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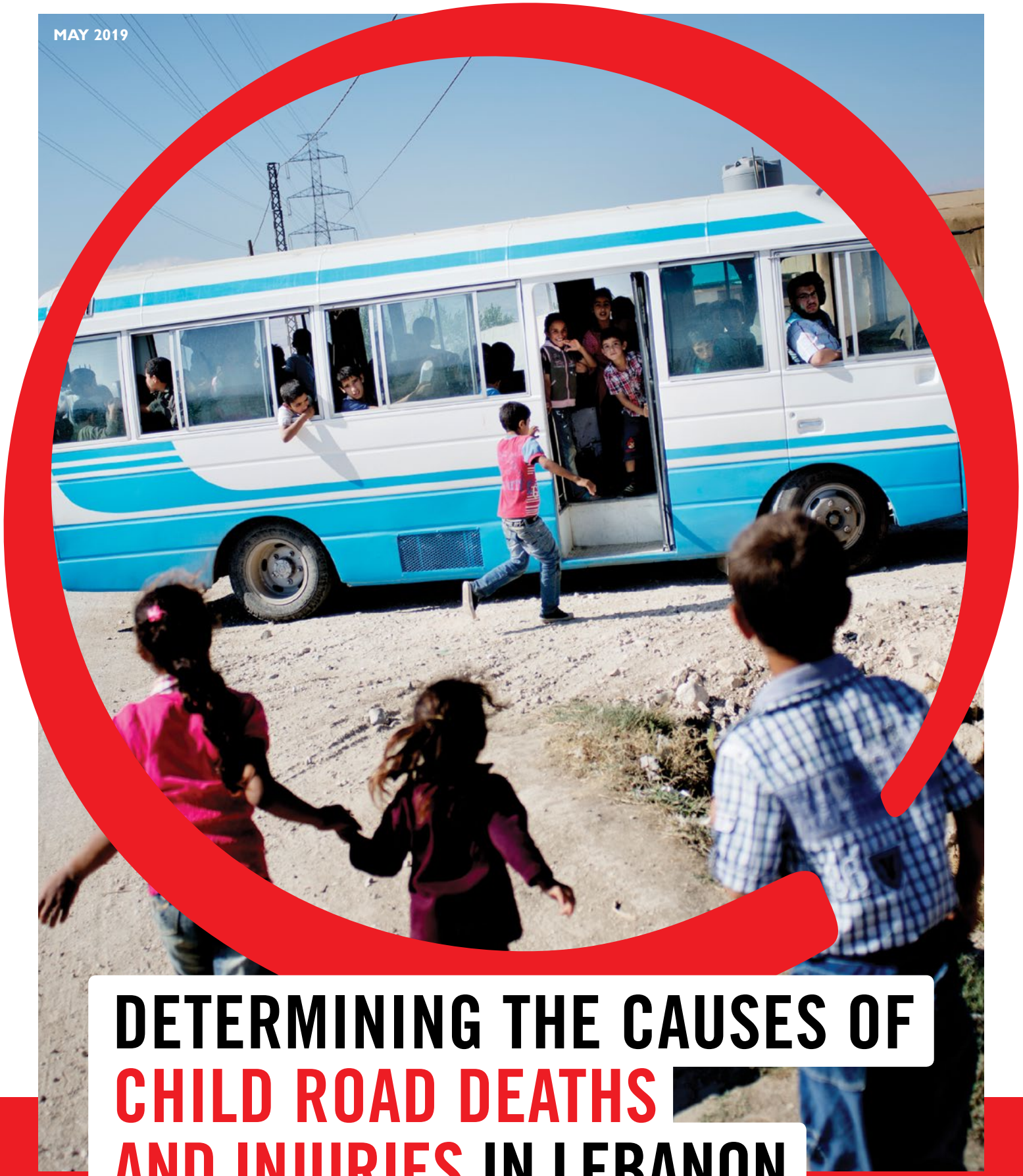

DETERMINING THE CAUSES OF CHILD ROAD DEATHS AND INJURIES IN LEBANON

Save the Children 100 YEARS

FIA FOUNDATION

AUB American University of Beirut

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ACRONYMS AND ABBREVIATIONS

ATV	All-Terrain Vehicle
AUB	American University of Beirut
AUBMC	American University of Beirut Medical Center
AVP	Accident Voie Publique
CHIRPP	Canadian Hospitals Injury Reporting and Prevention Programs
CITI	Collaborative Institutional Training Initiative
ED	Emergency Department
EMR	Eastern Mediterranean Region
HIC	High Income Countries
ICD	International Classification of Disease
IRB	Institutional Review Board
ISF	Internal Security Forces
LMIC	Low and Middle-Income Country
MENA	Middle East and North Africa
MVA	Motor Vehicle Accident
RTI	Road Traffic Injuries
SDG	Sustainable Development Goal
TBI	Traumatic Brain Injury
TEC	Traffic Emergency Committee
UNHCR	United Nations High Commissioner for Refugees
WHO	World Health Organization

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EXECUTIVE SUMMARY

Road traffic injury (RTI) constitutes the leading cause of death and disability for individuals aged 5-29 years.[1-3] Globally, road traffic injuries claimed the lives of 1.35 million people in 2016 with 50 million more injured or disabled.[3] It is estimated that, without sustained action, the number of RTI deaths will increase by 2030, making road injuries the 7th leading cause of death worldwide for people under the age of 29.[3] The burden of road injuries is disproportionally distributed globally with almost 90% occurring in developing countries due to the growing motorization industry coupled with a lack of road infrastructure and government safety legislation.[2,3] The Eastern Mediterranean Region (EMR) suffers from high rates of road traffic fatalities and disabilities.[6,7]

Like many Eastern Mediterranean countries, Lebanon experiences high road traffic morbidity and mortality rates. According to WHO Road Status Report 2018, the rate of road deaths in Lebanon was estimated at 18.1 per 100,000,[4] with more than half of these victims below the age of 30.[8-11] Road Traffic Injury is one of the leading causes of injury-related death in Lebanon, with an estimated 500 fatal injuries reported annually (almost 18% of these road injury victims suffer from permanent or long-term disabilities).[5]

Despite the available RTI data in Lebanon, underreporting of deaths and injuries caused by road crashes is a major concern that hinders the accurate assessment of the nation's RTI burden. However, limited available data points to the severity of RTI injury as a major national health problem.

This report integrates data from multiple sources to highlight the alarming number of child RTI and deaths on the roads in Lebanon. Save the Children commissioned this research study with the support of the FIA Foundation to shed light on the most common causes of child road injuries and deaths in Lebanon, with the aim of highlighting the severity of child RTI and understanding its characteristics and associated risk factors. This report quantifies child road injuries and deaths in Lebanon for the period of 2015-2017. Additionally, it identifies child RTI seasonal trends and patterns and examines victims' demographics, most common injuries and geographic distribution across six Lebanese governorates.

STUDY RESULTS

A newly designed child injury surveillance form was adopted to capture injury variables. Multiple sources of data were examined to comprehensively assess the burden of child road injuries. An estimated 3,270 cases of child road injuries and deaths were captured from police reports and retrospective hospital patient records through a review of 30 emergency departments across Lebanon for injured patients during the period of time from 2015 to 2017.

Findings from this study reveal that the vast majority of RTI victims are male (72.5%) compared to female (27.4%). Children aged 6-14 had the highest share of road injuries (45.2%) compared to children under five years of age (18.8%) and those between 15-17 (34.8%). Vulnerable road users (pedestrians, motorcyclists, cyclists) encompassed nearly half of the child RTI cases (47%); 66.5% of the cases were Lebanese, 27.9% were Syrian and 2.4% were Palestinian. Mount Lebanon, Bekaa/Baalbeck-Hermel and North Lebanon/Akkar were the regions with the greatest numbers of RTI. A significant proportion (38.3%) of the RTI occurred on two-way roads that are not physically divided, 15.8% of RTI occurred on side streets and 12.2% occurred on highways. The most common reported factors contributing to RTI were speed (25%), distracted/careless driver (20%) and (for pedestrians) carelessness while crossing the road (14%). Summer months witnessed more RTI compared to the other seasons. The study results show a substantially high proportion of child pedestrians suffering from morbidity and mortality associated with RTI. A noticeably high proportion of Syrian victims were pedestrians (51.7%), in contrast with other nationalities. The overall share of road traffic injury morbidity and mortality experienced by children increases with age, especially among children aged 15 (9%), 16 (11%) and 17 (14%). Nevertheless, children aged 0-5 suffer the highest proportion of fatal injuries compared to other age groups.

This study concludes with four primary recommendations:
(1) Ensure proper injury coding in hospitals and establish a national injury surveillance system.
(2) Enforce road safety laws, particularly those intended to protect children.
(3) Implement evidence-based road safety policies and behavioral change programs.
(4) Invest in safer road infrastructure.

INTRODUCTION

Road Traffic Injury (RTI) represents a major global public health problem, claiming millions of lives. Road injuries are the leading cause of morbidity and mortality globally, particularly for those aged 5-29 years, highlighting the high burden RTI places on individuals, societies and economies. RTI causes significant physical and psychological strains to those injured and their families as many of the injured children and young adults are left with permanent and long-term disabilities.[13] Additionally, the cost and economic consequences of RTI are substantial. It is estimated that the direct and indirect costs of RTI consume between 1% and 3% of the gross national products of world governments,[4,14] with a significant toll on Low and Middle-Income Countries (LMICs) in which young adults are among the primary wage-earning groups. The international community acknowledged the importance of implementing evidence-based interventions to reducing the number and impact of road injuries.[3,14] In September 2015, the UN General Assembly adopted the historic Sustainable Development Goals (SDGs). One of the SDG targets (3.6) is to achieve a 50% reduction in the global number of road traffic deaths and injuries by 2020.[15] Consequently, to prevent and reduce the impact of RTI, the "World report on road traffic injury prevention" made six recommendations.16 These include (1) identifying a lead agency in the government to guide national road safety efforts and assess the problems, policies and institutional capacities for road traffic injury prevention; (2) preparing a national road safety strategy and plan; (3) allocating the necessary financial and human resources; (4) implementing and evaluating actions to prevent and minimize RTI and (5) developing national capacity and international cooperation.[13,14,16,17]

LMICs bear the heaviest toll of road deaths and injuries in the world.[3,4] The burden of road traffic deaths remains disproportionally high among LMICs, with an estimated RTI death rate of 27.5 per 100,000, almost three times that of High Income Countries (HICs).[3] An estimated 13% of the global RTI deaths occur in low-income countries despite the fact that only 1% of world's motor vehicles are found in these countries.[3] Globally, Africa and South-East Asia have the highest rates of RTI deaths.[3] The lack of preventive safety measures and adequate health care facilities increases the number and severity of road injuries in LMICs. Children are particularly vulnerable road users and the Middle East and North Africa (MENA) region suffers one of the highest child RTI fatality rates.[4]

In Lebanon, Road Traffic Injury is a major, yet neglected public health issue. According to the WHO Road Status Report 2018, the rate of road deaths in Lebanon is estimated at 18.1 per 100,000 population.[4] The Global Burden of Disease 2017 reported that child road traffic deaths in Lebanon represent the sixth leading cause of death in Lebanon for those aged below 20, exceeding major non-communicable and infectious diseases.[1] Lebanon's history of conflict influenced the national health agenda and shifted the allocation of significant health resources to care for war injuries. Protracted conflict drained the nation's health care resources and diverted attention from preventable injuries. The limited literature on injury in Lebanon primarily documents the prevalence of various types of injuries (e.g. war injuries, falls, burns, road crashes and poisoning) with minimal translation of research into evidence-based injury prevention policies, programs and solutions to reduce the injury burden in the country.[20] More recently, the Syrian conflict and the resulted in the arrival of nearly 1.5 million refugees, approximately half of whom are children and youth. These refugees are particularly susceptible to various types of injuries including road traffic injuries due to their reliance on transportation infrastructure, poor living conditions, and hazardous work environments.

Currently, Lebanon lacks a national injury surveillance system and, consequently, accurate and reliable RTI data are absent or non-representative. Road-related injuries and deaths are collected by the Traffic Emergency Committee (TEC) and serve mainly for judicial and insurance purposes. Collected TEC data are limited to reporting severe road

crashes resulting in fatalities captured by police reports or the Lebanese Red Cross at the crash site. Nevertheless, existing road crash reports and unpublished government data show a steady upward trajectory in the number of RTI. Data from the Lebanese Directorate General of the Internal Security Forces (ISF) show that in 2015, the number of RTIs reached 576 deaths and 5,658 injured, with over three-quarters of all victims being male (ISF Unpublished data). The number of premature deaths due to RTI has been increasing dramatically every year since 2000, with the highest number of road fatalities reported among drivers aged between 15-44, who account for 70% of the total RTI injuries and 53% of the total number of RTI fatalities in Lebanon.

An analysis of ISF data in 2011 showed that about half of road traffic crash victims were under 30 years of age.10 Pedestrians were involved in almost 29% of the crashes where as many as 47% of the crashes were multi-vehicle crashes.[10] According to Kunhadi, a non-governmental organization for road safety awareness, figures show that although the total number of road traffic deaths and injuries decreased from 2015 to 2017, those for children less than 14 years old have increased substantially.[18] Compared to the total deaths, the percentage of child RTI deaths has increased from 13.7% in 2015 to 21.8% and 19.5% in 2016 and 2017 respectively. Of the total number of road injuries, the percentage of child RTI has increased from 9.6% in 2015 to 20.7% and 22% in 2016 and 2017 respectively.[18]

The objective of this research study is to quantify the prevalence and the characteristics of child road traffic injuries and deaths in Lebanon and to determine their associated risk factors. To the best of the research team's knowledge, this is the first study to capture national retrospective child road injury data from multiple sources. The study uses a designed injury surveillance form to review data over a three-year period, from 2015 to 2017. The outcome of this study will increase public understanding of the impact of road traffic injuries on children and youth in terms of the number of children injured, victim demographics, characteristics and geographic distribution of child injuries, the causes and types of RTI presented to Emergency Departments, child RTI hospitalization and emergency visit rates, associated risk factors and short-term survival outcomes. Collecting primary RTI injury surveillance data at Emergency Departments across hospitals helps to accurately assess crash injury data, quantify the frequency of RTI injuries and determine the nature, circumstances, risk factors and outcomes of these types of injuries.

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METHODOLOGY

This study conducted a retrospective review of police reports and hospital emergency department patient records for children aged 0-17 who sustained a road traffic injury or death across Lebanon during the period from 2015 to 2017. Any child road traffic injury case meeting the following study criteria was included in the study: (1) the child is below the age of 18, (2) the child sustained a road traffic injury or death, (3) the child is a road user victim (i.e. passenger, driver of a moving vehicle, pedestrian, cyclist, motorcyclist or motorcycle passenger) and (4) the child was treated at an Emergency Department or admitted to any of the participating hospitals across Lebanon during the selected period. To complement hospital data, we collected data from police reports to gain deeper understanding of the circumstances surrounding road crash injury.

The study was carried out over six months, from November 2018 until April 2019. The study was approved by the American University of Beirut (AUB) Institutional Review Board (IRB) BIO-2018-0459. The AUB IRB approval was shared with the Internal Security Forces (ISF), as well as with participating hospitals' ethical committees to ensure hospital approval to access to patients' medical records. To protect patients' privacy and confidentiality, an additional IRB application was needed at participating hospitals to secure ethical approval to retrieve patients' information from Emergency Department records.

STUDY DESIGN AND SAMPLING STRATEGY

To ensure a nationally representative sample, we adopted a cluster random sampling strategy to select hospitals across Lebanon. Initially, we compiled the list of 5-7 hospitals (meeting our inclusion/exclusion criteria) in each governorate (cluster).
A random sampling technique was conducted to randomly select hospitals from within each cluster to be included in the study. In order to give specific weight for each area, the number of hospitals selected from each cluster was informed by two main criteria:

1. The size of the governorate.
2. Population density.
3. The number of RTIs documented in the governorate based on existing RTI statistics provided by the ISF. For instance, based on unpublished ISF data, the Bekaa governorate reported a high incidence of road traffic deaths and injuries. Therefore, more hospitals were selected from the Bekaa region to ensure capturing of the maximum number of road victims occurring at this geographic location.

HOSPITAL SELECTION

Selected hospitals were a mix of public and private hospitals located within geographically dispersed areas throughout Lebanon across six governorates, including the regions of Beirut, Mount Lebanon, North Lebanon, South Lebanon Baalbek-Hermel and the Bekaa.

An extensive search for existing sentinel hospitals was conducted and a list of potential hospitals (location, governorate, number of pediatric beds) was prepared. The population of Lebanon was estimated at over 6.22 million in 2017. According to the Ministry of Public Health, there are 29 public hospitals and 117 private hospitals distributed across 20 major areas including Beirut, AlShouf, Baalbek, Zahleh, Bekaa, Baabda, Tripoli, Akkar, Bint Jbeil, Tyr, Marjeoun, Nabatiyeh, Hasbaya, Saida, Rashaya, Hermel, Bshari, Kura, Metn, Keserwen and Jbeil. The vast majority of road traffic injuries sustained by children are treated at local hospital EDs except for minor injuries that typically are treated through health services offered by local Public Health Centers. Refer to Appendix A for locations and number of cases retrieved at participating hospitals.

The research team mapped the geographic location of hospitals to support in the selection of a representative sample for this study. Criteria for sentinel hospital selection were (1) hospital location in high population areas where occurrence of child road injuries is proportionally high, (2) hospital location in a distant geographic location relative to other selected hospitals, (3) hospital has an Emergency Department, (4) hospital willingness to collaborate and to provide cleaned child road injury related data, (5) hospital data meeting the minimum cri-

teria for core variables of injury data (child age, gender, injury date, injury type, injury outcome) and (6) hospital size and catchment area are large. The research team selected hospitals with the largest bed size as it reflects the highest ED visits per year and consequently the largest number of anticipated road injured children will be treated at these hospitals. As the vast majority of injured children residing in large areas will present to one of the large hospitals EDs, road injury data collection at these hospitals maximized the capture of the number of child road injury cases in Lebanon. Refer to Appendix B for geographic distribution of participating hospitals.

Close communication was established with hospital directors in order to seek approval from hospital ethical committees to carry out the study at the hospital EDs. A letter of invitation to participate in this study along with AUB – IRB approval form was shared with hospital officials upon initial contact. Once the hospital ethical committee approved the study, the hospital director signed an approval letter prior to the research team's initial access to ED patient records and retrieval of anonymized patient data at each hospital site.

DATA COLLECTION FORM DESIGN

The research team developed and designed a new child RTI surveillance form to capture and quantify the characteristics of child road injuries and deaths presented to Emergency Departments. After an extensive review of existing international RTI data collection forms, the research team adapted the following three primary resources to develop the new RTI form: (1) The Canadian Hospitals Injury Reporting and Prevention Programs (CHIRPP) surveillance form, (2) the WHO Emergency Unit chart Trauma form and (3) The European Commission's 2016 study on serious road traffic injuries in the European Union.

Informed by the literature, the new form was finalized and used to systematically capture primary child injury data from the hospital ED records (both paper-based and electronic) and police crash reports upon availability. The form documented all available details related to:

(1) Child demographics and victims involved (e.g. driver/passenger, pedestrian, cyclist).
(2) Crash information (e.g. cause, location, weather conditions, time, car type).
(3) Contributing factors (e.g. not wearing a seat belt, alcohol).
(4) Injury nature (e.g. fracture, concussion).
(5) Child body part injured (e.g. head, neck, trunk, spine).
(6) Injury treatment (e.g. treated in ED, admitted to hospital).
(7) Injury outcome (i.e. ED Treat and Release, Dead on Arrival (DOA) or died in ED/hospital).

An electronic version of the newly designed form was built on RedCap (https://www.project-redcap.org) and was pilot tested at selected hospitals. The pilot testing served to modify the form, apply the necessary revisions and finalize it accordingly.

Research assistants recruited for this study were trained on the data collection process and the use of the forms. The training explained the objectives of the study, the type of data to be collected at each hospital and the electronic extraction, categorization and collection of data on RedCap, as well as training on the importance of safeguarding the privacy and confidentiality of patients' information. The research team underwent additional training online for biomedical research through the Collaborative Institutional Training Initiative (CITI) program and obtained their certificates prior to the onset of the data collection process.

DATA COLLECTION PROCESS AND STATISTICAL ANALYSES

The study team selected 30 sentinel hospitals dispersed across six governorates including Beirut, Mount Lebanon, North Lebanon, South Lebanon Baalbek-Hermel and the Bekaa. The research team visited each hospital to ensure that the hospital data matched the study requirements as well as to seek approval from hospital administration to participate in the study by requesting signatures on the ethical approval form. Once approved, the research team visited each hospital ED and communicated with the ED director, head nurses and Information Technology departments to retrieve patients' files and collect retrospective RTI child injury data using the designed injury surveillance form. At each hospital, ED log sheets were scanned to identify RTI child injury cases meeting the study criteria and retrieve corresponding patient records. The research team reviewed accumulated medical records for ED injury-related visits and extracted required injury data points from patient routine diagnoses. Patient identification information was not captured. Hospitals with electronic records were occasionally coded according to the International Classification of Disease - 10th edition (ICD-10) as not all hospital had the resources to complete the coding of cases and update their records. On the other hand, hospitals with paper-based patient records lack coding systems and therefore it was challenging to locate files due to the large amount of physical data. The research team was trained to handle both types of patient records. Electronic and paper-based data were recorded using the RedCap database. RTI child injury cases resulting in ED treatment and release were captured from ED patient records, while cases resulting in hospital admission were accessed through the hospital inpatient discharge system. RTI child injuries resulting in death (upon arrival or shortly after presenting to ED) were also collected. To eliminate the possibility of duplicate cases, those reported in ED and hospitalization records were considered as a single injury case with the highest severity of outcome documented.

Police reports, originally in Arabic, were translated to English and relevant variables were extracted into the RedCap data collection form. Police data included limited information on the physical nature of injuries, but nevertheless provided information on the circumstances of the injuries, road types, surface conditions and, in some cases, reported safety measures reportedly adopted by road victims.

Data collected from multiple sources, including patient medical records and police road crash reports, were compiled into a single comprehensive child road injury database.

DATA CLEANING AND ANALYSIS

Data was cleaned and compiled by removing missing and incomplete injury forms. De-identified data were entered electronically into a secure password-protected database and managed by the study research team. Duplicate cases of child road injuries or deaths were identified and removed from the final database. The identification of similar cases of hospital data and police report was conducted by determining four matching variables: (1) hospital name, (2) child age, (3) date of injury and (4) location of injury. These multiple data sources provided varied perspectives on the issue of RTI, complementing existing ED-collected data and presenting a comprehensive picture of the circumstances of each injury. Data was backed up routinely every month and saved securely on a password-protected computer.

Descriptive and inferential statistical analysis were conducted by the study epidemiologist using Stata to describe the causes and patterns of RTI child injury in the Lebanese population. Chi-squared tests were used to test the bivariate association between the different contributing factors of RTI and different outcomes (injuries and/or fatalities), while logistic regression models were used to test the association of multiple simultaneous factors and injuries/fatalities. An alpha level of 0.05 was used to determine statistical significance. Tableau v. 10.4 was used to generate the study graphs.

RESULTS

The research team collected 3317 cases of children who sustained road injuries, including those resulting in death, during the period between January 2015 and December 2017. These cases were retrieved from the Emergency Department patient records of 30 selected hospitals along with data retrieved from police crash reports. After removing 47 duplicate cases, the remaining number was 3270 cases of children (0-17) with road injuries or deaths.

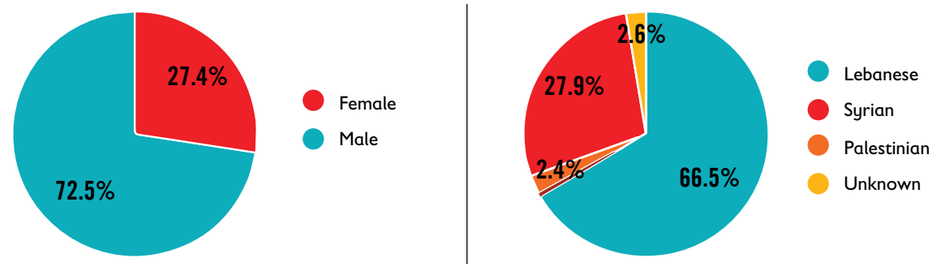


Figure 1 - Gender and nationality distribution of road victims

Across all ages and nationalities, most of the child road injury cases were males. Approximately 72% of the total number of children were boys and 28% were girls. The mean age was 11 (Standard Deviation ±5). As for nationalities, 66.6% of the cases were Lebanese, 27.9% were Syrian and 2.5% were Palestinian (Figure 1). The gender distribution was uniform across all nationalities.

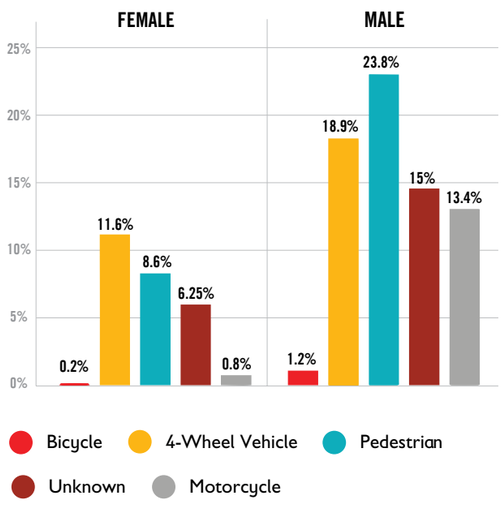


Figure 2 - Distribution of road victims between boys and girls

The research team investigated the distribution of road victims between boys and girls. Compared to girls, male road victims reported a higher proportion of injuries across all modes of transportation. Compared to girls, male road victims reported higher rates of injuries related to the adopted mode of transportation. Male victims were mostly pedestrians (23.8%), 4-wheeled vehicle occupants (18.9%) and motorcyclists (15.1%), whereas female victims were mostly 4-wheeled vehicle occupants (11.6%) (Figure 2).

	FEMALE		MALE	
	%	N	%	N
Bicycle	0.78%	7	1.66%	39
4-Wheel Vehicle	42.22%	377	26.08%	614
Pedestrian	31.35%	280	32.84%	773
Unknown	22.73%	203	20.82%	490
Motorcycle	2.91%	26	18.61%	438
Total	100%	893	100%	2354

Table 1 - Distribution of male and female road victims by transportation mode

Both female and male pedestrian road victims were substantial, with 31.4% and 32.8% respectively. Boys are at a higher risk of sustaining motorcycle-related injuries (18.6%) compared to girls (2.9%) (Table 1).

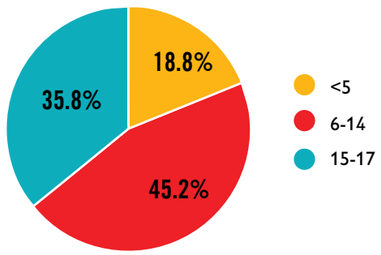


Figure 3 - Distribution of injuries across age groups < 5, 6-14 and 15-17

The research team grouped age into three categories: <5, 6-14 and 15-17. As depicted in Figure 3, children aged 6-14 had the highest share of road injuries (45.3%) compared to those aged 0-5 (18.9%) and 15-17 (34.8%).

Road traffic injury morbidity and mortality increase as children age, with significantly higher proportions among children aged 15 (9%), 16 (11%) and 17 (14%). The analysis clearly indicated that until the age of 12, the majority of the RTI cases involved 4-wheel vehicle occupants or motorcycle riders. However, starting at the age of 14, motorcycle-related injuries significantly increased, peaking at the age of 17 (Figure 4).

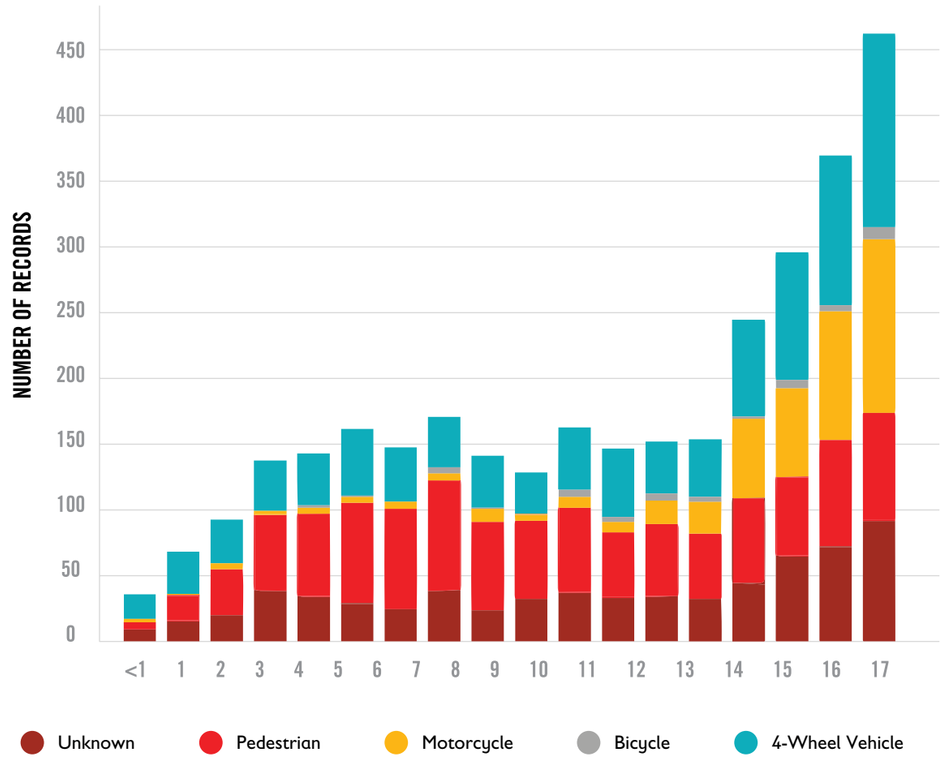


Figure 4 - Distribution of injuries and deaths across all ages by transportation mode

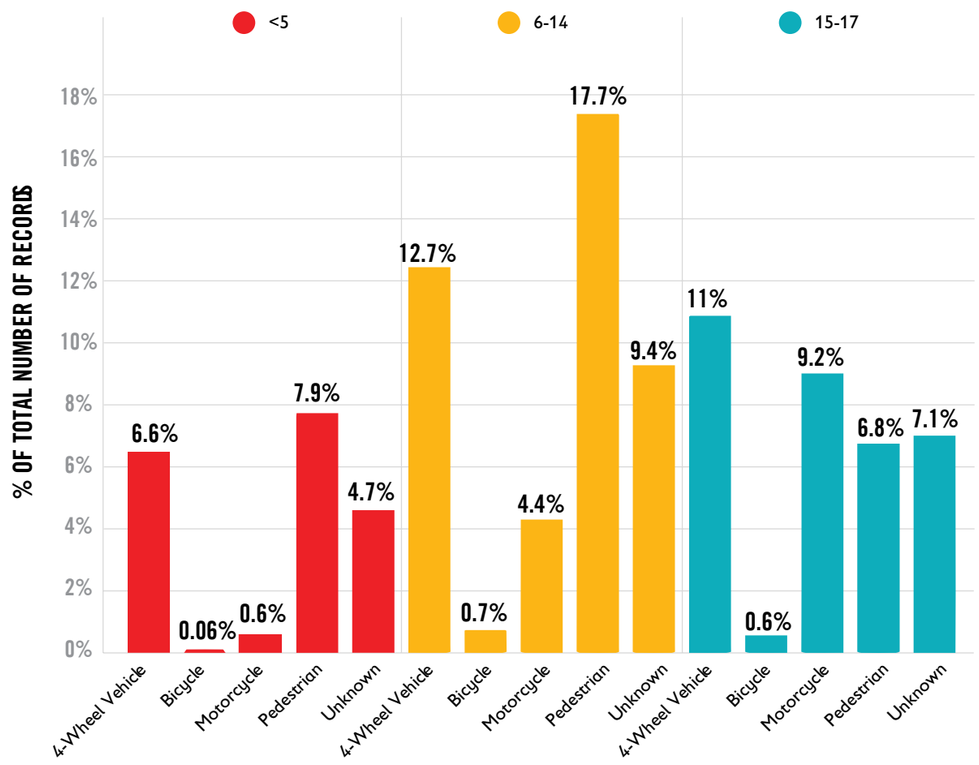


Figure 5 - Age distribution and mode of transport for all age groups

As shown in Figure 5, children aged 6-14 reported the highest proportion of pedestrian road victims (17.7%) compared to younger and older age groups. The age group 15-17 suffered from a high proportion of motorcycle injuries (9.2%) compared to children aged 6-14 (4.4%) and <5 (0.7%).

Vulnerable road users (pedestrians, motorcyclists, cyclists) constitute the majority of RTI cases (48.1%). Pedestrians represent the highest proportion of child road victims (32.4%), followed by 4-wheeled vehicle occupants (30.5%), motorcyclists (14.3%) and bicyclists (1.4%) (Figure 6).

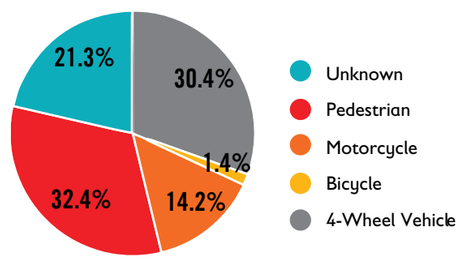


Figure 6 - Distribution of mode of transport

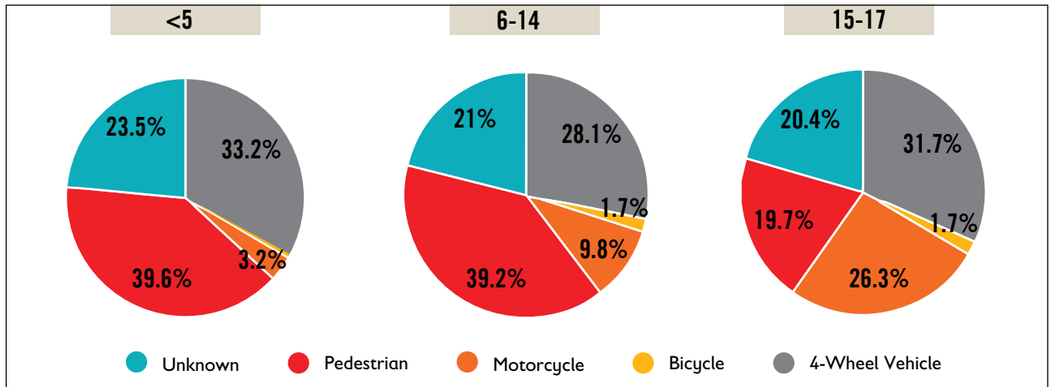
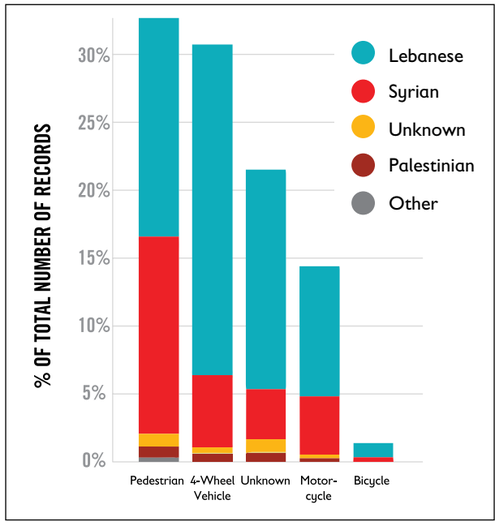


Figure 7 - Distribution of RTI by mode of transport within each age group

Within each age group, the distribution of road injuries varies substantially (Figure 7). Younger age groups are more susceptible to being victims as pedestrians (39.6%) while the oldest age group comprises more victims of 4-wheel vehicles (31.7%) and motorcycle (26.3%) crashes (Table 2).

	<5		6-14		15-17	
MODE OF TRANSPORT	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS
4-WHEEL VEHICLE	33.28%	215	28.17%	411	31.71%	359
BICYCLE	0.31%	2	1.71%	25	1.77%	20
MOTORCYCLE	3.25%	21	9.80%	143	26.33%	298
PEDESTRIAN	39.63%	256	39.27%	573	19.70%	223
UNKNOWN	23.53%	152	21.04%	307	20.49%	232
TOTAL	100.00%	646	100.00%	1459	100.00%	1132

Table 2 - Distribution of injuries by mode of transport across age groups



Nationality distribution differed among RTI victims (Table 3). Lebanese were the majority among 4-wheeled vehicle occupants. However, within the pedestrians group, Syrians were the most affected population. Among the motorcyclists, the distribution was roughly equal among the Lebanese, Syrians and Palestinians population (Figure 9).

	Pedestrian		4-Wheel Vehicle		Unknown		Motorcycle		Bicycle	
NATIONALITY	% OF TOTAL NUMBER OF RE-CORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RE-CORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RE-CORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RE-CORDS	NUMBER OF RE-CORDS	% OF TOTAL NUMBER OF RE-CORDS	NUMBER OF RECORDS
LEBANESE	49.29%	521	79.07%	786	75.18%	524	66.31%	309	72.34%	34
SYRIAN	44.37%	469	17.30%	172	16.79%	117	29.40%	137	25.53%	12
UNKNOWN	2.74%	29	1.91%	19	4.59%	32	2.15%	10	2.13%	1
PALESTINIAN	2.55%	27	1.51%	15	3.44%	24	1.93%	9	0%	0
OTHER	1.04%	11	0.20%	2	0%	0	0.21%	1	0%	0
TOTAL	100%	1057	100%	994	100%	697	100%	466	100%	47

Table 3 - Distribution of road victims among nationalities

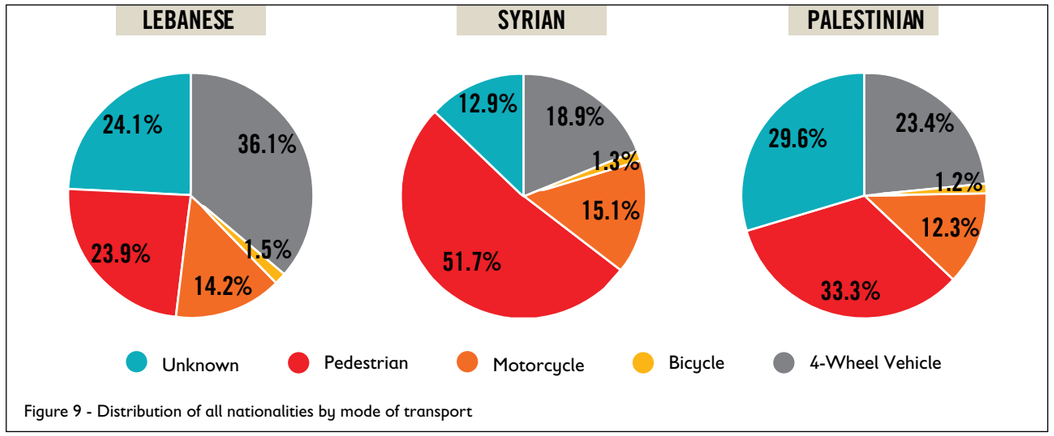


Figure 9 - Distribution of all nationalities by mode of transport

A noticeably high proportion of Syrian victims were pedestrians (51.7%), in contrast with other nationalities (Figure 9).

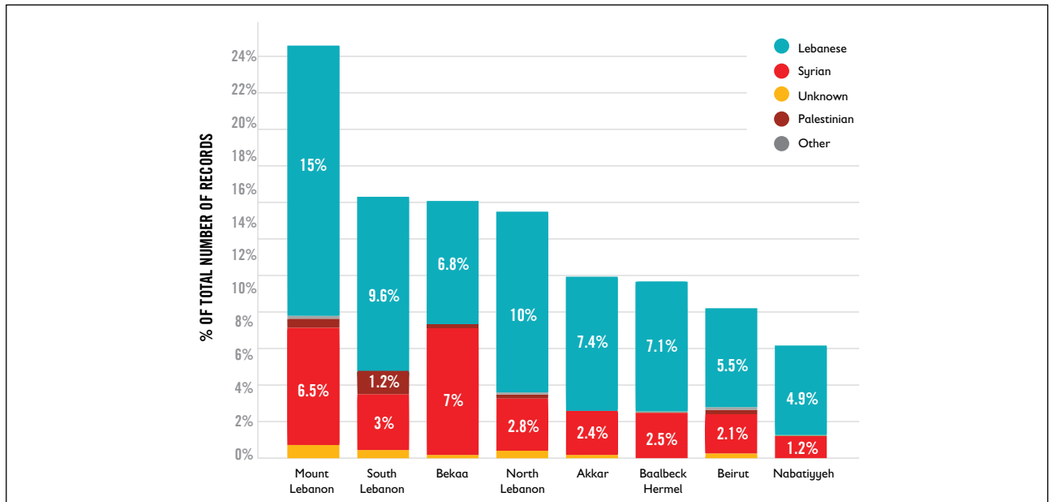


Figure 10 - Nationality distribution across the governorates

Child RTI cases were geographically scattered across all governorates in Lebanon with the highest proportion of cases reported in the Bekaa/Baalbeck-Hermel, North Lebanon/Akkar and Mount Lebanon regions (Figure 10). Of the nationalities, Lebanese represented the majority of road victims in all the governorates except for the Bekaa region, where a marginally higher proportion of Syrian children sustained road injury (7.1%) compared to Lebanese (6.9%) and other nationalities.

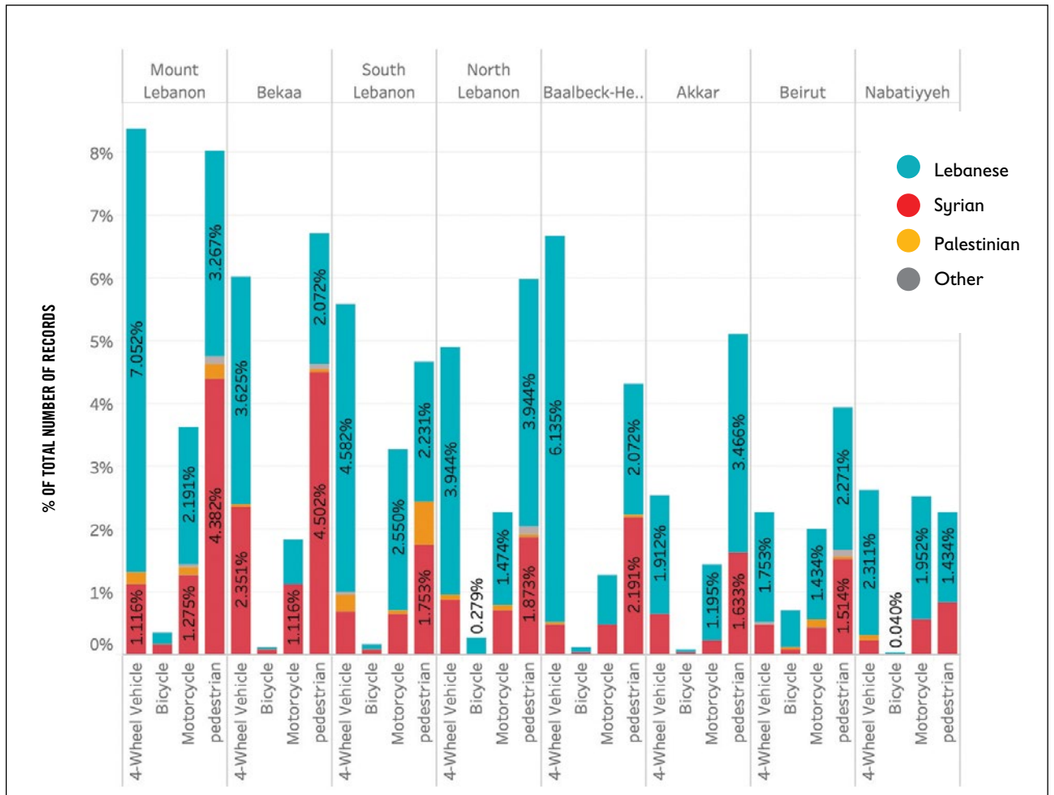


Figure 11 - Transport mode and nationality distribution across the governorates

The highest proportion of 4-wheel vehicle victims was reported in the Mont Lebanon Region (7.1%) followed by Baalbeck-Hermel (6.1%), while the highest proportion of pedestrian victims were found in Bekaa (4.5%) followed by Mount Lebanon (4.4%) (Figure 11).

Throughout the three-year study period, the patterns of child injuries changed across seasons with a significant peak in the summer months (32.5%), followed by spring (24.2%), fall (23.7%) and winter (19.5%) (Table 4).

SEASON	FREQUENCY	PERCENTAGE %
WINTER	646	19.54
SPRING	801	24.23
SUMMER	1,074	32.49
FALL	785	23.74

Table 4 - Seasonal variation of RTI

A significant portion (50.6%) of RTI sustained by children occurred on two-way roads that are not physically divided. 18.8% of RTI occurred on side streets and 13% occurred on highways. Weather conditions were not a conclusive factor in increasing risk of injury, as 55.4% of documented injury cases happened on dry surface conditions. 4-wheeled vehicle occupants comprised the majority of victims on highways and two-way unseparated roads, followed by motorcyclists. On side streets, however, the numbers of motorcyclists and pedestrians were relatively higher when compared to other types of roads (Figure 12).

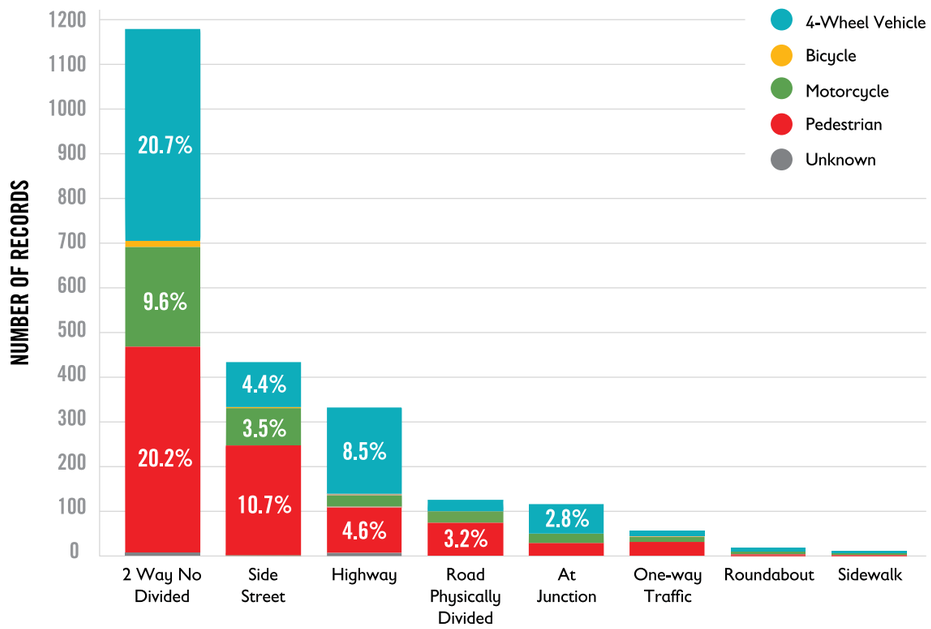


Figure 12 - Distribution of RTI by road type and road user

Most of the fatalities occurred when the RTI occurred on two-way roads that are not physically divided, followed by highways (19.9%) and side streets (19.2%) (Figure 13).

The most common reported factors contributing to RTI were speed (25%), distracted/careless driver (20%), and (for pedestrians) carelessness while crossing the road (14%) (Figure 14). Detailed information on the number and percentage of these multiple contributing factors are enlisted in Table 5. As noted, these factors were differently distributed among the regions. All three of these factors were reported to be more commonly associated with injuries occurring in Mount Lebanon and Bekaa, with the difference being statistically significant (Figure 15).

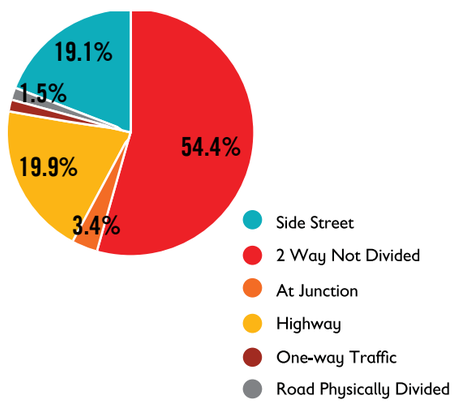


Figure 13 - Distribution of fatalities among road types

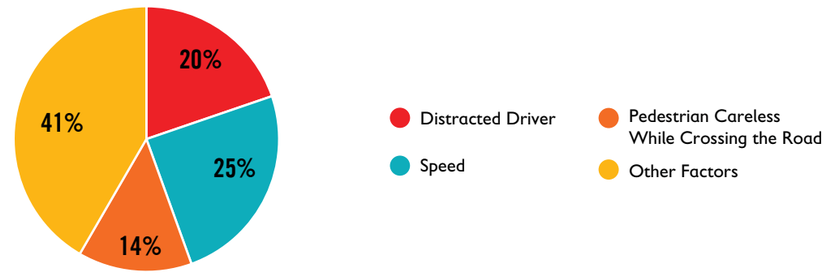


Figure 14 - Distribution of contributing crash factors

	DISTRACTED DRIVER		SPEED		PEDESTRIAN CARELESS WHILE CROSSING THE ROAD		LOST CONTROL		WRONGFUL OVERTAKING		OTHER FACTORS		TOTAL NUMBER OF CASES PER GOVERNORATE
	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	% OF TOTAL NUMBER OF RECORDS	NUMBER OF RECORDS	
AKKAR	20%	67	27%	91	17%	55	6%	21	4%	12	26%	85	331
BAALBECK	11%	36	26%	83	10%	31	2%	8	3%	10	48%	153	321
BEIRUT	16%	43	15%	41	14%	38	7%	18	4%	10	45%	123	273
BEKAA	27%	126	35%	161	18%	84	6%	26	10%	49	5%	21	467
MOUNT	16%	122	19%	145	12%	87	7%	50	7%	54	39%	290	748
NABATIYEH	31%	63	24%	50	10%	20	10%	20	8%	17	17%	36	206
NORTH	15%	69	24%	106	15%	66	4%	17	8%	36	34%	153	447
SOUTH	24%	112	23%	111	13%	60	7%	33	11%	51	23%	107	474

Table 5 - Distribution of risk factors across regions in Lebanon

The distribution of these contributing factors among age groups is documented in Table 6.

	DISTRACTED DRIVER		SPEED		PEDESTRIAN CARELESS WHILE CROSSING THE ROAD		LOST CONTROL		WRONGFUL OVERTAKING		OTHER FACTORS		TOTAL NUMBER OF CASES PER GOVERNORATE
	%	N	%	N	%	N	%	N	%	N	%	N	
0 -5 YEARS	21%	135	24%	158	15%	97	7%	44	6%	40	27%	173	647
6-14 YEARS	19%	285	27%	388	17%	247	4%	63	6%	82	27%	397	1462
15-17 YEARS	19%	213	21%	239	8%	95	7%	85	10%	114	34%	390	1136

Table 6 - Distribution of risk factors among age groups <5, 6-14 and 15-17

Table 7 presents the factors affecting boys and girls and increasing their risks of being road victims.

	DISTRACTED DRIVER		SPEED		PEDESTRIAN CARELESS WHILE CROSSING THE ROAD		LOST CONTROL		WRONGFUL OVERTAKING		OTHER FACTORS		TOTAL NUMBER OF CASES PER GOVER-NORATE
	%	N	%	N	%	N	%	N	%	N	%	N	
FEMALE	20%	176	27%	237	13%	120	8%	67	7%	61	26%	232	893
MALE	20%	464	24%	552	14%	319	5%	126	7%	177	31%	724	2362

Table 7 - Distribution of risk factors by gender

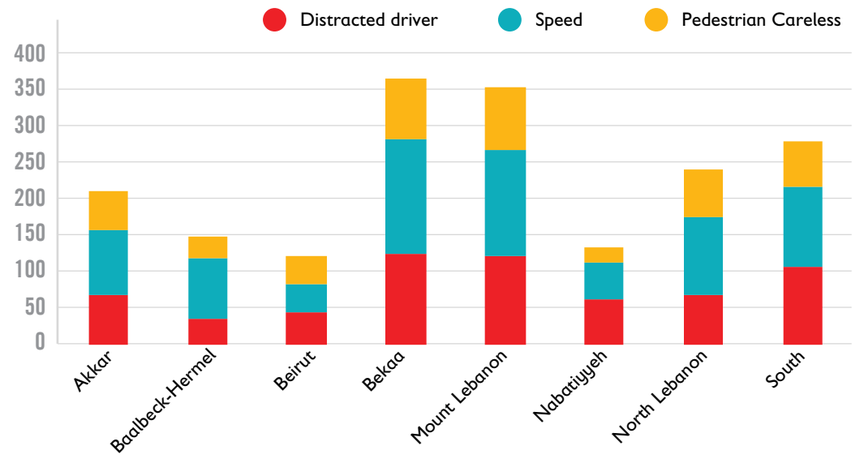


Figure 15 - Distribution of contributing crash factors among governorates

Speed was reported to be the most common factor for RTI in children in all age groups, followed by the "distracted/careless driver" factor. Children in the oldest age group (15-17) were more likely to suffer RTI related to speed and distracted/careless drivers, compared to RTI related to careless pedestrians. (Chi-squared test=41.9734, P-value <0.001) (Figure 16). There was no statistical difference between boys and girls with regards to these reported risk factors.

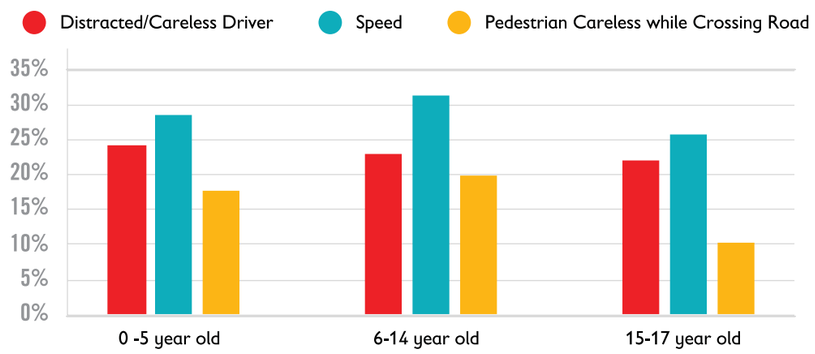


Figure 16 - Distribution of contributing crash factors among age groups

The nature and type of injuries were not uniformly reported across hospital and police data. Superficial injuries were reported to be 23% in police reports. In hospital data, the most common types of injuries over the three years were the following: superficial injuries including bruises and abrasions (36%), bone fractures (23%) and open wounds, including minor cuts and lacerations (18%) (Figure 17).

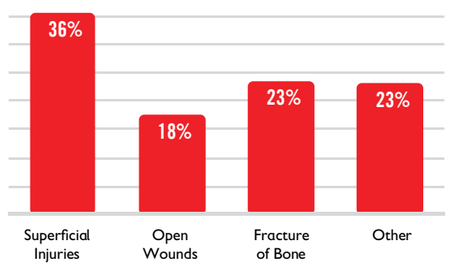


Figure 17 - Distribution of injury types

Regarding injury location, head and neck injuries were the most common nature of injury with 15% of the cases. These mostly included injuries to the head (including the scalp/skull) and face (including facial bones, eyelid/periocular area, ear, nose and the mouth/jaw). The second most common type of injuries were hip and leg ones (11.02%), followed by the trunk injuries (thorax, abdomen, pelvis, perineum and groin) (7.3%) and shoulder/arm (6.1%).

DEATHS

There were 237 fatalities reported in the study sample, 171 males (72%) and 66 females (28%). Fatal cases constitute (7.3%) of the total number of collected child road injury cases. Within each of the gender category, 7.3% of males who sustained a road injury died compared to 7.2% of the females. There was no statistical difference in death between males and females (chi-squared test= 0.0072, P-value=0.93).

Pedestrians had the highest share of fatalities with 60.8% of fatal cases, compared to occupants of 4-wheeled vehicles (25.0%), motorcyclists (12.3%) and bicyclists (0.8%). The distribution of fatalities among road type users was statistically significant (chi-squared test= 91.2871, P-value <0.001) (Figure 18).

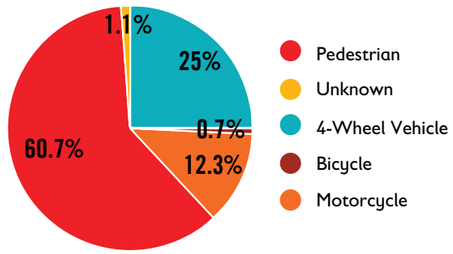


Figure 18 - Fatalities by mode of transport

The 6-14-year age group experienced the highest proportion of fatalities (42.3%). They were followed by those aged 0-5 years (31.4%) and 15-17 years (26.2%). The difference was statistically significant (chi-squared test= 26.4997, P-value <0.001) (Figure 19).

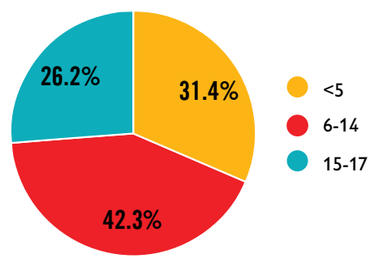


Figure 19 - Distribution of fatalities among age groups

MULTIVARIATE ANALYSES

In order to study the effects of many variables simultaneously on the outcome and severity of child RTI, two logistic regression models were carried out. The first model explored death as an outcome and the second model investigated head and neck injury as an outcome. We selected head and neck injury as an outcome as it is considered a proxy indicator for severe injuries in road traffic crashes. The adjusting variables included in the models were the following: type of road users, gender, age, nationality and season.

Based on the analysis, child pedestrians have higher odds of sustaining fatal injury compared to occupants of 4-wheel vehicles (OR = 1.6, 95% CI 1.17, 2.27). Older age groups have lower odds of dying as a result of road injuries: [6-14] (OR = 0.53, 95% CI 0.39, 0.74), [15-17] (OR = 0.51, 95% CI 0.35, 0.75). Syrian children have higher odds of dying as a result of road injuries compared to Lebanese children (OR = 2.4, 95% CI 1.83, 3.27). There were no statistical differences in the death as an outcome for gender and the seasons.

The research team selected head and neck injury for its potential to lead to long-term consequences and permanent disability for children. Logistic regression analyses showed that, while adjusting for all the other variables in the model, child pedestrians have lower odds of suffering from head and neck injuries (OR = 0.5, 95% CI 0.34, 0.74). Although the incidence of road injury is higher among males, female RTI victims have higher odds of suffering from head and neck injuries (OR = 1.28, 95% CI 1.01, 1.63). Older age groups have lower odds of sustaining head and neck injuries: [6-14] (OR = 0.69, 95% CI 0.52, 0.92), [15-17] (OR = 0.56, 95% CI 0.41, 0.76) compared to the youngest age group [0-5].

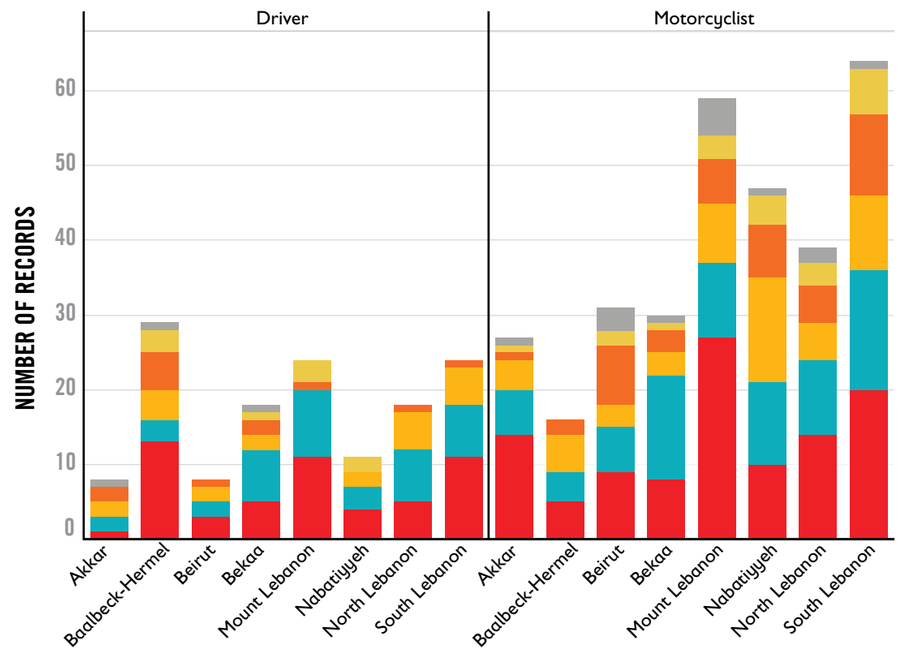


Figure 15 - Distribution of contributing crash factors among governorates

Despite the fact that the legal driving age in Lebanon is 18, the research team uncovered 140 cases in which children themselves were driving 4-wheel vehicles, and 313 cases of children driving motorcycles. Data analysis revealed that children as young as 12 years of age were involved in road crashes as 4-wheel vehicle drivers and as motorcycle riders, increasing their risk of sustaining fatal injuries – 16.4% of young 4-wheel vehicle drivers and 6.4% of young motorcyclists died. The proportion of child drivers increased with age. The vast majority of underage driver victims are male (88.9% of 4-wheel vehicle drivers and 99.8% of motorcycle riders). Rural and urban locations alike witness high proportions of underage drivers, with an elevated number of young 4-wheel vehicle drivers in Baalbek, Mount Lebanon and the South. Underage motorcyclists were more common in the South and Mount Lebanon.

DISCUSSION

This study reveals the significant burden of child road traffic injuries and deaths in Lebanon. Boys suffer the heaviest toll with the highest proportion (72%) of the total number of road victims. As with international studies, our results showed that boys were the majority of RTI victims across all ages.[13,16] Mount Lebanon, Bekaa/Baalbeck-Hermel and North Lebanon/Akkar were the regions with the greatest number of RTI. The main contributing risk factors for RTIs were speed and distraction/carelessness. Head/neck and lower extremity injuries were the most commonly reported. Most injuries were superficial, followed by fractures and wounds.

The number of RTI cases increased with age, however, those aged 0-5 had the highest number of fatalities, while the 15-17 age group sustained the highest proportion of injuries. Children aged 15-17 displayed a peak in road injury morbidity and mortality. Starting at the age of 14, there is a significant increase in the number of motorcyclist victims, peaking at 16 and 17. This may be explained by the tendency for young men to take risks on the roads and to drive motorcycles and motor vehicles.[13]

This study's findings align with other existing study results and reveal that the majority of road traffic injuries and deaths are among vulnerable road users, mainly pedestrians, cyclists and motorcyclists.[3,13,14,17] Pedestrians and cyclists constitute 47% of all road injuries and deaths compared to 30% sustained by users of motorized 4-wheelers. Pedestrians suffer the highest proportion of road deaths, with 13% of pedestrian victims dying; this was almost double compared to occupants of 4-wheeled vehicles (6.3%).

There are many risk factors that increase the likelihood of sustaining RTI in the general population.[16] It is essential to understand the risk factors faced by road users, specifically those affecting children, in an attempt to plan interventions and programs targeting the reduction of injuries and deaths resulting from RTI. Based on the study analysis, child age and road type were the two main factors associated with the nature and severity of RTI in children and youth.[13] The highest proportion of road fatalities was borne by the 6-14 age group, with almost 42% of the total number of child deaths. Nevertheless, it is worth noting that the youngest age group (0-5) suffered from the most fatal injuries; almost 12% of those children who sustained a road injury died, almost twice the percentage of deaths reported in older age groups. The increased death risk and injury severity in the younger population may principally be linked to this age group's lack of physical tolerance to high-impact crashes, especially when child restraints and seatbelts are not utilized.

In the older groups' cases, these facts are more related to developmental, gender and environmental factors.[13] Developmental factors relate to child physical development and limitations in their abilities to perceive risks and take preventive actions (limitations of size, hearing, vision, attention and judgment).[13] In older populations, these factors includes behavioral issues such as risk-taking, peer and social pressure and lack of driving experience.[13]

In many countries, the design and planning of roads and transport systems has not given enough consideration to the needs of all road users. Road infrastructure plays a significant role in increasing children's risk of RTI. The study findings reveal that a significant portion (38.3%) of the RTIs and most deaths-on-arrival to hospitals occurred on roads with two-way traffic that are not physically divided. Furthermore, the number of RTI for pedestrians and motorcyclists increased on side streets relative to other types of roads.

Our study showed that the most commonly reported contributing factors associated with RTI are speed and distraction/carelessness of road users. According to the literature, there are many risk factors that are elevated among children and young road users.[13,16] These include: (1) factors influencing exposure to risk such as a mixture of high-speed motorized traffic with vulnerable road users, (2) factors influencing crash involvement such as speed, gender and road design, (3) factors influencing crash severity such as excessive speed and use of helmets or seat belts and (4) factors influencing post-crash outcomes such as availability of emergency and health services and timely clinical intervention.

Similar to road injury studies conducted in other countries, this study shows that injuries (fractures, abrasions, lacerations and contusions) to the head and neck and extremities are the most common type of injury sustained by children following a road traffic crash.[13] Despite the inherent limitations of the documented hospital injuries sample, a significant proportion (5%) of child road victims presented to a hospital having sustained a traumatic brain injury (TBI), thus aligning with the international literature on the significant impact of TBIs on the severity and outcome of road traffic injuries, particularly among children.

According to the literature, lack of child restraint use is directly associated with high risk of morbidity and mortality as a result of RTI-related trauma. Based on the results of this study and the types of injuries sustained by children on the road, and with the limited available documentation of safety measures adopted by road users, the findings suggest that road users might not have been compliant with minimal safety requirements. Our study showed that children suffering severe injuries to the head and neck and extremities are likely to have suffered severe hits to the head against hard surface. Based on the literature, children under five are more likely to suffer from severe injuries or death if the child is unrestrained or positioned in the front seat or on an individual's lap. In these cases, they are likely to be ejected forward upon impact or crushed between the individual's body and the interior surface of the vehicle. The study's regression analysis demonstrated that children between the ages of 0-5 who experience RTI are at a higher risk of suffering from head/neck injury or death.

In 2017, WHO published "Save LIVES: a road safety technical package" as part of its multisectoral support to member states to provide support to its national and international partners in technical guidance, policy planning and implementation.17 The Save LIVES package includes strategies and evidence-based interventions aimed to reduce RTI and deaths by half by focusing on: (1) Speed management, (2) Leadership, (3) Infrastructure design and improvement, (4) Vehicle safety standards, (4) Enforcement of traffic laws and (5) post-crash Survival. In order to reduce child deaths and injuries on the roads, Lebanon needs to implement a road safety strategy that comprehensively addresses all five of these areas of work.

CONCLUSION AND RECOMMENDATIONS

This is a unique study that combines multiple sources of data to build a comprehensive understanding of the burden of child road injuries and deaths in Lebanon. To the best of our knowledge, this study was the first to be carried out at the national level to gain a deep understanding of the demographics, ethnicity, and geographic distribution of child road injuries and deaths across Lebanon. To complement our knowledge of the child road injury health problem, patient medical records were examined at 30 geographically dispersed hospitals across the nation to further assess the most common type of injuries sustained by road injured patients and the resulting injury outcome.

Road traffic injury is a severe yet neglected problem locally and regionally. This national study contributes to our understanding of child mortality and morbidity resulting from road traffic crashes in Lebanon.

- Children between the ages of 6-14 account for the greatest proportion of RTI, including death, followed by children between 15-17 and finally children under 5.

- Among all RTI resulting in death, children under the age of 5 are disproportionately more likely to be the victims of a fatal crash, whereas crashes involving children between the ages of 15-17 are disproportionately less likely to result in death.

- Children between the ages of 6-14 are most likely to be involved in RTI where speed was a contributing factor to the crash.

- According to the tables below, children between the ages of 0-5 and 6-14 are more likely to be involved in fatal pedestrian crashes, while children between the ages of 15-17 are most likely to experience fatal crashes involving four-wheel vehicles and motorbikes.

% OF CHILD FATALITIES BY MODE OF TRANSPORT AND AGE GROUP

	PEDESTRIAN	FOUR-WHEEL VEHICLE	MOTORBIKE	BICYCLE	UNSPECIFIED
0-5	68.5	23.6	3.3	0	4.4
6-14	66.1	19	10.7	0.8	3.3
15-17	30.6	33.3	24	1.3	9.3

This report calls upon government officials, policymakers, NGOs and health advocates to use this study's findings as a basis to design and implement child injury prevention measures and programs to reduce injuries and deaths on the roads, taking into consideration the distinct ways in which children of different age groups experience RTI.

1. ENSURE PROPER INJURY CODING AND ESTABLISH NATIONAL INJURY SURVEILLANCE SYSTEM

The initial step to understanding the burden of any type of injury is to accurately document and code injury cases presented to hospital Emergency Departments. In countries like Lebanon, where some hospitals lack vital statistics and registries, existing hospital administrative and clinical data is currently used to understand the injury morbidity and mortality rate at the national level and assess the country's injury burden. Such data sources are readily available and provide clinical and administrative data including chief complaints, outcome measures, lengths of stay and discharge diagnosis. However, the records lack accurate injury coding and documentation of essential information critically relevant to understanding the mechanism of injury. This gap limits the impact of research on injury prevention and policy. Coding and adopting the ICD-10 or any universal coding scheme is needed to help unify the classification and precise collection of injury data for effective analysis.

Similarly, the Internal Security Forces' traffic division should adopt a standardized road safety data collection form that is harmonized with the form utilized by hospitals. The harmonized data collection form should include standard information for each passenger involved in the incident, regardless of injuries sustained, including seat belt use, helmet use, use of child seat, number of occupants in the car, car mechanical issues, and airbag deployment, among others. The form should also note weather conditions and infrastructure considerations, such as nearby signage and street lighting (or lack thereof). In addition, the hospital and police data systems should be linked so that crash incidents and victim outcomes can be fully recorded and tracked, and the resulting data can be more easily analyzed and used for policy and program development.

Lebanon lacks national injury surveillance systems, which render injuries challenging to accurately measure and address. Within the context of road traffic injuries, the scarcity of injury surveillance systems results in the absence of accurate, reliable and valid road injury data. Consequently, existing injury intervention efforts are limited in scope, not evidence-based and deprioritized in policymaking. More accurate and reliable road injury data will help to reveal the extent and the magnitude of the road traffic injury as a growing public health problem in Lebanon. Integrating injury surveillance systems at the government level will help to understand the problem and to identify future policy priorities for prevention as well as to implement context-sensitive interventions to reduce injuries and mitigate their consequences.

2. ENFORCE ROAD SAFETY LAWS, PARTICULARLY THOSE INTENDED TO PROTECT CHILDREN

Lax enforcement of road safety laws exacerbates current road hazards and renders the environment adversely unsafe and risky in Lebanon, leading to a substantial increase in the number of road crashes. Over-capacity vehicles represent one major challenge to road safety, particularly among poor families. Children must always be secured using appropriate child restraints whenever they are traveling within vehicles. Motorcyclists must also adopt safety measures such as wearing helmets and refraining from transporting young children as passengers.

In Lebanon, strong traffic laws – Law 243 (Annex D) – exist, however many elements of the law are never enforced. According to the law, children under the age of 10 are prohibited from sitting in the front seat, and children under the age of 5 should be properly seated in a car seat in the backseat of the car – fines for either of these infractions are listed at LBP 450,000 ($300). Traffic police must increase enforcement of Law 243, particularly when the safety of children is at stake. Increasing enforcement of Law 243 would be the most effective way to ensure that adults protect children within vehicles. Regular, reliable enforcement could lead to sustained behavior change among parents.

3. IMPLEMENT EVIDENCE-BASED ROAD SAFETY POLICIES AND BEHAVIOR CHANGE PROGRAMS

Many countries have adopted road injury interventions and policies that have shown tremendous success in reducing road traffic injuries, a leading cause of preventable death among children and adolescents. These strategies can be contextualized to serve communities in Lebanon. Adopting data-driven injury prevention and control measures can eventually lead to a reduction in road injuries and fatalities. These measures should be guided by road safety and urban planning principles that consider ways to encourage safe behavior among pedestrians and drivers. For example, strategically installing walkways and lighting near areas of high traffic may encourage pedestrians to cross in designated areas and lead drivers to accordingly reduce their speed.

Installing low-cost road dividers (e.g. trees and plants) and roundabouts would also encourage drivers to engage in safer behavior.

Additionally, road safety behavior change programs should be initiated in schools, hospitals and communities to reduce road deaths and mitigate their impacts on children in Lebanon. There are many effective models for working directly with schools, such as creating road safety clubs and promoting road safety practices among students, teachers and parents. Any road safety programs must go beyond traditional "awareness campaigns" and focus on developing the right practices and habits that can keep both children and adults safe. Much can be done by implementing these programs along with initiating infrastructure improvements around schools, such as painting crosswalks and installing traffic calming measures.

4. INVEST IN SAFER ROAD INFRASTRUCTURE

In light of the greater number of roads connecting industrialized cities, the increased use of transportation infrastructure and the absence of government road safety enforcement, road crashes are on the rise in Lebanon. Findings from this study reveal that road type correlates with the risk of road injury, particularly among vulnerable road users (children, pedestrians and motorcyclists). The government should capitalize on increased foreign investment in infrastructure through the CEDRE conference and dedicate funds to improving road safety.

Authorities and local municipalities are urged to collaborate and enhance the safety of local roads through the design, development and implementation of enhanced road traffic injury prevention measures (e.g. traffic calming). These include infrastructure additions to reduce vehicle speed such as roundabouts and speed bumps. These measures should also include the strategic placement of road dividers and medians in areas of higher pedestrian and vehicle traffic. This may serve to discourage unsafe driving practices, reduce vehicle speed, and encourage pedestrians to cross at designated points along the road. These investments are low-cost, but high-impact.

In addition, investment is needed to improve the visibility of road users and reduce pedestrian exposure to road traffic. Such measures would include expanding the number of pedestrian crossings, including the strategic placement of lights at such crossings. Ensuring that pedestrians are visible and cross only at designated, marked, and well-lit locations would likely reduce the high number of pedestrian injuries and fatalities.

As noted above, roads near schools should be prioritized. The International Road Assessment Program (iRAP) provides tools and assistance for assessing roadway safety. Lebanon should ensure that primary roadways are upgraded to at least "3 stars," and to 4 or 5 stars for roads near schools.

REFERENCES

1. GBD 2017 Causes of Death Collaborators. Global, regional, and national age-sex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the Global Burden of Disease Study 2017. The Lancet. 8 Nov 2018;392:1736-88. doi: http://dx.doi.org/10.1016/S0140-6736(18)32203-7

2. Krug, Etienne G., Gyanendra K. Sharma, and Rafael Lozano. "The Global Burden of Injuries." American journal of public health 90.4 (2000): 523. Print.

3. World Health Organization (WHO) Injuries, Traffic: http://www.who.int/topics/injuries_traffic/en/

4. World Health Organization. Global status report on road safety 2018.

5. Choueiri, E. M., Aoun, J., & Otayek, E. (2017, June). Effectiveness of the newly introduced variable message signs in Lebanon on driver behavior. In Models and Technologies for Intelligent Transportation Systems (MT-ITS), 2017 5th IEEE International Conference on (pp. 562-567). IEEE.

6. Dalal K. Transport injuries and deaths in the Eastern Mediterranean Region: findings from the Global Burden of Disease 2015 Study. International journal of public health. 2017.

7. Mokdad AH. Adolescent health in the Eastern Mediterranean Region: findings from the global burden of disease 2015 study. International journal of public health. 2017:1-8.

8. Choueiri B, Choueiri G, Choueiri EM. An overview of road safety in Lebanon with particular attention to non-urban roads. Advances in transportation studies. 2007;11:75-91.

9. Choueiri E, Choueiri GM, Choueiri BM. Analysis of Accident Patterns in Lebanon. In: 4th International Symposium on Highway Geometric Design; 2010.

10. Choueiri EM, Choueiri GM, Choueiri BM. An overview of land transport in Lebanon, with special emphasis on traffic safety. Advances in Transportation Studies. 2012(28):63-80.

11. Choueiri EM, Choueiri GM, Choueiri BM. Road safety in Lebanon: magnitude, cost and potential countermeasures. Advances in Transportation Studies. 2015(35):73-88.

12. United Nations High Commission on Refugees. 2016. Syria Regional Refugee Response – Lebanon – June 2018. Available: http://data.unhcr.org/syrianrefugees/country.php?id=122; accessed September 2018.

13. World Health Organization. Youth and Road Safety. 2007: https://www.who.int/management/programme/ncd/Youth%20and%20Road%20Safety.pdf

14. World Health Organization. Global Plan for the Decade of Action for Road Safety 2011-2020. 2011. http://www.who.int/roadsafety/decade_of_action/plan/en/

15. United Nations General Assembly. Transforming our world: the 2030 Agenda for Sustainable Development. 2015. https://sustainabledevelopment.un.org/post2015/transformingourworld

16. Peden M et al., eds. World report on road traffic injury prevention. Geneva, World Health Organization, 2004. http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/

17. World Health Organization. Save LIVES: a road safety technical package. 2017. Available from: https://www.who.int/violence_injury_prevention/publications/road_traffic/save-lives-package/en/

18. Kunhadi, Youth Awareness on Road Safety. 2019. http://www.kunhadi.org/kunhadi/numbers.php?lang=1

19. Internal Security Forces. Government of Lebanon. The New Traffic Law. 2012. Available from: http://www.isf.gov.lb/files/law243.pdf

20. Al-Hajj, S., Powliuk, C., Smith, J., Pike, I. (2019). "History of Injury in Developing Country: A Scoping Review of Injury Literature in Lebanon". In Press (the Journal of Public Health).

APPENDIX A
TIMELINE

ACTION PLAN	NOV 2018	DEC 2018	JAN 2019	FEB 2019	MAR 2019	APR 2019	MAY 2019	JUN 2019
Develop the inception and action plan								
Review existing RTI forms								
Explore local and international RTI Data Collection Forms								
Design new RTI-ED Forms								
Pilot test RTI-ED Forms at selected ED								
Modify and Finalize the RTI/ED Form								
Conduct Training to senior RA and RA on data collection								
Prepare and Submit Phase Report								
Select participating hospitals								
Emergency Department Data collection								
Compile Data and Verify Data Validity								
Data Cleaning								
Data Analysis								
Submit Draft Report								
Data Reporting and Dissemination								
Prepare and Submit Final Report								

APPENDIX B
LIST OF SELECTED HOSPITALS

HOSPITAL	TYPE	DISTRICT	GOVERNORATE	# OF CASES
KMC	Non Governmental	Keserwen	Mount Lebanon	15
AUBMC	Non Governmental	Beirut	Beirut	88
Abou Jaoudeh	Non Governmental	Jounyeh	Mount Lebanon	14
Hasbayya Gov	Governmental	Hasbayya	Bekaa	10
Geitawi	Non Governmental	Beirut	Beirut	10
CHN	Non Governmental	Tripoli	North	14
New Mazloum	Non Governmental	Tripoli	North	19
Tannourine Gov	Governmental	Batroun	North	16
Dar al Shifa	Non Governmental	Tripoli	North	21
Sacre Coeur	Non Governmental	Beirut	Beirut	33
NDU	Non Governmental	Jounyeh	Mount Lebanon	31
Hammoud	Non Governmental	Saida	South	50
Saida Gov	Governmental	Saida	South	14
Al Youssef	Non Governmental	Akkar	Akkar	94
Al Haykal	Non Governmental	Tripoli	North	62
Bint Jbeil Gov	Governmental	Bint Jbeil	Nabatiyyeh	11
Bahman	Non Governmental	Beirut	Mount Lebanon	68
Dar al Amal	Non Governmental	Baalbeck	Baalbeck-Hermel	82
Dar al Hikmah	Non Governmental	Baalbeck	Baalbeck-Hermel	79
Libano Franciase	Non Governmental	Zahleh	Bekaa	72
Lebanese Italian	Non Governmental	Sour	South	60
Monzer El Hajj	Non Governmental	Chouf	Mount Lebanon	13
Khoury	Non Governmental	Zahleh	Bekaa	13
Rashayya Gov	Governmental	Rashayya	Bekaa	7
Ragheb Harb	Non Governmental	Nabatiyyeh	Nabatiyyeh	10
Kamal Jomblat	Non Governmental	Chouf	Mount Lebanon	71
Hariri Gov	Governmental	Beirut	Beirut	20
Martime	Non Governmental	Jbeil	Mount Lebanon	20
Maounette	Non Governmental	Matn	Mount Lebanon	23
Hamed Farhat	Non Governmental	West Bekaa	Bekaa	10

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