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WHO COLLABORATING CENTRE
INDIAN INSTITUTE OF TECHNOLOGY DELHI

T R I P - CENTRE **BULLETIN**
TRANSPORTATION RESEARCH & INJURY PREVENTION CENTRE
VOL 2 NO. 1

PUBLICATIONS

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Excerpts from: CYCLING BEHAVIOUR IN 17 COUNTRIES ACROSS 6 CONTINENTS: LEVELS OF CYCLING, WHO CYCLES, FOR WHAT PURPOSE AND HOW FAR?

Goel R., Goodman A., Aldred R., Nakamura R., Tatah L., Garcia L M.T., & Woodcock J

We found a strong positive association between the level of cycling and women's representation among cyclists. In almost all geographies with cycling mode share greater than 7% women made as many cycle trips as men, and sometimes even greater. The share of cycling trips by women is much lower in geographies with cycling mode shares less than 7%. Among the geographies with higher levels of cycling, children (<16 years) are often overrepresented. Older adults (>60 years) remain underrepresented in all geographies but have relatively better representation where levels of cycling are high. In low-cycling settings, females are underrepresented across all the age groups, and more so when older than 16 years. With increasing level of cycling, representation of females improves across all the age groups, and most significantly among children and older adults.

Clustering the cities and countries into homogeneous cycling typologies reveals that high cycling levels always coincide with high representation of females and good representations of all age groups. In low-cycling settings, it is the reverse. Thus, with both comparative and demographically focused literature limited to a relatively small number of countries, we lack an international landscape of cycling prevalence in relation to demographic variation.

This study starts to fill this gap, reviewing cycling prevalence and trip characteristics alongside variation in age and gender.

With a focus on cycling levels, trip characteristics, and demographics of the users, we address the following research questions:

1.What is the mode share of cycling across countries and cities for all trips, and for work and non-work trips?

2.How does cycling mode share by distance vary across countries and across cities and how does this relate to level of cycling?

3.How does cycling mode share for age and gender groups differ across countries and across cities, and does this relate to cycling levels?

4.What is the interaction between age and gender representation of cyclists, and how does this vary?

5.Can we establish a global typology of cities based on level of cycling, and representation of gender and age among cyclists?

The distance distribution of cycling seems unrelated to how common cycling is in a setting, although there is some evidence of regional differences. This is a novel finding as we did not find research studies comparing distance-based propensities across multiple different settings as we have done here. Since 50 to 60% of all trips (across all modes) are shorter than 5 km (see SI), a high propensity of cycling for shorter trips alone can result in high levels of cycling. We found that at higher levels of cycling, it is either as frequently used for non-work trips as for work trips, or even more frequently for non-work trips. This is also to our knowledge a novel finding in cross-national context. It suggests that, to grow cycling, a focus beyond the commute to work may be needed; which fits with greater age and gender equity, given patterning of trip purposes by age and gender (Collins and Tisdell 2002; Shaw et al. 2020).

Our study, like other comparative work (e.g. Götschi et al., 2015; Pucher & Buehler, 2006,Pucher, Garrard, and Greaves 2011) highlights associations between cycling levels and age and gender equity in cycling. Places with cycling levels greater than 7% have good representation of women as well as good representation of children and the working age group, and older adults are reasonably represented. In places with lower levels of cycling, women are always a minority and children and/or older adults are often severely under-represented. These findings imply that, in low-cycling cities, developing cycling infrastructure to meet the observed demand (e.g. middle-aged men commuting to work) may perpetuate gender and age inequalities. It is therefore important that evaluations of cycling policies should not only focus on overall use but also usage by gender and age, to ensure equitable growth in cycling.

Our cycling typologies provide further insight into equity and cycling. The three low-cycling clusters have high levels of gender inequality, suggesting that the path towards higher cycling levels must involve addressing gender inequalities in cycling. If this is done, the rewards are potentially great: cluster 5 shows an over-representation among women, thus the suppressed demand among this group is much larger than among men. Age shows somewhat different patterns. Some lower-cycling contexts have achieved higher levels of age equity for older adults or for children (but not, generally, for both). The highest-cycling contexts have generally good age equity although there is some variation, but the fourth cluster (containing contexts with medium levels of cycling – near 10% on average mode share) has notable over-representation among children. However, the same is true of some contexts (e.g. USA; Brisbane, Australia) in low-cycling Cluster 3. Thus, it seems possible to have cycling stuck at low levels alongside relatively good representation of children among cyclists, while the same is not true for women. Perhaps this is not surprising given the association of cycling with childhood, which can be a barrier to its consideration as a mainstream transport mode (Aldred 2012).

Goel, et al, (2022). Transport News 42(1) 58-81

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Excerpts from SAFETY EFFECTS OF PAVED SHOULDER WIDTH ON A FOUR-LANE DIVIDED RURAL HIGHWAY IN INDIA: A MATCHED CASE-CONTROL STUDY

Laxman Singh Bisht , Geetam Tiwari

The impact of shoulder widths on victims of motorized two-wheelers (MTW) users, slow-moving vehicles and rear-end fatal crashes were also analyzed. The study stretch was divided into segments of 100 m. Each segment was linked to the traffic volume, speed, geometric characteristics, and roadside hazards characteristics. Analysis of the crash data revealed that 39% of the total crashes are due to rear-end collisions, mostly occurring at night time. The model results are interpreted concerning segments with no shoulder as the baseline category. Model results suggest that paved shoulder has safety benefits for all road users up to 1.5 m shoulder width. The provision of paved shoulders reduced the risk of all fatal crashes and improved the safety of pedestrians and slow-moving vehicles.

This study assessed the safety effect of paved shoulder width on the frequency of fatal crash types on a divided four-lane rural highway in Punjab state of India. The impact of the other variables related to cross-sectional elements and ADT was also accounted for. The matched C-C study sample consists of a total of 408 segments for both types of crashes. In the matched dataset, there were 153 fatal crash segments, and 59 rear-end fatal crash segments accounted for in the year 2016 to 2018. A matched C-C method was employed to calculate the OR for paved shoulder width categories. Speed was used as a matching variable, and controls and cases segments were matched with a ratio of 1:4.

Crash characteristics on the studied highway revealed that rear-end collisions have a significant share in the total fatal crashes. VRUs, especially MTWs are at a higher risk on the studied highways. Cars and Buses are involved in most fatal crashes. Nighttime fatal crashes have a higher share in the total fatal crashes. The estimated OR results for paved shoulder categories suggest that providing paved shoulder till 1.5 m is good for safety compared to no shoulder scenario. The safety benefit of the paved shoulder is consistent with the increase in the width for all fatal crashes and good for the safety of slow-moving vehicles and VRUs as well. However, in rear-end only fatal crashes, the impact of shoulder-width more than 1.5 m is detrimental to safety. Likewise, for MTW, the wide shoulder more than 2.0 m widths are not safe.

However, in this study, results were not statistically significant due to the smaller number of cases. Hence, to get concrete results availability of a sufficient number of cases is mandatory. This research makes a strong case for developing a rich database for road safety risk factors in India. Such databases would help in conducting advanced research, promoting research-based findings and interventions to prevent crashes. It is recommended that a dedicated crash data recording system should be developed within each state's police department. Moreover, to deal with the underreporting of crashes, the hospital databases and police databases should be linked and updated timely.

This study was a unique attempt to assess the safety effectiveness of the paved shoulder in case of heterogeneous traffic on a divided four-lane highway in India. The matched C-C method has proved to be an alternative method in the limited data availability scenario to assess the safety effects of the interventions. Hence, the outcomes of this study would help the road authorities to consider paved shoulder as one of the mitigation interventions to improve the safety of VRUs, especially MTW users and reduce the risk of fatal crashes on the divided highway. Furthermore, research on similar highways using detailed databases would be useful in future.

One of the well-studied cross-sectional elements of the highway is the shoulder and its characteristics. The impact of providing shoulder and, in particular, the change in shoulder width of a highway has been extensively studied (Zegeer et al., 1981; Frank Gross & Jovanis, 2007; Zeng et al., 2013; Gitelman et al., 2019; Pokorny et al., 2020). These studies have shown the safety benefits of providing a shoulder. The shoulder provides a recovery space to the errant vehicles and space for emergency manoeuvres and mechanically broken-down vehicles.

However, there is also concern that a wide shoulder might promote high speed due to behaviour adaption among drivers (Ben-Bassat & Shinar, 2011). Also, the safety effectiveness of shoulder characteristics may change depending on characteristics of traffic volume, lane width, road curvature and roadside conditions (Stamatiadis et al., 2009). Hence, the effect of these variables should be controlled to quantify the impact of shoulder characteristics on crash risk.

National Highway (NH) is one of India's major highway types, and their category, such as four and more lanes, is approximately 23% of the total NH network length (MoRTH, 2019). In addition, the network length of four-lane highways is gradually increasing in India to improve inter-state connectivity (Chakrabarti, 2018). The Indian Roads Congress (IRC) is an agency for setting the guidelines and standards for the design of highways through its codes and manuals. IRC SP:84-2019 is the code that governs the minimum geometric design specifications of the four-lane highway in India (IRC SP: 84-2019, 2019). According to the IRC SP:84-2019 guidelines, the paved shoulder width increased from 1.5 m to 2.5 m widths, whereas the unpaved shoulder width decreased from 2.0 m to 1.5 m for multilane highways in India. However, this decision is not supported by any research findings based on the context of the Indian highway.

Researchers have shown that the traffic characteristics on Indian rural highways are heterogenous and much similar to the urban traffic (Chandra & Kumar, 2003; Jain et al., 2016). In addition to vulnerable road users (VRUs), slow-moving vehicles such as tractors and motorized three-wheelers (M3W) are also significant on the multilane highways in India. Consequently, Indian road authorities have asserted that the paved shoulder could be used as a non-motorized vehicle (NMV) lane, mainly for motorized two-wheelers (MTW) on multilane highways. Hence, it is imperative to study the effect of paved shoulder width on the safety of MTW and slow-moving vehicles on these highways (Mitra, 2010).

There are limited studies that have assessed the impact of geometric elements on the safety of Indian highways, considering the heterogeneous traffic characteristics and indigenous issues (Chikkakrishna et al., 2016; Dinu & Veeraragavan, 2011; Mitra et al., 2017; Vayalamkuzhi & Amirthalingam, 2016a). So far, there are no Indian empirical studies that have assessed the safety effectiveness of paved shoulder width on the four-lane highway. Hence, it is essential to fill this research gap since the traffic mix on Indian roads is different from the developed countries, which leads to quite different crash characteristics (Tiwari, 2018).

In India, there is no centralized road crashes database that researchers can access. The non-existence of the centralized database compels the researchers to collect primary data manually. Moreover, data related to road traffic crashes, geometric data and other secondary data needed for road safety studies are not readily available. Often the available crash data is in the local language of the respective state.

Hence, the study aims to assess the impact of paved shoulder width on the frequency of fatal crashes on a rural highway. The first objective of this research was to identify the crash patterns on the highway using fatal crash data from the year 2016 through 2019. The second objective was to assess the safety risk of the paved shoulder width with the help of matched case-control study design. Finally, the effect of paved shoulder width on all-fatal crashes, rear-end only fatal crashes, slow-moving vehicles and VRUs, and MTW was evaluated. This study also demonstrated the application of the case-control method as a viable alternative method in the case of limited data availability.

The methodological insight from the study establishes that the matched C-C method can be a feasible alternative method when data availability is limited, as is the case in LMICs. This study's data collection methodology can guide authors from LMICs to collect data when the national database is unavailable and minimal resources to collect data. Further, the study highlighted that VRUs are at higher risk in fatal crashes on four-lane Indian highways. The results indicated that shoulder width as a safety intervention is a viable option for the safety of VRUs. However, its effectiveness needs to be assessed, considering the complex interaction of the other geometric and unobserved variables. Besides, the study has been conducted in the heterogeneous traffic condition, which is also prevalent in other LMICs. The effect of the shoulder width under varying conditions for all road user groups, all crash types, and injury types can be investigated, keeping this study as a benchmark study from a methodological viewpoint. Nonetheless, the results of this study are not transferable to other settings of LMICs.

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NEWS

WCTR 2023 – World Conference on Transport Research, *17 – 21 July 2023, Montreal, Canada. http://wctr2023.ca/*

The conference aims to bring together experts in all areas of transport research from all parts of the world and to stimulate the exchange of ideas in the field of transport policy and practice.

The 7th Conference of Transportation Research Group of India, *7-20 December 2023, Surat, India. https://ctrg2023.trgindia.org/*

The conference provides a forum within India to interchange ideas among researchers, educators, practitioners, managers, and policy-makers in transportation in India and around the world.

The 15th International Conference of Eastern Asia Society for Transportation Studies, *4-7 September 2023, Kuala Lumpur, Malaysia. https://easts.info/easts-conference/*

The Times Of India 8 May 2023: Amid consistent rise in deaths of pedestrians and cyclists, Punjab has taken the lead among the states and UTs to implement the 'right to walk' by making it mandatory for all road-owning agencies, including the NHAI, to provide footpath and cycle tracks in all future expansion of roads and construction of new ones.

The state government has issued these directions following two court orders after PILs were filed at Punjab and Haryana High Court and another in the Supreme Court. The courts have sought the action taken reports on safety of pedestrians and cyclists.

As per a communication from Punjab chief secretary Vijay Kumar Janjua to Punjab government's traffic adviser, Navdeep Asija, "in future all expansions of existing roads and construction of new roads, a mandatory provision of cycle tracks and footpaths should be made by all road owning departments and agencies".

The letter sent last week added that all agencies such as the public works department, local bodies, NHAI and urban development departments have been instructed to prepare an action plan to construct footpaths and cycle tracks with a time frame and budget provision.

Government data show that the number of pedestrians killed in road crashes has increased from 25,858 in 2019 to 29,124 in 2021, indicating that road infrastructures don't cater to the safety of pedestrians. The road accident report of 2022 has not yet been published.

The Supreme Court, in an interim order last year, had asked states to ensure the safety of pedestrians, cyclists by providing them separate, seamless and safe pedestrian lanes and cycle tracks.

Asija himself had filed a PIL in the Punjab and Haryana HC in 2010 seeking the "Right to Walk under Article 21" by ensuring safe facilities for pedestrians. The petition had highlighted how its common policy makers, planners, and engineers have an understanding that those on non-motorised mode such as walking and cycling have an inferior right to use public roads compared to the motor vehicles. It also flagged how there is a perception that roads are funded by motorists.

The plea before the HC had also pointed out how pedestrians and cyclists are sometimes forbidden from using a particular public road to avoid delaying motorised traffic and this has pushed the level of motorisation, especially private vehicles on roads in urban areas.

The World Health Organization (WHO) launched a new manual for authorities to increase the use of helmets for motorcycle riders today. The second edition of the Helmets Manual offers guidance to help leaders establish the laws, regulations and actions needed to increase the use of safe, quality helmets to save lives.

Head trauma is the leading cause of death for motorcycle riders, and safe, quality helmets reduce the risk of death by over six times and brain injury by up to 74%. Yet the use of quality helmets in many low-and middle-income countries remains low, even as the number of motorcycles increases rapidly.

'As motorcycles proliferate at an astonishing rate, especially in low and middle-income countries, urgent action is needed to stave off a rapid rise in deaths and injuries in the coming years,' said Dr Matts-Ake Belin, Global Lead for the United Nations Decade of Action for Road Safety 2021- 2030 at WHO.

'Authorities must put the laws, frameworks and actions in place to boost the availability and uptake of safe, quality helmets. Rooted in evidence, the latest manual sets out what is needed,' said Dr Belin.

The New WHO manual aims to strengthen pedestrian safety

Pedestrians account for nearly a quarter of all road crash deaths, with the number of pedestrian victims rising at nearly twice the rate of all other road crash fatalities.

The World Health Organization [WHO] and partners launched a revised m anual to help decision m akers curb the scourge of pedestrian deaths and injuries in road traffic crashes today.

Walking brings health, transport and environmental benefits, but roads remain unsafe for pedestrians everywhere. Over 310 000 pedestrians were killed in crashes 2016, accounting for 23% of all global deaths. Per kilometre travelled, pedestrians face a nine times higher risk of death than car occupants.

The proportion of pedestrians killed compared with other road users is highest in the WHO African Region, at 40%, and lowest in the WHO South-East Asian Region at 14%. Yet pedestrian deaths and injuries are under-reported in many countries.

Pedestrian collisions are predictable and preventable, and it is crucial that authorities put evidence-based laws, frameworks and actions in place to reduce pedestrian deaths and injuries. The latest Pedestrian Safety Manual offers new case studies, data and guidance for decision-makers with a focus on low and middle-income countries, where nine-in-ten of all road crash deaths occur.

The manual was launched at the N etwork of African Road Safety Legislators Meeting in Kampala, Uganda. Hosted by Uganda's Parliamentary Forum on Road Safety with the African Union, in collaboration with The World Bank Sub-Saharan Africa Transport Policy Program, the

UN Economic Commission for Africa, the UN Environment Programme and WHO, legislators from 10 African countries are meeting to strengthen and align national legislation to meet the United Nations global target of halving road crash deaths by 2030.

The Transportation Research and Injury Prevention Programme has been operational for two decades. On May 21st 2021 it was established as TRIP Centre. It is based at the Indian Institute of Technology (Delhi) and is an interdisciplinary academic unit focusing on the reduction of adverse health effects of road transportation. Researchers at TRIP Centre seek to integrate all issues concerned with transportation to promote safety, active mobility, cleaner air, and energy conservation. They are involved in planning safer urban and inter-city transportation systems and developing designs for vehicles and safety equipment.

Endowments for perpetual Chairs
CONFER, India: TRIPP Chair for Transportation Planning
Ford Motor Co., USA: Ford Chair for Biomechanics and Transportation Safety
Ministry of Urban Development India: MoUD Chair for Urban Transport & Traffic Planning
MoUD Chair for Urban Transport and Environment
MoUD Chair for Urban Traffic Safety
VREF: Volvo Chair for Transportation Planning for Control of Accident and Pollution

Establishment funds have been received from
Ministry of Industry, Government of India
Asian Institute of Transport Development, India
Tata Motors Limited, India
Volvo Research and Educational Foundations (VREF), Sweden

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TRIP CENTRE BULLETIN
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Excerpts from: DELHI ROAD SAFETY: DATA TO ACTION

Reliable and accurate road crash data enable governments to effectively address the challenges to road safety. Comprehensive analysis of data allows the government to identify vulnerable road users, hazardous locations, time period of highest risk, and various reasons for traffic crashes. The data highlight the magnitude of the road safety problem especially vis-a-vis other societal issues. It exposes the social and economic cost and benefit of road safety interventions. Data enables the government to identify problems, design evidence-based measures, and ultimately, to implement a Safe Systems Approach to road safety.

The 2020 and 2021 Delhi Road Crash Fatalities Reports are a step towards enhancing road safety surveillance data to respond to road crashes with urgency. These reports highlighted the road crash situation in Delhi in 2020 and 2021. In Delhi, the Transport Department, the Delhi Police and the Health Department work together on the surveillance system to utilise the available crash data. The three departments play a vital role in understanding why the crashes occur, how to respond to them, and how to prevent them in order to save lives.

This 'Data to Action' report builds on the previous annual reports and mainly focuses on transforming the data into actual measures. There are three main sections: the first part is a discussion of road crash data and crash spots, the second a presentation of road safety risk factors, and the third, recommendations on road safety interventions. It is for government stakeholders, private organisations, and the public who will all need to work together in road safety.

Furthermore, for the first time, the Road Safety Lead agency (RSLA) will be identifying crash spots using The Ministry of Road transport and Highways (MoRTH)'s recommended black-spot definition which is "five road crashes on a stretch of national highway of about 500 metres in length in which either five road crashes (in all three years put together involving fatalities/grievous injuries) took place during the last three calendar years or 10 fatalities (in all three years put together) took place during the last three calendar years." This report uses the three-year fatal crash data from 2019, 2020 and 2021 to identify crash spots based on the MoRTH's definition for road crash "black-spots." Apart from the crash spots, the report also presents district-wise heat maps identifying high risk junctions or intersections, schools, and metro stations. These identified crash spots and high-risk areas will assist the Government of National capital Territory (NCT) of Delhi and the Diatrict Road Safety committees (DRSC) to act upon improving road safety at these areas.

Finally, this report will guide DRSCs to focus on targeted strategies, activities and interventions at a district level. Road crash data as well as safety performance indicators such as speeding, seatbelt, and helmet use presented in this report will also enable DRSCs to better understand the road safety situation and focus on specific strategies for saving lives.

In this road safety report, fatal crash data from the last three years (2019, 2020 and 2021) was analysed. The combined crash data of these three years is presented in frequency distribution tables or charts in the forms of numbers or percentages. Geographic Information System (GIS) mapping of fatal crashes was done to identify hazardous crash spots and create crash heat maps. Crash spots were identified using MoRTH's definition of road crash black-spots.

The section on "Monitoring compliance with road safety risk factors in Delhi" presents road-side observations on speeding, correct helmet, and seat-belt use. A standardised data collection method was used to collect data on the mentioned road safety risk factors at 15 city representative locations.

The last section on road safety interventions presents all road safety activities undertaken by the Government of NCT of Delhi.

Case-level crash data provided to the Transport Department, Delhi by the Delhi Traffic Police (DTP) the Bloomberg Philanthropies Initiative for Global Road Safety (BIGRS) for the years 2019, 2020 and 2021 was used to complete this report. This dataset had only a limited set of attributes. The dataset included the First Information Report (FIR) number, name of the police station where it was filed, and Indian Penal Code (IPC) sections of the case. The analysis was restricted for those cases that included at least one fatality, indicated by IPC section 304A (Causing death by negligence). Using the FIR numbers, the data entry operators of BIGRS, individually queried, each FIR using the Delhi Police's public database (https://www.delhipolice.nic.in/view-fir.html). The data was extracted from these FIRs and coded into a road crash recording form that was developed by the Transport Research and Injury Prevention Centre (TRIP Centre) at the Indian Institute of Technology (IIT) Delhi.

The crash recording system includes data entry for three different categories– crash incident details, vehicle details, and person details. The 'crash form' includes all the details at the crash level, for example, date, time, location, and type of crash. The 'vehicle form' includes details of all the vehicles involved in the crash, irrespective of whether the vehicle occupant sustained an injury or not. A pedestrian is the only road user that is not considered as a vehicle. The 'person form' includes details of all the individuals involved in the crash. This includes all the occupants of different vehicles as well as pedestrians. The details of individuals are recorded, irrespective of whether they sustained any injury or not. The dataset thus obtained is relational in nature, with a hierarchical data structure. All the vehicles and persons are linked to a crash, and all the victims are linked to their corresponding vehicles, except in case of pedestrians that are linked directly to the crash.

In addition to the crash attributes that are directly coded from FIR, other data are derived from other sources. The description of crash location (street name, landmark, and direction of movement of victim) was used to approximate geo-coordinates using Google Maps and Google Earth. In the vehicle form, as described above, licence plate numbers of all the vehicles involved in the crash were coded, whenever available. Those numbers were used in the online portal of MoRTH (vahan.parivahan.gov.in) to retrieve vehicle type and specifications data (e.g. model year, registration year or fuel type). To estimate death rate by different age and sex groups, age-and-sex specific projected population of districts and states in India were taken from the U.S. Census Bureau available at the Spatial Data Repository of the Demographic Health Surveys (DHS) Program.

Geospatial analysis was done through Quantum Geographic Information System (QGIS). At the same time, statistical analysis was done with R Version 4.2.1. Reported crash cases that occurred in the previous calendar year but were registered in the adjoining year (i.e. a fatal crash occurring in 2020 was registered and reported in 2021) were excluded from this analysis.

The data was retrieved from FIRs which contain information captured in the nascent stages of investigation. In addition, FIRs are legal documents and are designed for prosecution purposes. Some crash variables may not be available in FIRs which are later captured by DTP for their crash analysis. In addition, since the data is only coming from the police, there is a level of underreporting especially of injuries. There is a lack of comprehensive data on road safety risk factors in FIRs.

Road crash injuries endanger the lives of people of Delhi. For the past three years, crash fatalities have been fluctuating primarily because of extended periods of mobility restrictions. The pandemic also influenced modal shifts which significantly increased the exposure of road users particularly of riders of Motorised two-wheelers (MTWs). This section presents key road safety statistics over the last three years and highlights important findings related to crash

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epidemiology. This includes identifying the at-risk population, determining when and where crashes occur the most, and enumerating high-risk locations. It also presents a comparative analysis of crash statistics before COVID-19 pandemic and the impact of the pandemic on road safety.

The pandemic and the government's response to limit the spread of COVID-19 heavily impacted people's mobility, behaviour, and travel patterns. Traffic volumes significantly decreased and at the same time, travel mode share has shifted in favour of MTWs.

In Delhi, there was a drop in crash fatalities from 1,429 fatalities in 2019 to 1,151 in 2020. While this seems to be a success in saving lives, this reduction in fatalities should be viewed alongside other data. For example, it would be important to determine whether fatalities per distance walked or travelled have increased or decreased, or whether mobility restrictions associated with the COVID-19 pandemic were the main factor. In addition, assessing the number of fatalities together with safety performance indicators such as speeding will help reveal whether the roads have actually been made safer or not.

The following year, 2021, crash fatalities increased again by 8% most possibly due to the easing of mobility restrictions. This implies that the reduction of fatalities in 2020 was caused more by the reduction of exposure (limited presence of road users) as a result of severe mobility restrictions.

In addition, from 2019 to 2021, the share of pedestrian fatalities have continued to decrease in contrast with motorcycle fatalities, which have been increasing. During the lockdowns, there has been a proliferation of MTWs, specifically motorcycles which are used in logistics, delivery, aside from day-to-day travel. In each of these past three years, more than 90% of the deaths have occurred among vulnerable road users (pedestrians, motorcyclists, cyclists and auto rickshaw occupants).

Mobility behaviour and travel patterns can be shaped by one's age and gender. Figure 2.1 reflects how different segments of the population have different travel behaviour and activities and therefore experience road risks differently.

In Delhi, male children ages 0 to 14 have almost the same rate of fatalities as females of the same age. This shows how children, whether male or female, have similar travel patterns such as going to school and therefore face particular and unique risks on the road network.

Males across all groups have a higher rate of fatalities than females and the rate is much higher for ages 30 to 59. This may be attributed to the mode of transport such as motorcycles, gender-based risk taking behaviour, and the types of journeys men take throughout the day. Females on the other hand have higher rates for ages 45 to 74 reflecting increased vulnerability at older ages. It is important to investigate further what activities make certain demographics more susceptible to road crashes.

Before the pandemic in 2019, death rate was highest for the age group of 60 to 74 for both males and females. For males, specifically, fatalities are high for ages 15 to 74 relative to other age groups whereas for women, ages 45 to 75 and above have a higher rate of fatalities. This implies the difference in journeys that these groups have, hence, the difference in road risks they face. A further investigation of trips is needed to conclude why this is the case.

In 2020, mobility restrictions resulted in an overall reduction of fatality rates, especially of children and the elderly but exposed women, 30 to 44 years to more road risks. For children and the elderly, the decrease can mostly be attributed to decrease in travel including the shift to online classes and mobility restrictions. For women ages 30 to 44, the increase in death rate can be because of a particular travel pattern that has been made more pronounced during the pandemic and has exposed this age and gender group to more risks on the road.

Further disaggregating the data, pedestrian deaths were highest among males and females aged 60 to 74 years old followed by males and females aged above 75 years (see Figure 2.5). This shows that the pedestrian death rate is highest among the elderly population. At the same time, this implies that in its current state, pedestrian infrastructure is hostile. Ensuring adequate, accessible, and safe pedestrian infrastructure for the elderly will result in a significant reduction of pedestrian crashes in Delhi.

In contrast with pedestrian fatalities, motorcyclist fatalities are highest among males aged between 15 to 29 years and 30 to 44 years old (see Figure 2.6). This demographic includes workers and also those associated with risk-taking behaviour. Among females, there was no pronounced age pattern for road crash deaths.

The RSLA of the Transport Department of NCT of Delhi with the support of Vital Strategies prepared and publicly released the 2020 and 2021 Delhi Road Crash Fatalities Report. RSLA, set up in 2017, has been mandated by the Supreme Court Committee on Road Safety to collate road injury crash data periodically, analyse the data to identify high risk areas/road stretches and at risk road user types. The 2020 and 2021 crash reports are a step towards enhancing road crash data monitoring in Delhi and presents an analysis of the data extracted from FIRs of the fatal crashes reported in 2020-21.

These reports aim to increase the understanding of the type, times and locations of fatal crashes and the profiles of those involved, so that more targeted interventions can be undertaken to prevent fatal crashes.

Moreover, to better estimate the burden of road crash injuries in Delhi and describe the types and severity of injuries, the Transport Department of NCT of Delhi, TRIP Centre - IIT Delhi and Vital Strategies have planned a pilot crash linkage exercise. This exercise aims to gather data from multiple sources to better estimate the rate of RTI deaths and injuries.

More specifically, this assessment is a descriptive cross-sectional study using retrospectively collected routine hospital data, ambulance data, post-mortem reports, and Police Control Room (PCR) call records with linkage to already available police road crash records. This assessment will be conducted at six designated trauma centres and 16 post-mortem centres in Delhi. It is expected to take seven months to complete starting from February 2023, to the completion of the analysis by October 2023.

The road death rate in Delhi has been declining over the past two decades, however, it still remains much higher than many of its city counterparts. The reduction of traffic injuries has an intrinsic value, as these are preventable, and is indeed a moral imperative of the state. In addition, safer roads can also encourage the use of transport modes that provide greater physical activity and have low or negligent emissions. The risk from road crash injuries is a major barrier to the uptake of sustainable modes of transport such as walking, cycling, and public transport. Therefore, road safety is strongly tied with the objectives of cleaner air and reduced carbon emissions from the transport sector.

It is in this spirit that the Government of the NCT of Delhi, IIT Delhi and Vital Strategies, have prepared this report. By meticulously extracting data from police FIRs, a database of fatal crashes was prepared, covering a period of three years. Using this data, the report provides a descriptive summary of fatal crash patterns in Delhi.

The results give us an insight into the specific actions and policies that can help reduce road crashes. The formation of DRSCs is an important step towards decentralising road safety management within the city. To provide DRSCs with specific action points within their jurisdiction, the report provides district-specific maps highlighting black-spots and some of their key features requiring interventions.