tbody>
</table>

Proportion of pedestrian fatalities NCRB (2015)
Traffic crash data recording and reporting process in India

Traffic Accident recording

Traffic Crash → Information received at the Police station → Visit to the site, diary entry → FIR filed → Manual/Electronic/CCTNS

Case file prepared → Site plan → Vehicle Inspection → Investigation for the court → Court/MACT

Traffic Accident Reporting

NCRB → SCRB → DCRB 13 tables → MoRTH(TRW) → State PWD → PWD District level, 17 tables
Accuracy of Police data?

- Fatalities ~ 5% under reported compared to hospital data
- Injury RTCs 15-20 times under reported
- Large variation between health ministry death registrations and police data
Shortcomings of police data

• National level tables (NCRB and MoRTH) for victims are based on “road user causing the accident, therefore pedestrians and bicyclists numbers are incorrect (lower than actual numbers)

• Location is available in the case file, not marked on the map for analysis and remedial measures
Levels of data collection for safety standards/policies

- **Base**
  - Police Data, Traffic police
  - Traffic Data, Injury coding, **specialists practitioners**

- **Intermediate**
  - Crash reconstruction
  - Specialists researchers

- **In-depth multidisciplinary causative**
  - Vehicle design standards, road furniture design, crash barriers
  - Traffic management strategies, road designs (cross sections)

- **Epidemiology of fatal crashes, fixing priorities**
The analyses of primary level data is expected to accomplish the following important functions:

1. To give perspective view of the RTC situation in terms of who is involved (the type of road user) where (Urban or rural area, road layout), when (day or night) and under what circumstances.

2. To enable trends to be examined, and provide a basis for comparison against which road safety workers may match their performance, either within or between state or national administrations.

3. To provide a basis for establishing priorities for action.
Past Efforts for improving RTC recording


• Electronic recording
Feedback from police personnel on the revised MoRTH(2017) Format

• Generally standardised recording format is not used in the police stations. Data at police station is recorded in FIR format, FIR-E format, post-mortem report and mechanical Inspection report are kept in the case files. It was recommended that photograph of the location should be attached. This should be added in the recording format.

• Local police department does not have enough people to fill up recording and reporting formats. Police officers concern is lack of staff for filling up the recording and reporting formats since this is a specialized task and cannot be done by ordinary police constables. Coordination is required between PWD and police.
Feedback from police personnel on the revised MoRTH(2017) Format

• Often, injury only crashes are not recorded. Fatal and serious injury cases should be investigated by SP level officers. Recording format to be used for improving investigation level combine with site plan.

• SP and SSP should monitor the fatal case recording.
Detailed formats have several missing entries:

*Example from selected cities-Vehicle Factors Missing*
Shortcomings of police data

• National level tables (NCRB) for victims are based on “road user causing the accident, therefore pedestrians and bicyclists numbers are incorrect (lower than actual numbers)

• Location is available in the case file, not marked on the map for analysis and remedial measures

• IPC 279, 304A, 336, 337, 338 and MVA sec. 185, 184 is used for RTAs. CRPC 174 for single vehicle crashes or no one to “blame” are not counted towards road traffic crash.
Data recording process in RADMS, Tamilnadu
Collaboration between Police, RTO, PWD.NHAi

Operating the System

1. Accident Occurrence
2. Manual FIR Recording
3. Data logging in System
4. Server at STPC
5. Data Entry by Transport Dept.
6. Data Entry by Highway Dept.
RADMS Evaluation

• Location of crashes identified

• Total number of deaths in RTAs differs depending on –Drivers, passengers, pedestrians

• Type of Impacting vehicle in collision can not be extracted

• Victim vs impacting vehicle matrix cannot be made
Conventional practices continue in Electronic format

Filling the ARF
There are 7 possible headers which have to be filled, namely, General Details, Location Details, Collision Details, Vehicle Details, Driver Details, Passenger Details and Vehicle Details. The computer operator first begins by filling the General Details. There are 150 fields to be filled, of which 68 are marked as mandatory.

First, a unique Crime Number is generated by the police department for the accident which is fed into the ARF. For the purpose of this system, it is nothing but the FIR number. The police officials are also required to analyse the event before filling the form to try to identify the major causes for the accident and propose counter remedial measures, which have to be filled in this section. From the feedback we got, in most cases, the causes are mentioned as Rash & Negligent driving, which is true for over 90% of the cases. In the general details, they also
**Shortcomings in current recording and reporting process**

<table>
<thead>
<tr>
<th>Index</th>
<th>Description of current shortcomings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Traffic crash reported under IPC (against an accuser), Minor injury and vehicle damage crashes usually not reported, many single vehicle crashes reported under CR Pc 174</td>
</tr>
<tr>
<td>2</td>
<td>Standardised format usually not followed, alcohol presence, use of helmets, seat belts, road details, chainage, speed and traffic information, victim age, not filled</td>
</tr>
<tr>
<td>3</td>
<td>CCTNS is under implementation, traffic crash related items cannot be filled in the current form.</td>
</tr>
<tr>
<td>4</td>
<td>Location details are often unclear, vehicle inspection report is to meet the insurance requirement, post mortem report does not have standardised injury codes</td>
</tr>
</tbody>
</table>
Shortcomings in current recording and reporting process

### Index

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#### Case file does not include details which are not admissible in the court.

#### 13 tables prepared manually, victim type based on accused vehicle

#### 17 tables prepared manually, many details reported which are not recorded regularly, victim type based on accused vehicle
International Best Practices
Fatality Analysis Reporting System (FARS), USA since 1975

- FARS was created by National Highway Traffic Safety Administration (NHTSA) in 1975, and maintained by National Center for Statistics and Analysis (NCSA).
- It provides data about fatal crashes involving all types of vehicles. It is used to identify highway safety problem areas, provide a basis for regulatory and consumer information initiatives, and forms the basis for cost and benefit analyses of highway safety initiatives.
- It is a census of fatal motor vehicle crashes with a set of data files documenting all qualifying fatalities that occurred within the 50 States, the District of Columbia, and Puerto Rico since 1975.
Important features of FARS

• **Data Sharing Cooperative Agreement with States**

  NHTSA has a cooperative agreement with an agency in each State’s government to provide information on all qualifying fatal crashes in the State. These agreements are managed by NCSA's FARS Program staff. Trained State employees, called “FARS Analysts,” are responsible for gathering, translating, and transmitting their State’s data to NCSA in a standard format.

• **Crash Inclusion Criteria in the FARS database**

  A crash had to involve a motor vehicle traveling on a trafficway customarily open to the public, and must have resulted in the death of a motorist or a non-motorist within 30 days of the crash.

• **Input Data for FARS Database**

  FARS data are obtained from various States’ documents, minimum data specified
Data sources used in FARS

- Death Certificates
- Police Crash Reports
- Vital Statistics and other State Records
- State Vehicle Registration Files
- Emergency Medical Service Reports
- Coroner/Medical Examiner Reports
- State Driver Licensing Files
- State Highway Department Data
FARS Process

1. Data Collection from the states
2. Data Coding and Validation in Data Files
3. Data entering into elements of Data file
4. Creation of Electronic Data for Public Access in SAS format
Traffic Accident Analysis System, South Korea

TAAS
Traffic Accident Analysis System

Integrating all accident data from each organisation.
Providing the accident input & management system on the basis of standard format

Managing and standardising input management system.
Unification of channel of providing road accident data by the police

Sharing the accident data based on geographic information system (GIS) and the accident analysis data
Swedish Traffic Accident Data Acquisition (STRADA)

• STRADA (Swedish Traffic Accident Data Acquisition) is a national information system containing data on traffic accidents and injuries occurring in the Swedish road transport system.

• The data in STRADA is based on two separate sources: traffic accident reports provided by the police, and medical reports provided by the hospitals that are part of the STRADA system.

• The Swedish Transport Agency is the authority responsible for STRADA. Nationwide reporting to STRADA by the police has been carried out continuously since 2003 (early trials of the system began in 1999). Hospital reporting to STRADA has increased gradually from 29 hospitals in 2003 to 68 hospitals in 2012.
The Australian Road Deaths Database provides basic details of road transport crash fatalities in Australia as reported by the police each month to the State and Territory road safety authorities. It is published by the Bureau of Infrastructure, Transport and Regional Economics.

The Australian Road Deaths Database (ARDD) is maintained and published by BITRE (Bureau of Infrastructure, Transport and Regional Economics). It commenced in 1989 and is updated on a monthly basis.
Lessons from International best practices I

• Given the difficulty and complexity of improving reporting and recording of all crash and injury severity type, most countries have focused on improving reporting of fatal crashes by combining different data sources.

• Elvik and Mysenn (1999) concluded from 13 EU countries
• Reporting is incomplete at all levels of injury severity. 95 percent for fatal injuries, 70 percent for serious injuries (admitted to hospital), 25 percent for slight injuries (treated as outpatient), and 10 percent for very slight injuries (treated outside hospitals). There are large differences among countries in the reporting level at a given level of injury severity.
Lessons from International best practices I

• Reporting level tends to be highest for car occupants and lowest for cyclists. This pattern is consistent across countries. The reporting of single-vehicle bicycle accidents is particularly low—below 10 percent in all countries studied.
Lessons from International best practices II

- Police data form the basis for traffic crash database. Police data under-reports non-fatal crashes.
- Police reporting systems can be improved by using digital formats and simplified formats.
- For detailed data base which has details on injury patterns, details of location and traffic, police data has to be linked with other data sources.
- A different level of expertise is needed to create a more detailed data base. Most countries have created specialised institutions to link police data with other data sources.
Lessons from International best practices III

• Specialised institutions are able to create accurate and reliable data useful for various levels of policy making.

• Often police data is linked with hospital data base and other reliable sources like census to complete the required data. This requires employing specialists. This is difficult for all police reported crashes.

• Selected crashes are studied in more detail by specialists.

• National levels institutions have been funded by the national governments to create data on fatal crashes and made publicly available for researchers. This improves the usefulness and accuracy of data.
Recommendations I

- **Primary Level: Police recording and reporting**
  - Standardised format recommended by the MoRTH (2017) can be added to the list of documents in the case file.
  - The format should be filled up by the investigating officer.
  - The format can be completed when the investigation is completed since most of the information is available at that time.
  - The recommended format should be analysed after one year and revised to simplify recording of important crash details.
  - Traffic accident location must be recorded by geo codes available on any smartphone or other devices.
Recommendations II

Computer recorded FIR(CCTNS)

• MoRTH and Home ministry have to collaborate to include minimum required fields in the standardised data recording format in CCTNS.

• Until this time, Standardised format recommended by the MoRTH (2017) can be added to the list of documents in the case file.

• Electronic recording systems have to be evaluated by experts. RADMS in Tamilnadu, iMAAP Himachal Pradesh. Shortcomings have to be corrected by the system designers.

• Data can be made available to researchers and policy makers after hiding the id details of the road users involved. This will increase system usefulness and improvements in future.
Recommendations III

Hospital Data

• Hospitals can use the standardized simple format for MLC. Ministry of health and WHO have made suggestions for this. Hospital data has to be linked with the police case file. For this a copy of the hospital record can be kept in the police case file.

DCRB (District Crime Record Burea) report

• Standardised data recording formats should be used for preparing 13 tables.

• Table identifying type of victim should be titled “Type of victims” with clarification that victims are listed by the type of vehicle used by them at the time of crash. Pedestrian is a separate category.

• A copy of the standardised format should be sent to DCRB.
Recommendations IV

Ministry of Roads and Highways/State PWD/DCRB

- MoRTH can make simple excel based formats which can be generated from the standardised recording formats.

- State PWD should establish a traffic safety cell with permanent staff. Staff must have specialised training.

- The State PWD should prepare monthly reports in the standardised formats based on recording forms from the local police stations. As far as possible, DCRB and MoRTH should have similar formats.

- SCRB may be instructed through Home Ministry to prepare separate database for fatal crashes. Additional staff may be hired to separate fatal crashes, verify the incomplete and missing details from local police stations.
Recommendations V

Hospital Data

• At state level a nodal hospital has to be identified with additional budget and trained staff to monitor data collected in trauma centres and other hospitals.

Tertiary data (in-depth data for selected cases)

• Centres of excellence to be established at selected IITs/NITs which can contribute to continuous data collection and analysis at regional and national level.

• COEs have to conduct in-depth investigation on sample crashes. NSSO uses robust sampling methods to draw representative samples for the country. Some of these methods have to be used for selecting sample crashes for detailed investigation.
Thanks

Questions?