AN OVERVIEW OF ROAD TRAFFIC INJURIES AMONG CHILDREN IN SWEDEN OVER 20 YEARS

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ABSTRACT

This register study, focusing on children from (0-17 years), aimed to investigate traffic injuries (AIS1-5) among children on roads in Sweden between 2000 and 2019. The Swedish national database (STRADA) was used. It includes road traffic crashes reported by the police and by emergency care centers. The data included road user group, age, gender, injury type, AIS level, and use of seatbelt or child restraint. Descriptive statistical analysis and simple linear regression were performed to investigate significant changes in injury distribution between 2010 and 2019. A total of 14 731 registered crashes during the last 20 years involved 15 045 injured children (0-17 years). Six thousand six hundred forty-three were girls and 8088 boys. The total number of injuries decreased over time (40% since 2010). Most injured children (80%) sustained minor injuries (AIS1). Most were 12 to 17 years old (80%). A change in injury distribution was found according to age; for 0-9-year-olds, most injured children were pedestrians, while for 9-13 years old's, bicyclists were most common. For 14-16-year-old children, moped riders were most common. Most injured children (62%) were vulnerable road users (2000-2019). A 15% increase in the proportion of injuries between 2010 and 2019 was found. A 24% decrease in the proportion of injuries for children as vehicle occupants (excl. motorcycle and moped riders) between 2010 and 2019 was found; still, in 2019, 35% of the injured children were vehicle passengers. The most frequently injured body region was the head (26%), followed by the neck (19%). Eleven percent of the injured children in cars were unbelted. Twenty-two percent of the 0-12 years old children did not use a proper child restraint. The study confirms that Sweden's traffic safety for children (0-17 years) has improved since 2000. A 40% reduction in the number of injuries was found between 2010-2019 (including minor injuries that account for 80% of all reported injuries). The study also highlights that for vulnerable road users, the proportion of child injuries (0-17 years) increased by 15%, which was lower than vehicle occupants (24% decrease). Moped riders account for the largest road user group (35%) (2000-2019). Therefore, it is important to improve protection for children as vulnerable road users both regarding severe injuries as well as minor injuries leading to long term consequences for a safe (sustainable) traffic environment.

INTRODUCTION

Traffic safety is on the global agenda. Target 3.6 in the UN Sustainability Development Goals state the ambition to reduce fatalities and injuries by at least 50% by 2030 [1]. UNICEF is the global custodian for children, responsible for 7 of the UN sustainability goals [2]. Knowledge of accident and injury distribution is important for designing a safe road transport system and prioritizing countermeasures that minimize the risk of traffic accidents and injuries (e.g., recommendations on speed limits, separation of road user groups, helmets, and restraint use). A total of 390 children were killed on European roads, and more than 6000 were seriously injured in 2020 [3]. Children have physical and cognitive limitations that make them more at risk., Children are less visible to drivers due to their small stature and when in traffic, have a lower field of view than adults. Their posture and size also influence the type of injuries they sustain in crashes. Over the past decade (2011-

2020), road safety for children has improved more rapidly than road safety for the rest of the population (46% and 36% decrease in mortality, respectively) [3]. Serious injuries for children in traffic crashes account for approximately 5% of all serious road traffic injuries in the EU [3]. There are, however, large differences within the EU countries. The mortality rate for children in traffic is ten times higher in Romania compared to Norway, Cyprus, or Sweden [3]. The proportion of child road traffic deaths compared to all causes of death varies from less than 2% in Norway to over 11% in Latvia, and about 10% in Israel, Czechia, and Romania [3]. In 2020 a total of 204 road traffic fatalities occurred in Sweden, of which 15 were under the age of 18 [4]. Approximately 100 000 children are born each year in Sweden, and 23% of the Swedish population is under the age of 19. Approximately 500 children under 19 died of any cause in Sweden in 2020, a decrease from 670 fatalities in 2000. Sweden has a strong safety culture manifested in national programs such as Vision Zero [5] and the annual road traffic safety targets [6, 7]. Since 2005 children under 15 must use a helmet while biking. Since 2008 it has been mandatory to have a driving license for a moped, which can be obtained from the age of 15. A driver's license for cars can be obtained by age 18 (from 16, it is allowed to drive with an educated supervisor). The use of child restraints has been regulated by law since 1988, and in 2007 a requirement to use child restraints up to a height of 135 cm was implemented. Focused regional efforts have increased the awareness of child safety in traffic [8, 9]. During the last decade, Sweden has had a 23% reduction in deaths on roads, meaning that the national target of a 50% reduction over the period 2007-2020 has been reached [10]. Sweden is now working towards target 3.6 adopted in the UN sustainability goals for 2030, targeting a 50% decrease in mortality over the decade. Typically, mortality and serious injury rates are used as safety targets in the EU for international comparison, e.g.,[1, 3, 11]. However, there is less knowledge regarding the development of minor injuries. Moreover, many minor injuries could lead to long-term consequences [12]. Children, as a road user group, are not analyzed separately on the same regularity as adults. Hence, this study takes advantage of 20 years (2000-2019) of data covering road traffic accidents in Sweden, where accident and injury distributions are studied for children 0-17 years of age as various road users. This study thus targets children specifically, includes all injury severity levels, and complements official statistics on fatality and serious injury rates. The result can guide preventive actions for children of various ages and road user groups to reach the UN Agenda 2030 goals.

METHOD

Material

This study is based on the registry STRADA, the Swedish national system for traffic injury data collection (for a full description of STRADA, see [13]. The Swedish Transport Agency hosts STRADA with restricted access. For example, ethical approval is needed for access. STRADA includes information from two separate sources; traffic accidents reported by the police and medical reports provided by Swedish emergency hospitals. Only accidents within the road transport environment are included. The road environment is defined as a street, pedestrian and cycle path, sidewalk, separate parking, market square, public transport stop, or petrol station. A road accident is defined as a sudden event (collision) within the traffic environment that leads to a personal injury. Fall (e.g., falling when walking on pavement) is typically not included within the dataset in line with the international definition of an accident in the road system. The information in the registry is pseudonymized. Extracted dataset for this study includes all unintentional injuries (i.e., excluding suicide) of children aged 0-17 years during the study period 2000-2019, which can be found in both data sources (police reports and hospital data). For each injury, extracted variables from police reports include accident number, reference number, accident date, accident description, seatbelt use, child restraint use, road characteristics, speed limit, road user group (pedestrian, cyclist, moped rider, car occupant, bus occupant, light/heavy truck occupant, etc.), and injury severity as set by the police in two categories (minor and serious injury). Extracted variables from medical reports include accident number, reference number, accident date, diagnostic code, road user group (the same categories as in the police report), injury type, AIS level, age, and gender. Body region was derived from the injury diagnosis. One accident can include more than one child, and each child can sustain multiple injuries. One child can be involved in several accidents during the study period. The Swedish ethical review authority approved the research via the regional ethical board in Stockholm (DRnr 2018/711-31/5).

Analysis

The analysis was performed with descriptive statistics, including frequencies and proportion (percentages) of all available variables for children 0-17 years old (excluding. suicide) for 2000-2019. The studied variables

were road user group, age, gender, injury type, body region, AIS level, seatbelt, and child restraint use. Excel Power Pivot (v. 2108) and SAS Enterprise Guide (v. 8.3.0.103) were used for statistical analysis. 95% confidence intervals (CI) were used to identify significant changes between variables, Eq. (1). The road user groups included: pedestrians, cyclists, moped riders, car occupants, bus occupants, light/heavy truck occupants, and others (tractors, snowmobiles, horse riders, off-road vehicles, etc.). The road user groups were also divided into two categories according to their degree of protection in traffic; (1) vulnerable road users (VRU) include unprotected road users such as pedestrians, cyclists, motorcycle riders, and moped riders, and (2) vehicle occupants refer to passengers who are protected inside a car, bus, or heavy/ light vehicle. Changes over time were highlighted by calculating relative change (Eq. 2) and by estimating the trend with simple linear regression between 2010 and 2019 to ensure a none-overlapping 95% CI (Eq. 2). By 2010, all hospitals in Sweden were included in STRADA and by excluding 2020, the covid pandemic year is accounted for in the analysis.

$$95\% \text{ confidence interval:} \quad CI \quad \rule{3cm}{0.4pt} \quad \text{(Eq. 1)}$$

$$\text{Relative change:} \quad C = \frac{x_2 - x_1}{x_1} \quad \text{(Eq. 2)}$$

RESULTS

During the study period, 2000-2019, a total of 13 139 registered traffic accidents occurred that involved 14 731 (unique) injured children (0-17 years old). Six thousand six hundred forty-three were girls, and 8088 were boys. A total of 34 776 injuries are included in the data set. The descriptive statistics are presented (Figures 1 to 6), and corresponding frequencies include 95% CI for the included variables. A visualization of the simple regression analysis is presented in the Appendix.

Age and gender distribution of injured children

The majority (80%) of the reported injured children between 2000 and 2019 (including all severity levels and road user groups) were 12 to 17 years old, Figure 1. Over time, a general decline in injured children (0-17 years old) was found (2000-2019). Subsequent simple linear regression analyses for the accident years 2010 to 2019 (when all hospitals were included) estimates a significant negative trend for injured children in the 12 to 17 age group (a 40% decrease). The trend estimates a 95% CI for mean 2010 and 2019 is non-overlapping. See Appendix, Figure A1.
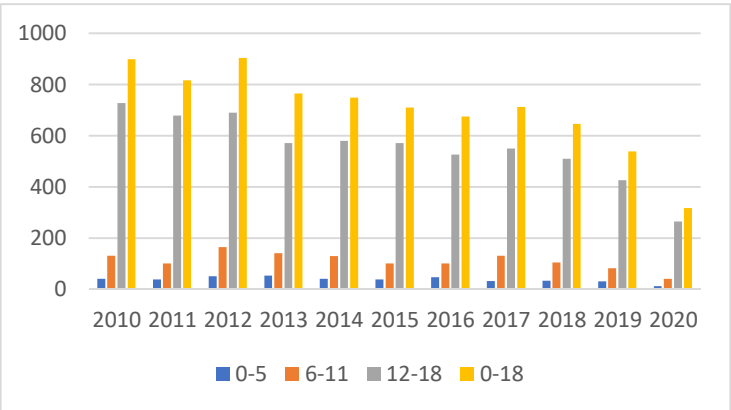

Figure 1. The number of injuries across age groups during the study period (2010-2019). The corresponding table, including CI 95%, can be found in the Appendix, Table A2.

Children in the 0-5-year-old age group were most often injured as pedestrians (23%), while 9-13-year-olds were mostly injured as bicyclists (22%). Between 12-17 years old, children were mostly injured as moped riders (44%), Figure 2. The proportion of injured children as car occupants decreased by age: 0-5 years (68%),

7-11 years (55%), and 12-17 (28%). Boys accounted for 55% of the number of injured and girls 45% (accidents 2000-2019). For moped riders, a larger proportion of boys were injured than girls (64% and 36%, respectively).
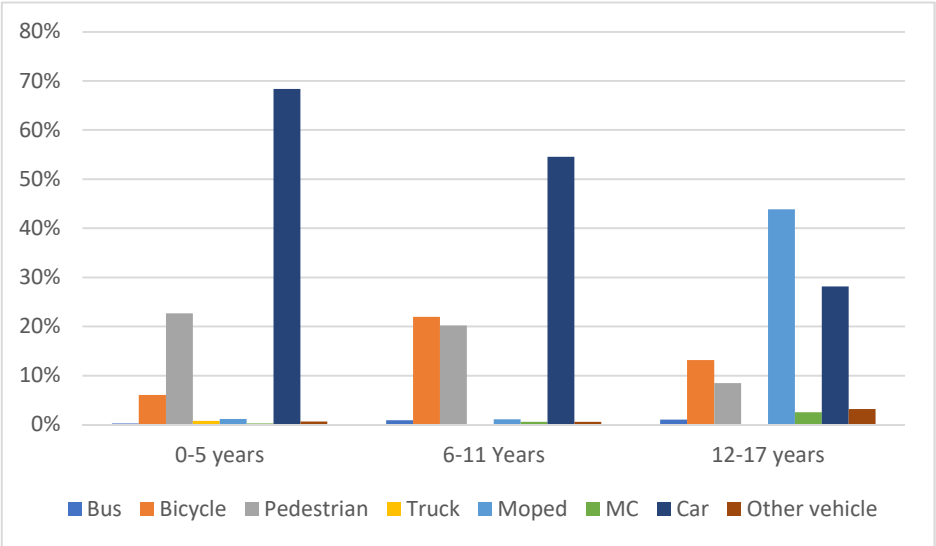

Figure 2. The Proportion of injured children per road user group by age. The corresponding table, including frequencies, proportions, and CI 95%, can be found in the Appendix, Table A3.

The distribution between different road user groups

A majority (62%) of the injured children 0-17 years old (including all severity levels) were injured as vulnerable road users during the study period (2000-2019) Figure 3, where eight percent were traveling as pedestrians, 13% as a bicyclist (13%), and 35% as moped riders. Children 0-17 years old traveling as vehicle occupants (bus, car, light/heavy vehicle) accounted for 38% of all road traffic injuries during the study period (2000-2019). Car occupants specifically accounted for 35% of all injuries. Simple linear regression analysis estimated significant trends (decreases) for the following groups (children 0-17) between the accident year 2010 and 2019 (Appendix, Figures A2-A5): vulnerable road users (30%), vehicle occupants (54%), car occupants (57%), moped riders (35%). Indications of decreases in the number of injured children between 2010 and 2019 for pedestrians and bicyclists were found (not significant). Considering the proportion of injuries among children as vulnerable road users and vehicle occupants between 2010 and 2019, a 15% increase could be seen for vulnerable road users, during a 24% decrease in injuries for vehicle occupants. Based on police data, the proportion of injured children using child restraints increased during the same period (from 14% in 2010 to 25% in 2019). Nevertheless, 11% of the children injured as car occupants did not wear the seatbelt, and as high as 14% of the 12-17 years old were unbelted. Twenty-two percent of 0-12-year-old children did not use proper child restraint.
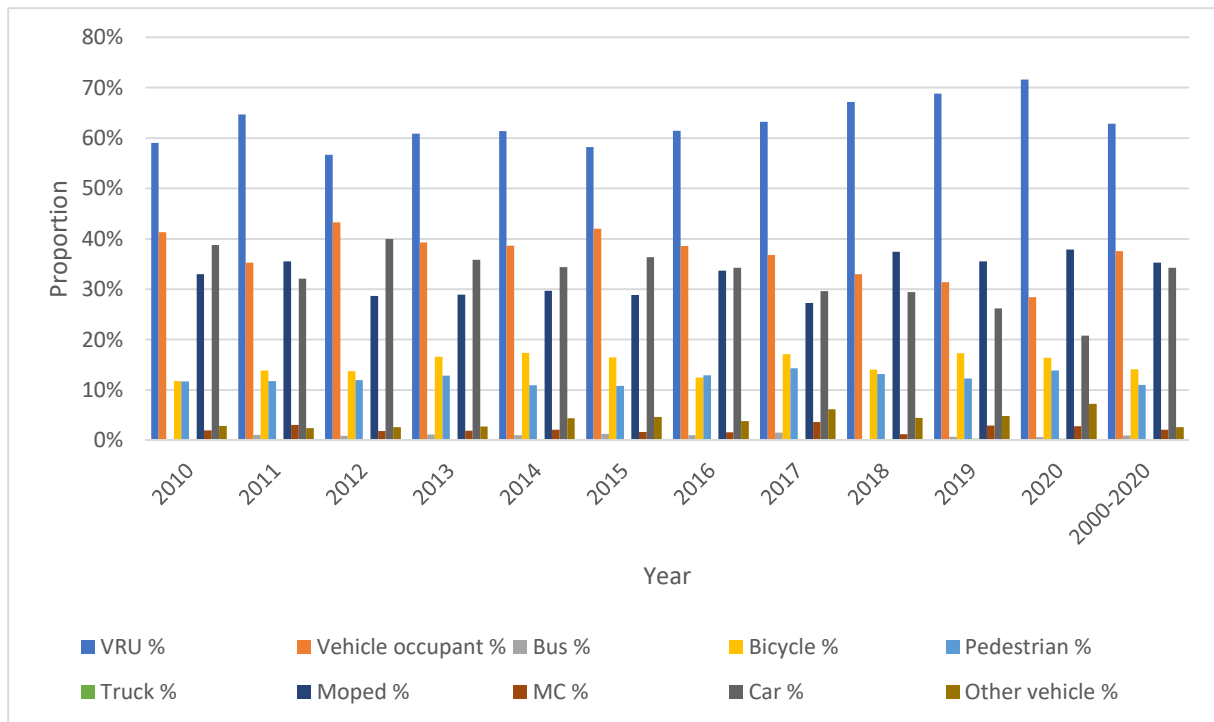
Figure 3. The proportion of injured children per road user group and accident year. The corresponding table, including frequencies, proportions, and 95% CIs, can be found in the Appendix, Table A4.

Injured body region

The main injured body regions for injured children aged 0-17 years (2000-2019), including all road user groups and injury severity levels, were the leg and pelvis (35%), followed by upper extremities (22%) and head/face (20%), Figure 4. However, the injury distribution varied according to the road user groups. For vulnerable road users, the most injured body regions were leg and pelvis injuries (36%), followed by the arm (25%) and head/face (22%). For pedestrians and bicyclists specifically, head/face (30-31%) is the second largest body region. The major injured body regions for vehicle occupants were the head (26%) and neck (19%). No major trends were found over 2010-2019 when comparing relative changes for injured body regions except for car occupants. Head/throat injuries were reduced to a larger extent (300%) than other body regions (total mean of 176%).
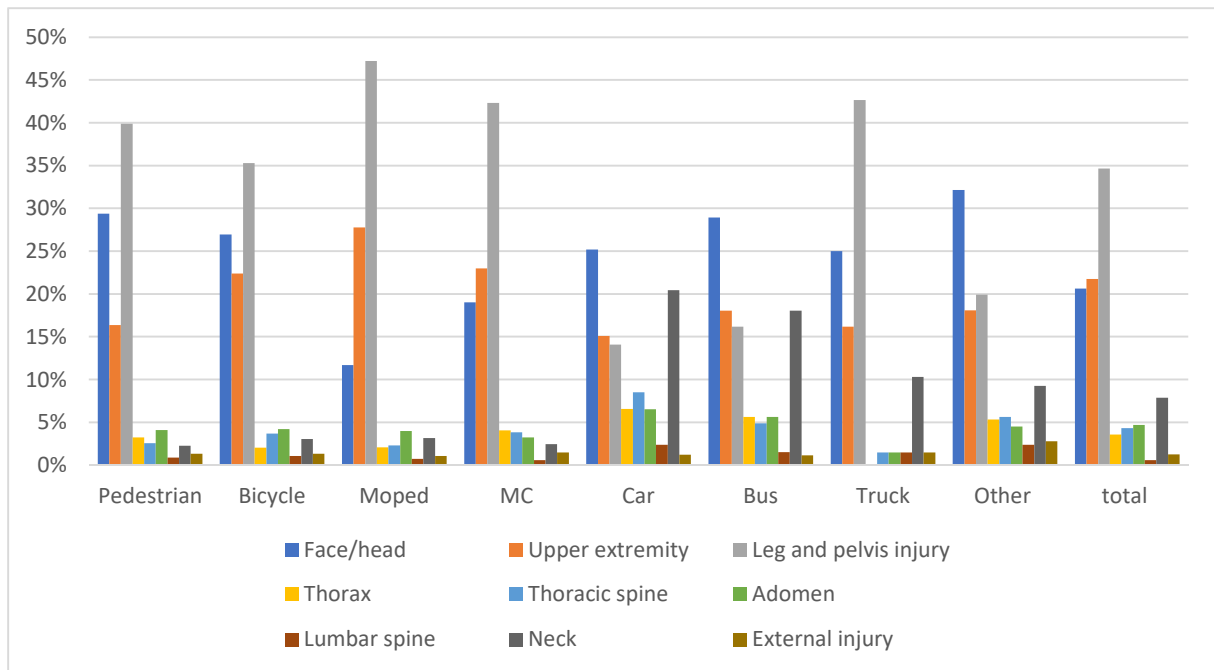
Figure 4. The overview of injured body regions per road user group, including all ages and severity levels. The corresponding table with frequencies, proportions, and 95%CIs can be found in the Appendix, Table A5.

Injury severity level

Over the 20 years investigated, most injuries sustained by children (0-17 years old), including all road user groups, were minor injuries (80%) (AIS1), Figure 5. Moderate to serious injuries (AIS 2+) accounted for 20 %. Most of those receiving moderate to serious injury (AIS2+) were 15 years old or older. The injury severity for children (0-17) varied among the road user groups during the study period (2000-2019). Motorcycle riders sustained the most severe injuries (AIS3+: 9%). Large road user groups sustained moderate injuries (AIS2) includes motorcycle riders (27%), moped riders (15%), pedestrians (18%). Only a small variation could be seen in severity levels between vulnerable road users (AIS1: 80%; AIS2:16%; AIS3+4%) and vehicle occupants (AIS1: 82%; AIS2: 13%, AIS3+: 5%). Over time, the number of injuries has decreased by 40% for children (0-17 years) (2010-2019). However, a larger decrease is seen for minor injuries (AIS1: 47%) than moderate to severe ones (AIS2+: 24%). The linear regression analysis indicated significant changes in the estimated trends between 2010-2019 for minor injuries but not for moderate to severe injuries, see Appendix Figure A10-A11.
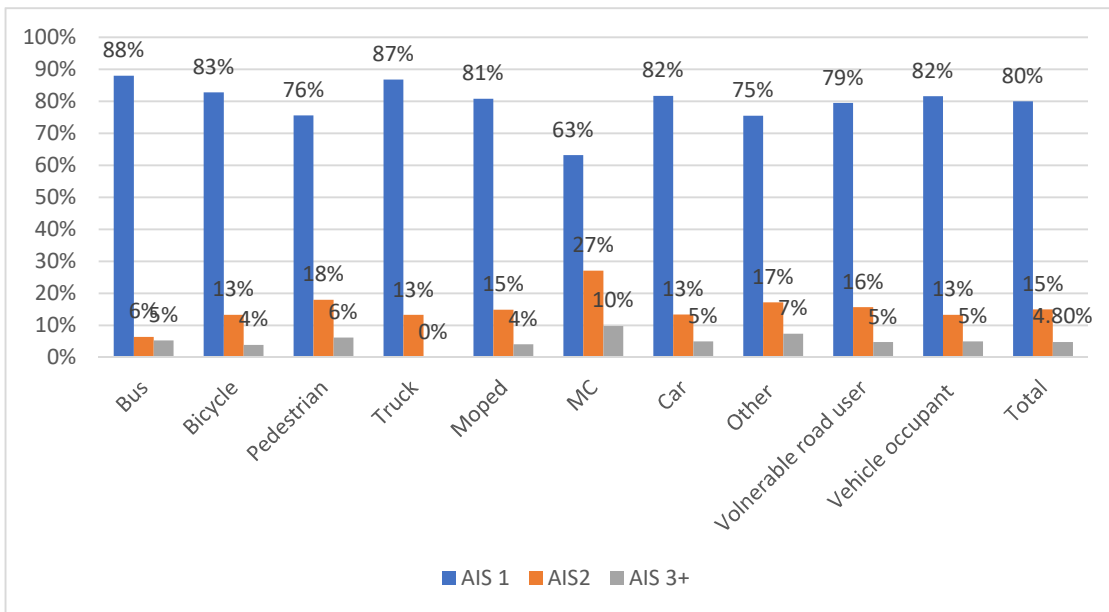
Figure 5. The overview of the severity of injuries according to the AIS scale as reported by the hospitals divided into road user groups (2000-2019). The corresponding table with frequencies, proportions, and 95% CIs can be found in the Appendix, Table A6.

Type of accident

The vulnerable road users were most often struck by a vehicle (73%), and approximately 20% were involved in single-vehicle crashes (with no (human) counterpart). Forty-seven percent of vehicle crashes involved another vehicle, and about 30% were single-vehicle crashes.

DISCUSSION

Over time, an overall decrease in road fatalities has been reported for children and adults[10, 11]. However, this study shows a significant decrease in the number of injuries (including minor injuries) sustained by 12-17-year-old children, while there is no significant trend for the other age groups. There may be many reasons for this trend. Children travel increasingly independently as they age. Their choice of transportation changes accordingly. This point is also reflected in the injury distribution of this study as in other studies on fatal child injuries. Children in the 0-5-year-old age group were most often injured as pedestrians (23%), while 9-13-year-olds were mostly injured as bicyclists (22%). Twelve to 17-year-olds were mostly injured as moped riders (44%). Hence, the decrease in injuries for car occupants by age is probably a result of traveling by other means of transportation. Therefore, it is important not to consider children (0-17) as one homogenous group. In this study, moped riders are the most frequently injured road user group for children 0-17 years (35%) and as much as 74% of the 15 years old children. A significant decline in the number of injuries when traveling by moped was found during the study period (2010-2019). In 2008, a driver's license was introduced for moped riders. Despite that fact, moped riders were the largest road user group involved in crashes in 2019, indicating the need for more preventive actions.

Official statistics on fatality rates for the year 2020 show that car occupants accounted for more than 50% of the fatalities (106 out of 204), while the numbers for pedestrians and moped riders are lower (25 and 2, respectively) [10, 11]. This study has shown that vulnerable road users account for the majority (62%) of the injuries, while children injured as car occupants account for about 35%. Historically preventive actions for car occupants have been prioritized. The national goals for reducing fatality rates among car occupants have been fulfilled in Sweden. However, the fatality rates for vulnerable road users do not show the same positive trend. This fact is also true for children. This study shows that 0-17-year-old children injured as vulnerable road users

increased by 15% during the study period 2010 to 2019, while children injured as car occupants decreased by 59%. Carlson et al. [14]showed that fatalities among 0-14-year-old children as passengers decreased by 83% from 1980 to 2010, while for vulnerable road users, the decrease was only 30%. Another report[11] also shows a mortality rate reduction between 29% and 74% for different road user groups over time. This study shows the need for more preventive actions to reduce injuries sustained by children traveling as vulnerable road users, especially as moped riders.

Knowledge of accident and injury distributions among road users and age groups for children is important to design a safe road system and prioritize preventive actions. Sweden has successfully adopted the Vision Zero program, a strategic approach for a safe system where no one should be fatally or seriously injured while using the road transport system. This study identifies that motorcycle riders (AIS3+) are the largest group for serious and sever injuries. The long-term national goal, Vision Zero, regarding a 50% reduction in fatality rates, has been fulfilled for car occupants and children in cars. However, for vulnerable road users, the goals have not been fulfilled, urging more preventive actions.

Even though 0-17-year-old children only represent 23% of Sweden's population and only 4% of those people were fatally injured in traffic in 2019, this study shows that an average of 750 children are injured each year, and 80% are minor. In Sweden, a serious injury is defined as an injury leading to any kind of permanent medical impairment. Out of all injuries (for all ages) leading to permanent medical impairment, 81% are initially reported as minor by the police and regarded as minor according to the AIS scale [12]. The figure for the corresponding proportion of injuries to children 0-12 years old is 67% [15]. Future studies must identify injuries leading to permanent medical impairment for children as road users and in different age groups. This information is important for finding effective preventive actions.

Limitations

The nationwide coverage of STRADA varies over time, and the inclusion process has changed (e.g., due to GDPR 2018). The COVID pandemic (2020) influences the number of reported cases. This situation has been accounted for in the analysis by (1) focusing on the last ten years of data (because by then, most hospitals had been included in the data set) and (2) excluding the COVID pandemic year 2020. Furthermore, people suffering from a minor injury requiring only primary care, without being directed to a hospital, are not recorded in STRADA. However, road users with minor injuries known by the police are reported in STRADA. Fatalities are excluded from the data set because the hospitals stopped reporting them in 2018. The injured road user must be reported by the police and a hospital to be included in the analysis. In some cases, only one source could report an injured road user. Therefore, the number of injured children presented is an underestimation of the total number of injured children, especially from 2000-2010. Falls on the road system (e.g., a pedestrian falling while walking on the pavement) are not typically included in STRADA because they are not covered by the definition of traffic accidents and are, therefore, most often not reported. Studies have shown that falls are a major pedestrian accident category (influencing perceived traffic safety). Including a fall as a road traffic accident could impact the distribution of injuries among road user groups [16].

CONCLUSION

This study confirms that traffic safety for 0-17-year-old children in Sweden is improving over time, with a 40% reduction in the number of injuries (AIS1-AIS3) during the last decade. The improvement varies by age and means of travel. Therefore, it is important not to consider 0-17-year-old children as one homogenous group. Studies have shown that most fatally injured children are injured as car occupants. However, this study shows that the majority of injured children were vulnerable road users (i.e., pedestrians, bicyclists, moped and e-scooter, and horse riders). Moped riders were in 2019, despite the large reduction due to the introduction of a driving license in 2008, the most frequently injured road user group for children. Even though there is a general decline in the number of injured children, the proportion of vulnerable road users is increasing (15%) and does not follow the same positive trend as vehicle occupants (24% decrease). Therefore, more effort is needed to protect children as vulnerable road users to fulfill the UN sustainability and the national Swedish Vision Zero goals. Future studies should identify injuries leading to permanent medical impairment for children as different road users and in different age groups. This information is important for finding effective preventive actions.

ACKNOWLEDGEMENT

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Table A1. The overview of the total number of injured children from 2000-2020. One child can be injured several times during the study period. Other vehicles include, e.g., tractors, snowmobiles, and 4-wheelers.

	Vulnerable road users (VRU)				Vehicle occupants (excluding Moped/MC)				
	Pedestrians	Cyclists	Mopeds	Motor bikes	Cars	Buses	Heavy / light vehicles	Other vehicles	Total
Age									
0-5	179	48	9	2	540	2	6	5	791
6-11	447	501	25	13	1233	21	3	16	2259
12-17	1019	1585	5266	305	3380	125	19	386	12020
Gender									
Girl	843	921	1958	48	2799	88	10	133	6268
Boy	800	1213	3341	272	2352	60	18	274	8058
Unbelted									
0-5					9%				
5-11					6%				
12-17					13%				
Child Restraint									
0-5					10%				
6-11					28%				
12-17					10%				

Table A2. The corresponding table to Figure 1. The number of injuries across age groups during the study period (2010-2019), including frequencies and 95% CIs.

	Number of injured children				% (CI 95%)		
Year	**0-5**	**6-11**	**12-17**	**0-17**	**0-5**	**6-11**	**12-17**
2010	41	130	727	898	5±6.4%	15±6.0%	81%±2.9%
2011	38	100	678	816	5±6.7%	12±6.4%	83%±2.8%
2012	50	164	689	903	6±6.3%	18±5.9%	76%±3.2%
2013	53	140	571	764	7±6.8%	18±6.4%	74%±3.6%
2014	40	129	579	748	5±7.0%	17±6.5%	77%±3.4%
2015	38	101	571	710	5±7.2%	14±6.8%	80%±3.3%
2016	47	101	526	674	7±7.3%	15±7.0%	78%±3.5%
2017	32	130	550	712	5±7.2%	18±6.6%	77%±3.5%
2018	33	104	509	646	5±7.5%	16±7.1%	78%±3.6%
2019	30	82	426	538	6±8.2%	15±7.8%	79%±3.9%
2000-2020	**414**	**1222**	**6090**	**7726**	**5.25%**	**15.01%**	**79.89%**

Table A3. The corresponding table to Figure 2. The proportion of injured children (0-17) by age group per road user group for 2000-2020, including frequencies and 95% CIs. Other vehicles include, e.g., tractors, snowmobiles, and 4-wheelers.

	Number of injured children				% (CI 95%)			
	0-5	**6-11**	**12-17**	**0-17**	**0-5**	**6-11**	**12-17**	**0-17**
Buses	2	21	125	148	0.3±7.0%	0.9±4.1%	0.9±1.8%	1±1.6%
Cyclists	48	496	1583	2127	6±6.8%	22±3.6%	22±1.6%	13±1.5%
Pedestrians	179	456	1022	1655	23±6.1%	20±3.7%	20±1.6%	9±1.5%
Trucks	6	3	19	28	1±6.9%	0.1±4.1%	0.1±1.8%	0.2±1.6%
Mopeds	9	25	5269	5302	1±6.9%	1±4.1%	1±1.8%	44±1.3%
MCs	2	13	305	320	0.3±7.0%	0.6±4.1%	0.6±1.8%	3±1.6%
Cars	540	1233	3381	5152	68±3.9%	54±2.8%	55±1.2%	28±1.3%
Other vehicles	5	13	382	400	0.6±7.0%	0.5±4.1%	0.6±1.8%	3±1.6%

Table A4. The corresponding Table to Figure 3. The proportion of injured children per road user group and accident year 2010-2019, including frequencies and 95% CIs. VRU refers to vulnerable road users not protected by a vehicle (e.g., pedestrians, cyclists, and moped riders). Vehicle occupants include those people who are protected inside a vehicle (e.g., buses, cars, trucks). Other vehicles include, e.g., tractors, snowmobiles, and 4-wheelers.

	VRUs	Vehicle occupants	Buses	Cyclists	Pedes trians	Trucks	Mopeds	MCs	Cars	Others
					Number of injured children					
2010	530	371	1	106	105	1	296	18	348	26
2011	528	288	9	113	96	1	290	25	262	20
2012	512	391	8	124	108	2	259	17	361	24
2013	465	300	9	127	98	1	221	15	274	21
2014	459	289	8	130	82		222	16	257	33
2015	413	298	9	117	77	1	205	12	258	33
2016	414	260	7	84	87	1	227	11	231	26
2017	450	262	11	122	102	2	194	26	211	44
2018	434	213	2	91	85		242	8	190	29
2019	370	169	4	93	66	2	191	16	141	26
					% (CI 95%)					
2010	59±4.2%	41±5.0%	0±6.5%	12±6.1%	12±6.1%	0.1±6.5%	33±5.4%	2±6.5%	39±5.1%	3±6.4%
2011	65±4.1%	35±5.5%	1±6.8%	14±6.4%	12±6.4%	0.1±6.9%	36±5.5%	3±6.8%	32±5.7%	2±6.8%
2012	57±4.3%	43±4.9%	1±6.5%	14±6.1%	12±6.1%	0.2±6.5%	29±5.5%	2±6.5%	40±5.1%	3±6.4%
2013	61±4.4%	39±5.5%	1±7.0%	17±6.5%	13±6.6%	0.1±7.1%	29±6.0%	2±7.0%	36±5.7%	3±7.0%
2014	61±4.5%	39±5.6%	1±7.1%	17±6.5%	11±6.8%	0.0±0	30±6.0%	2±7.1%	34±5.8%	4±7.0%
2015	58±4.8%	42±5.6%	1±7.3%	16±6.7%	11±6.9%	0.1±7.4%	29±6.2%	2±7.3%	36±5.9%	5±7.2%
2016	61±4.7%	39±5.9%	1±7.5%	12±7.1%	13±7.0%	0.1±7.5%	34±6.1%	2±7.5%	34±6.1%	4±7.4%
2017	63±4.5%	37±5.9%	2±7.3%	17±6.7%	14±6.8%	0.1±7.3%	27±6.3%	4±7.2%	30±6.2%	6±7.1%
2018	67±4.4%	33±5.8%	0±7.7%	14±7.1%	13±7.2%	0.3±0	37±6.1%	1±7.7%	29±6.5%	4±7.5%
2019	69±4.7%	31±6.3%	1±8.4%	17±7.7%	12±7.9%	0.4±8.4%	36±6.8%	3±8.3%	26±7.3%	5±8.2%
2000-2020	**63%**	**38%**	**0.98%**	**14.14%**	**11.00%**	**0.19%**	**35.24%**	**2.13%**	**34.24%**	

Table A5. The corresponding Table to Figure 4. The overview of injured body regions per road user group, including all ages and severity levels (2000-2020). One child can have multiple injuries. VRU refers to vulnerable road users not protected by a vehicle (e.g., pedestrians, cyclists, and moped riders). Vehicle occupants include those people who are protected inside a vehicle (e.g., buses, cars, trucks). Other vehicles include, e.g., tractors, snowmobiles, and 4-wheelers.

	VRUs	Vehicle occupants	Buses	Cyclists	Pedestrians	Trucks	Mopeds	MC	Cars	Other vehicles
					Number of injuries					
Head/face	4634	2723	77	1469	1262	17	1663	193	2363	313
Upper extremity	6136	1617	48	1221	704	11	3944	233	1416	176
Leg and pelvis	10828	1536	43	1925	1714	29	6710	429	1320	194
Thorax	597	671	15	111	139		293	41	617	52
Thoracic spine	697	849	13	201	110	1	329	39	798	55
Abdomen	1013	663	15	229	176	1	566	33	612	44
Throat	70	141	2	21	7	2	37	5	133	4
Lumbar spine	208	248	4	58	38	1	102	6	224	23
Neck	680	1911	46	145	91	5	413	20	1785	86
External injury	299	144	3	73	57	1	154	15	113	27
					% (CI 95%)					
Head/face	18±1.1%	21±1.5%	29±10.1%	27±2.3%	29±2.5%	25±20%	12%±1.5%	19%±5.5%	25±1.8%	29±5.2%
Upper extremity	24±1.1%	15±1.8%	18±10.9%	22±2.3%	16±2.7%	16±21%	28±1.4%	23±5.4%	15±1.9%	18±5.7%
Leg and pelvis	43±0.9%	15±1.8%	17±11%	35±2.1%	40±2.3%	43±18%	47±1.2%	42±4.7%	14±1.9%	16±5.6%
Thorax	2±1.2%	6±1.9%	6±11.7%	2±2.6%	3±2.9%	0,00±0	2±1.6%	4±6%	7±2.0%	6±6.1%
Thoracic spine	3±1.2%	8±1.8%	5±11.7%	4±2.6%	3±3.0%	1±24%	2±1.6%	4±6%	9±1.9%	5±6.1%
Abdomen	4±1.2%	6±1.9%	6±11.7%	4±2.6%	4±2.9%	1±24%	3±1.6%	3±6.1%	6±2.0%	6±6.1%
Throat	0.3±1.2%	1±1.9%	0.8±12%	0.3±2.6%	0.2±3.0%	3±24%	0.3±1.6%	0.5±6.1%	1±2.0%	0.8±6.3%
Lumbar spine	0.8±1.2%	2±1.9%	1.5±11.9%	1±2.6%	0.9±3.0%	1±24%	0.7±1.6%	0.6±6.1%	2±2.0%	1±6.2%
Neck	2.7±1.2%	18±1.7%	17±10.9%	3±2.6%	2±3.0%	7±23%	3±1.6%	2±6.1%	19±1.8%	17±6%
External injury	1.2±1.2%	1±1.9%	1±11.9%	1±2.6%	1±3.0%	1±24%	1±1.6%	1±6.1%	1±2.0%	1±6.2%

Table A6. The Corresponding Table to Figure 5. The overview of the severity of injury according to the AIS scale reported by hospitals divided into road user groups from 2000-2020. VRU refers to vulnerable road users not protected by a vehicle (e.g., pedestrians, cyclists, moped riders). Vehicle occupants include those people who are protected inside a vehicle (e.g., buses, cars, trucks). Other vehicles include, e.g., tractors, snowmobiles, and 4-wheelers.

	Buses	Cyclists	Pedestrians	Trucks	Mopeds	MCs	Cars	Othesr	VRUs	Vehicle occupants
Number of injuries										
AIS1	234	4504	3248	59	**11483**	640	7649	734	**19986**	**8565**
AIS2+	31	935	1039	9	**2701**	373	1713	239	**5122**	1918
AIS3+	14	212	267	0	**584**	99	463	72	1187	524
% (CI 95%)										
AIS 1	88±4.2%	83±1.1%	76±1.48%	87±8.7%	81±0.7%	63±3.7%	82±0.9%	75±3.1%	79±0.5%	82±0.8%
AIS2	6±11.6%	13±2.47%	18±2.71%	13±22.2%	15±1.5%	27±5.2%	13±1.9%	17±5.7%	16±1.1%	13±1.8%
AIS 3+	5±11.7%	4±2.61%	6±2.9%	0±0%	4±1.6%	10±5.8%	5±2%	7±6.1%	5±1.3%	5±2.1%
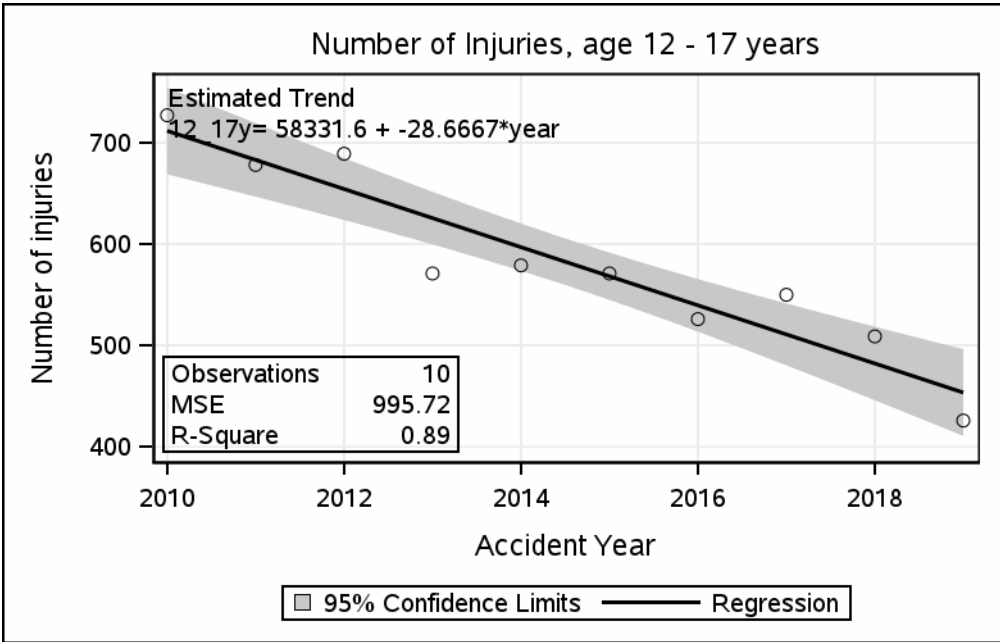
Figure A1. A simple linear regression analysis with an estimated trend for the number of injuries (2010-2019)
for children 0-17 years old.
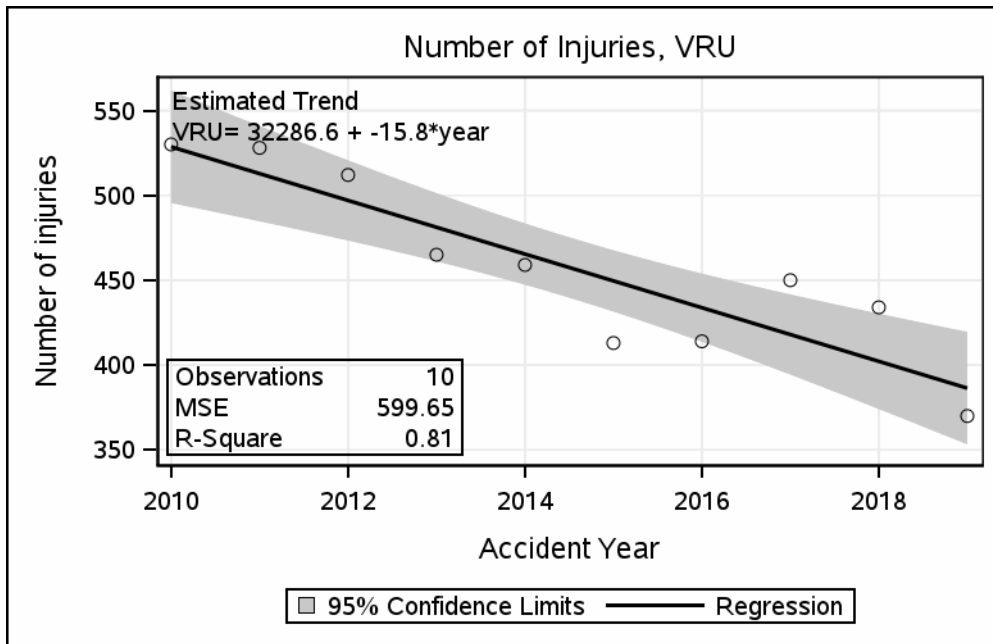
Figure A2. A simple linear regression analysis with an estimated trend for the number of injured VRU (2010-2019) for children 0-17 years old.
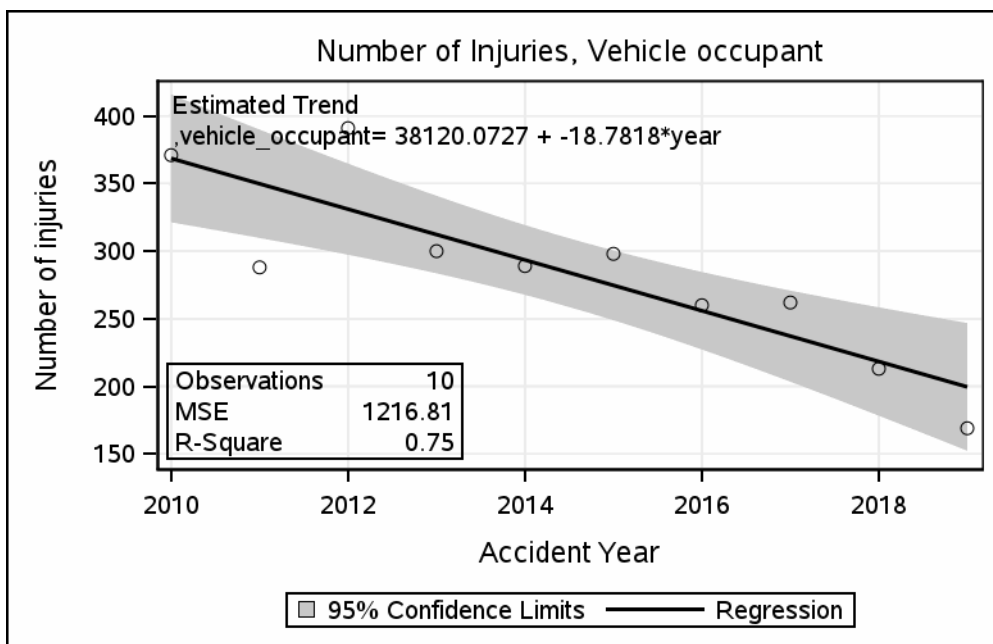

Figure A3. A simple linear regression analysis with an estimated trend for the number of injured vehicle occupants (2010-2019) for children 0-17 years old.
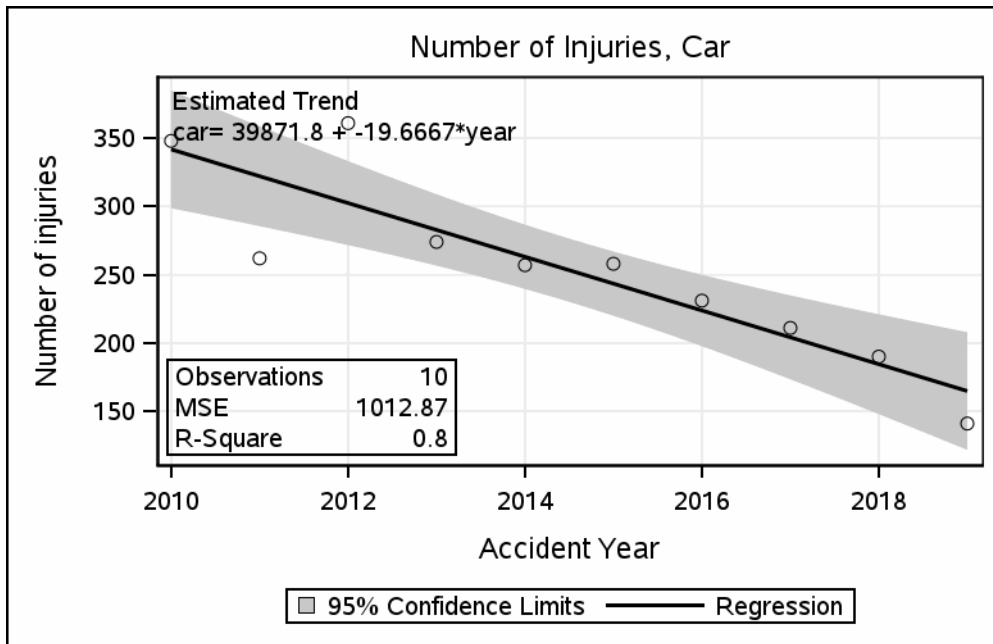
Figure A4. A simple linear regression analysis with an estimated trend for the number of injured children (0-17) traveling by car (2010-2019).
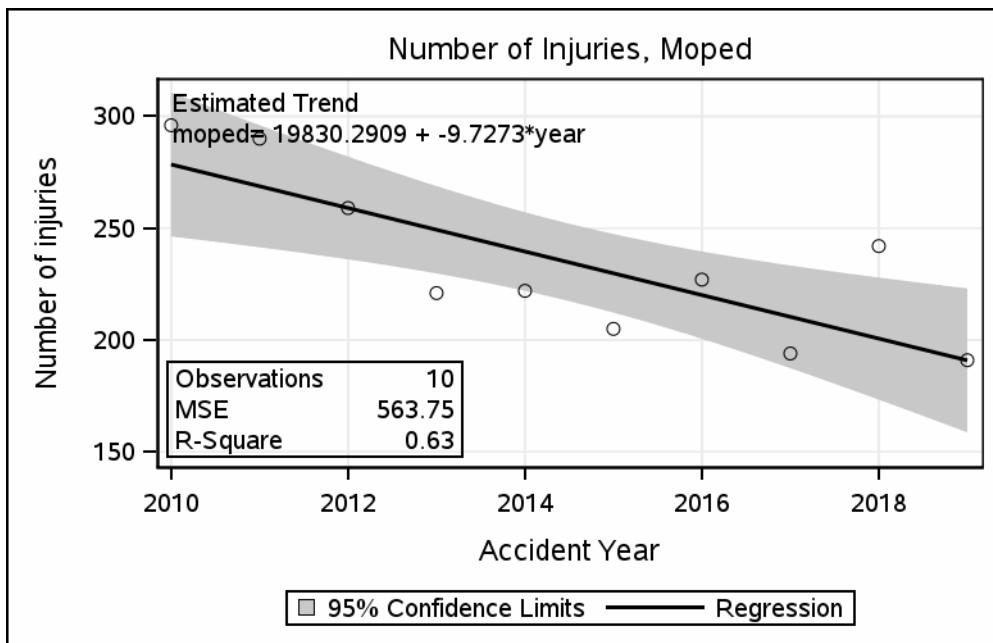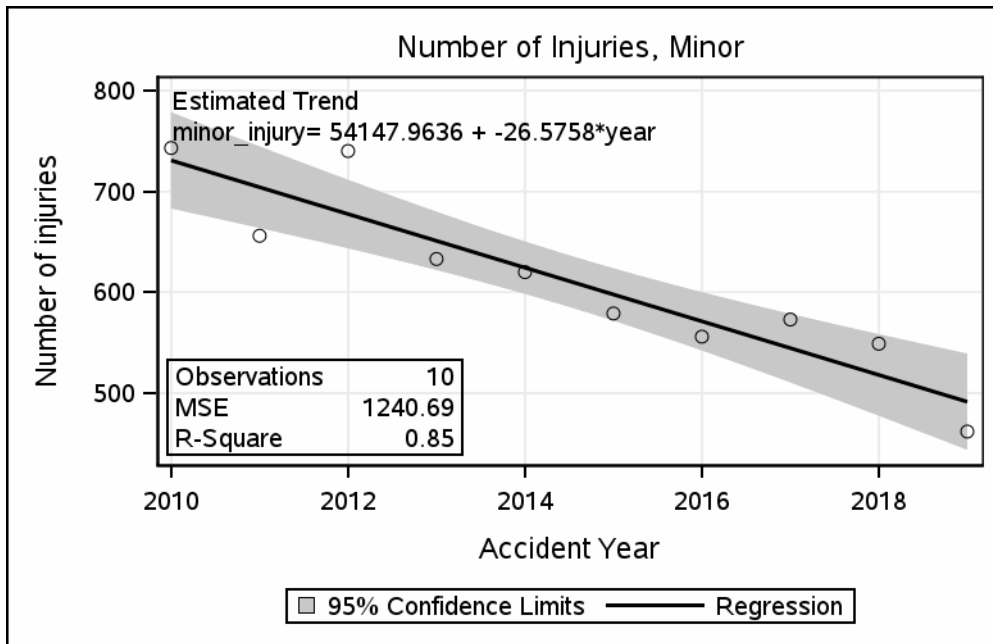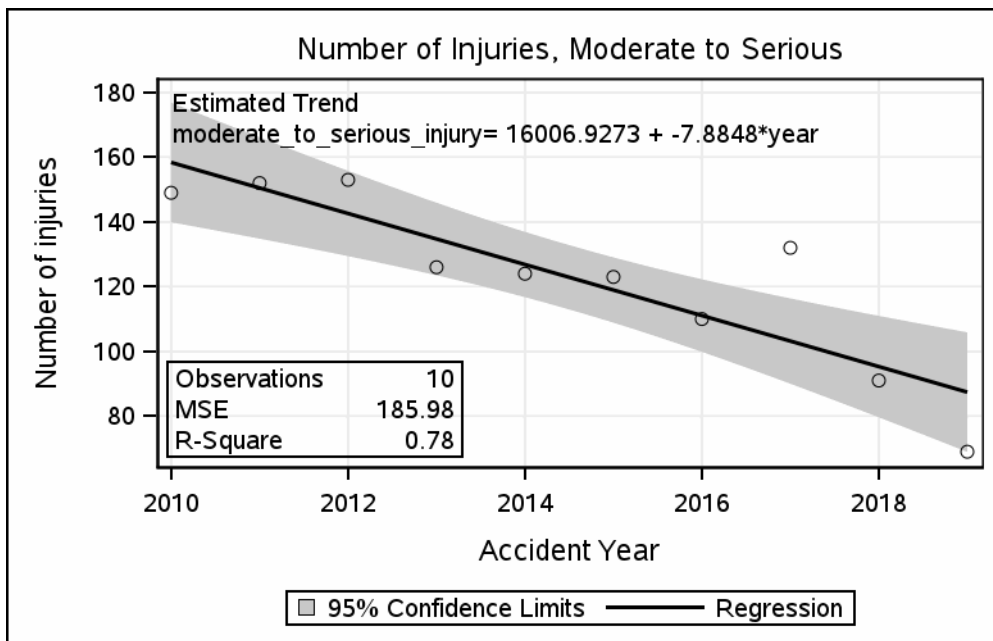

Figure A5. A simple linear regression analysis with an estimated trend for the number of injured children (0-17) traveling by moped (2010-2019).
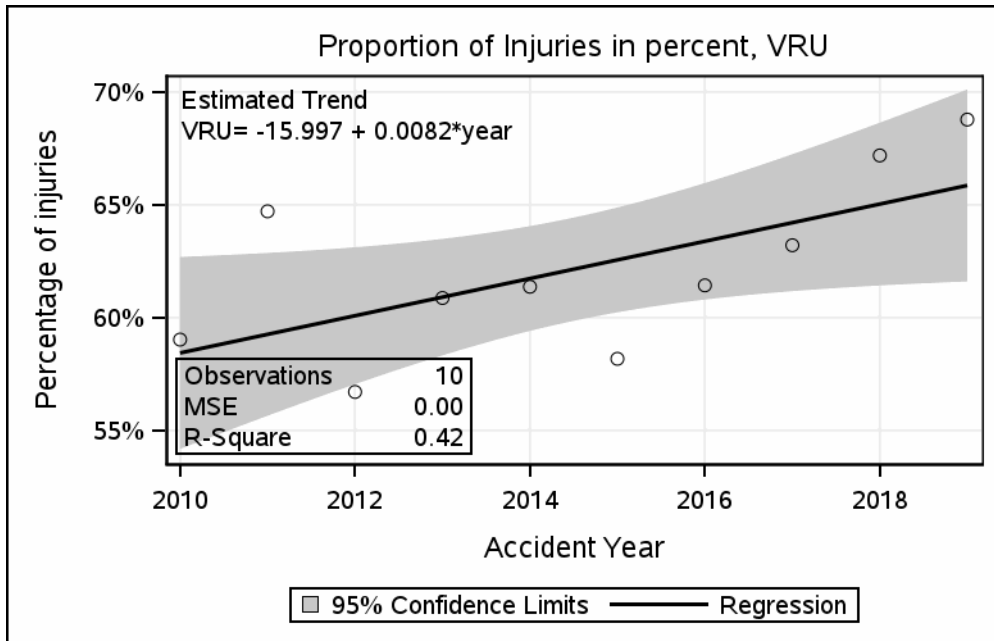
Figure A6. A simple linear regression analysis with an estimated trend for the number of minor injuries (2010-2019) for children 0-17 years old.

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Figure A7. A simple linear regression analysis with an estimated trend for the number of moderate to serious injuries (2010-2019) for children 0-17 years old.
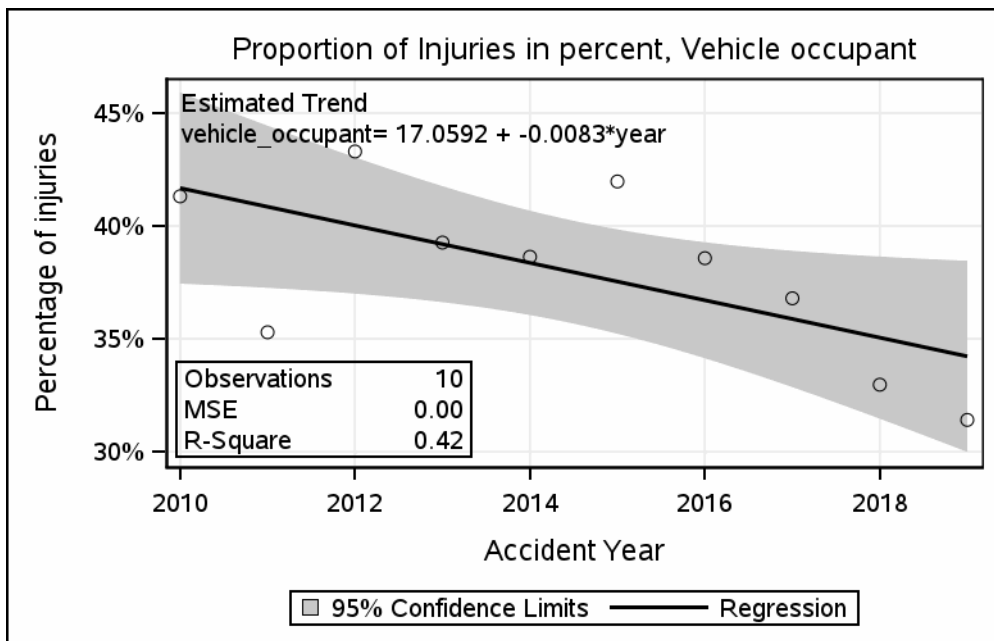
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Figure A8. A simple linear regression analysis with an estimated trend in the proportion of VRU injuries (2010-2019) for children 0-17 years old.

Figure A9. A simple linear regression analysis with an estimated trend of the proportion of vehicle occupant injuries (2010-2019) for children 0-17 years old.
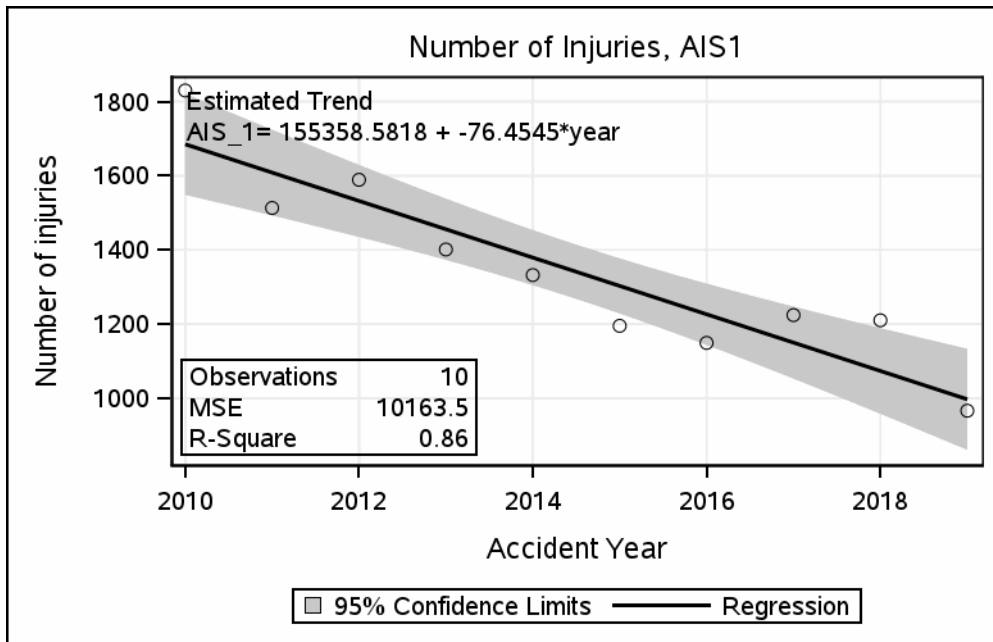
Figure A10. A simple linear regression analysis with an estimated trend in the number of AIS1 injuries (2010-2019) for children 0-17 years old.
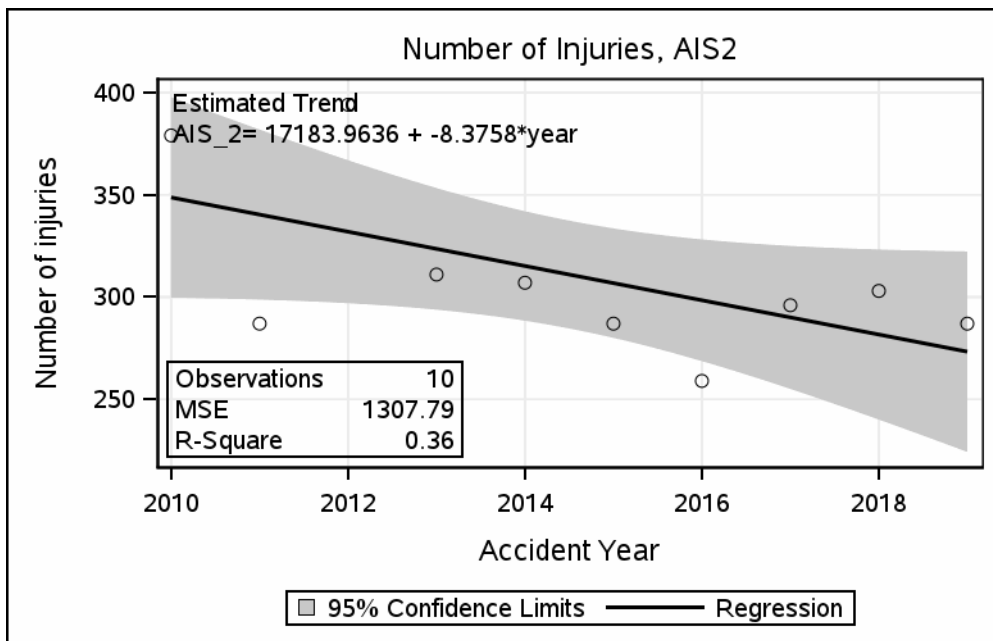

Figure A11. A simple linear regression analysis with an estimated trend in the number of AIS2+ injuries (2010-2019) for children 0-17 years old.