

IN-DEPTH ANALYSIS OF ROAD TRAFFIC ACCIDENTS RELATED TO CHILDREN AND MEASURES FOR CHILDREN SAFETY IMPROVEMENT IN HO CHI MINH CITY

Anh Tuan VU

Dinh Vinh Man NGUYEN

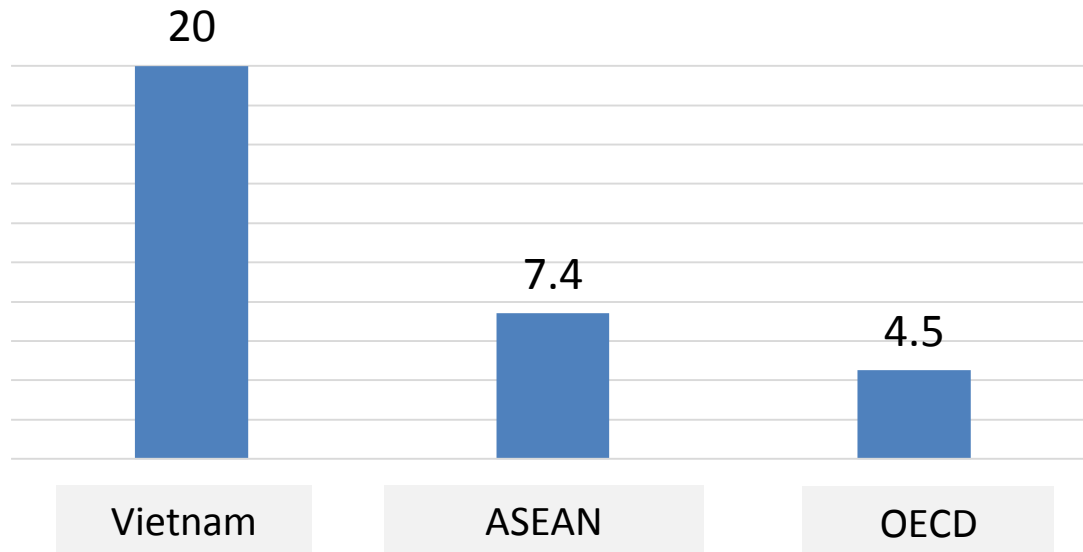
Vietnamese-German Transport Research Centre
Vietnamese-German University



Road Traffic Safety Problems in HCMC

- ▶ Around the world, an average of **2 minutes**, there is a child died in a traffic accident (WHO, 2008)
- ▶ In **Vietnam**, traffic accidents kill nearly **2,000 children a year** (NTSC, 2015).
- ▶ HCMC has the highest number of RTAs in Vietnam; Of which around **9% relates to children** (PC67, 2015).
- ▶ Lack of **in-depth studies** on traffic accidents related to children to **support the development of policies and measures** to improve traffic safety for children.

Rate of RTAs related to children/100.000 children



Source: NTSC 2015

OECD: *The Organisation for Economic Co-operation and Development*

Research Objective

- Systematic and in-depth analysis on the **trend, pattern** and **cause** of road traffic accidents (RTAs) involving children,
- Propose solutions to enhance road traffic safety for children in HCMC.



Analysis Results

Trend, patterns, and causes of RTAs
(Trend, Pattern, Cause, Age, Sex, Location, Time)

RTAs Database in the past
(PC67, HCMC road traffic police, 2010-2015)

Traffic characteristics and traffic violation of children & parents

Camera Survey
(15 schools & 10 roads)

Factors impact on risky behaviours

Interview
(600 parents, 1000 students, 93 teachers)

Propose practical solutions to improve children traffic safety

Review and evaluate solutions
(Domestic and international experience)

Trend of RTAs in HCMC

While the number of traffic accidents, deaths, injuries are declining, **traffic accident involving children tend to increase rapidly.**

Year	Total Accidents	Total Deaths	Total Injuries	Child Accidents	Child Deaths	Child Injuries
2010	1101	837	432	n/a	n/a	n/a
2011	1042	887	495	n/a	n/a	n/a
2012	958	824	388	n/a	n/a	n/a
2013	941 ↓	775 ↓	349 ↓	36 ↑	35 ↑	15 ↑
2014	850 ↓	701 ↓	322 ↓	85 ↑	61 ↑	55 ↑
2015*	771 ↓	692 ↓	268 ↓	104 ↑	111 ↑	54 ↑
Total 2013-2015	2562	2168	939	225	207	124

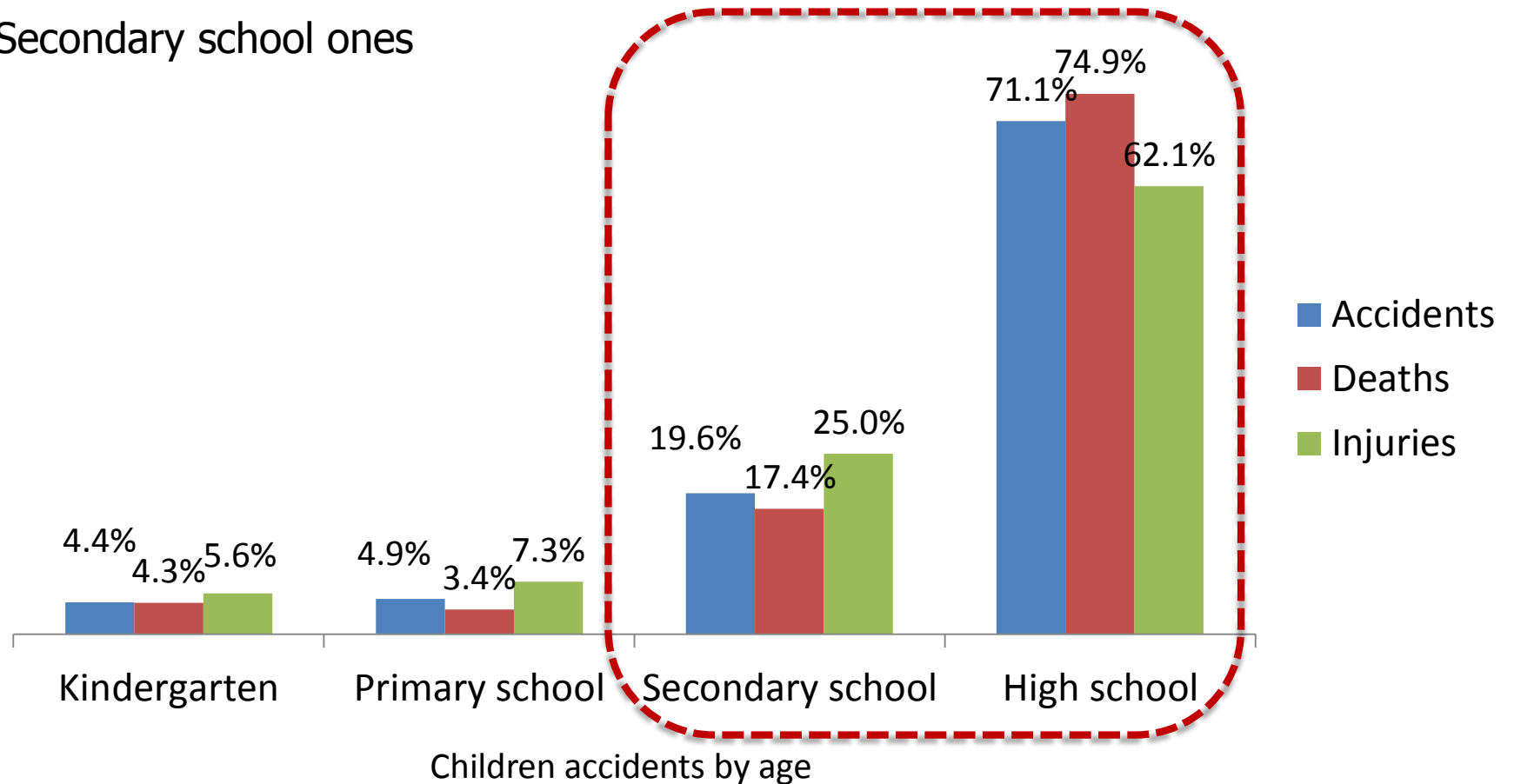
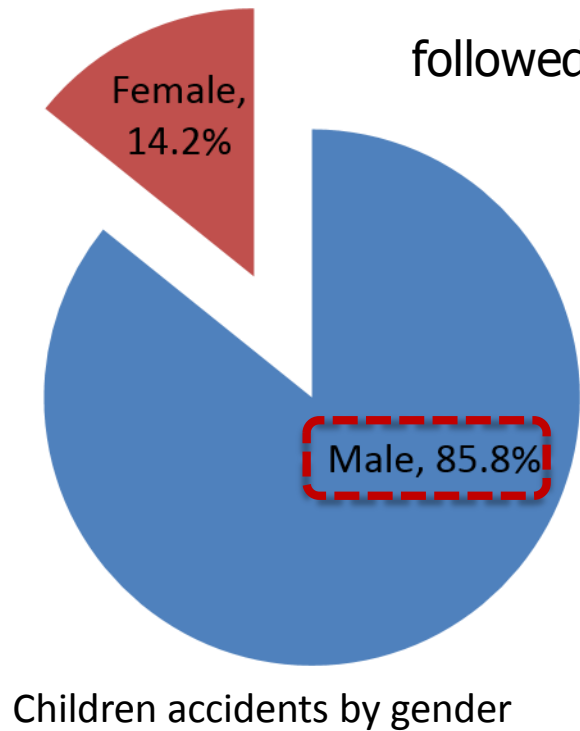
Data source: Highway and Railway Police Division, HCMC Police Dept. (PC67), 2015

(): Accounted until 15/11/2015*

Children Accidents by Age and Gender

Male children are much more vulnerable than female ones.

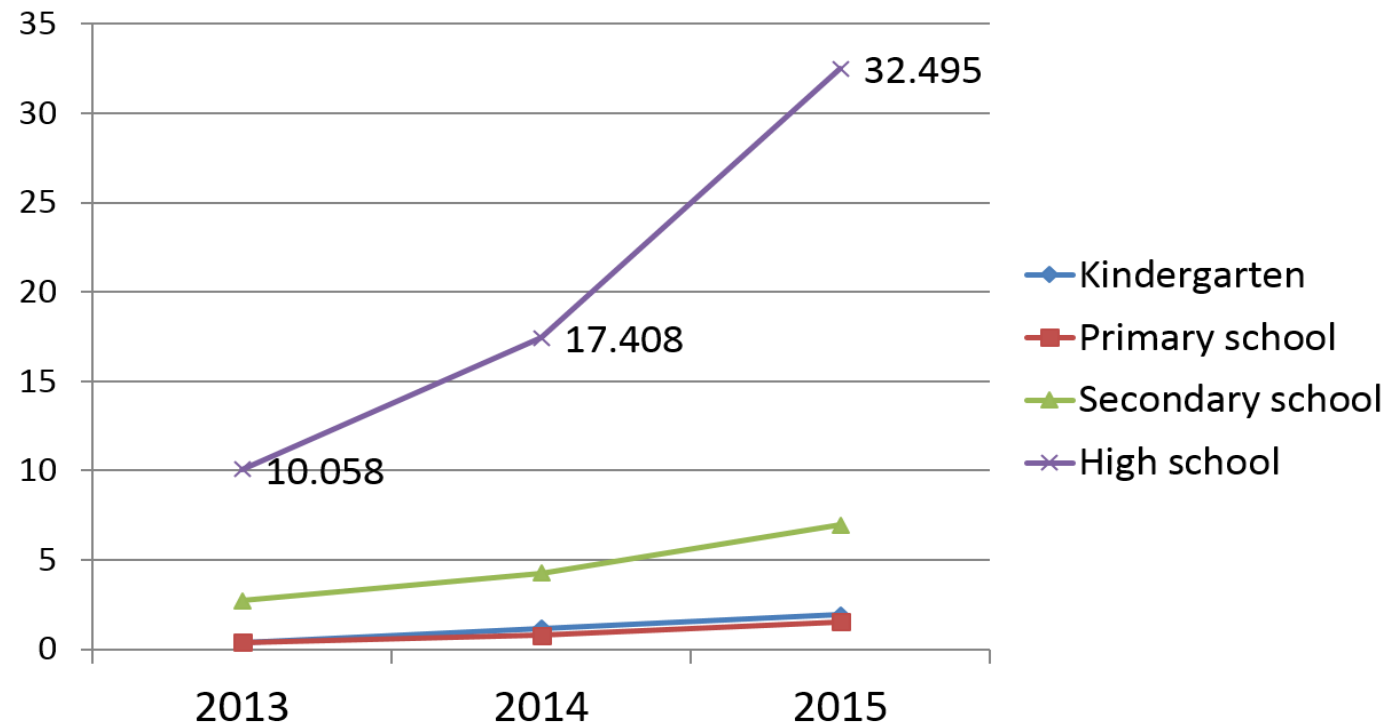
High school students (16-18 years old) has the highest rate of accident, death and injury, followed by Secondary school ones



- Accidents
- Deaths
- Injuries

Fatality Rate Per 100,000 Children

The fatality rate of **high school student** is much higher than other student groups and tend to increase rapidly by the year



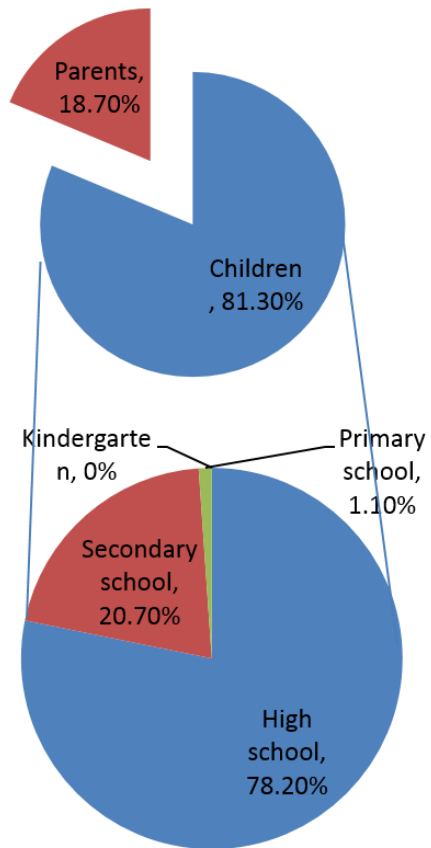
Data source: Highway and Railway Police Division, HCMC Police Dept. (PC67), 2015

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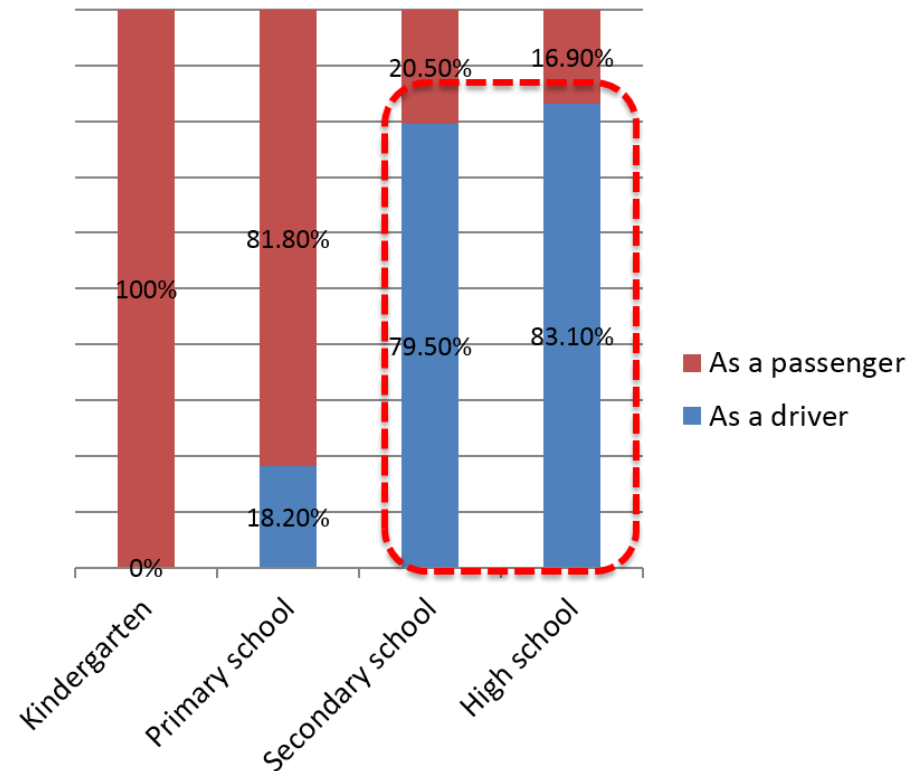
Who drove in traffic accidents related to children?

There is more than **80%** of **self-driving school student** in traffic accidents.

The **accident rate** of self-driving **high school student** account for more than 75%, **secondary school** is around 20%.



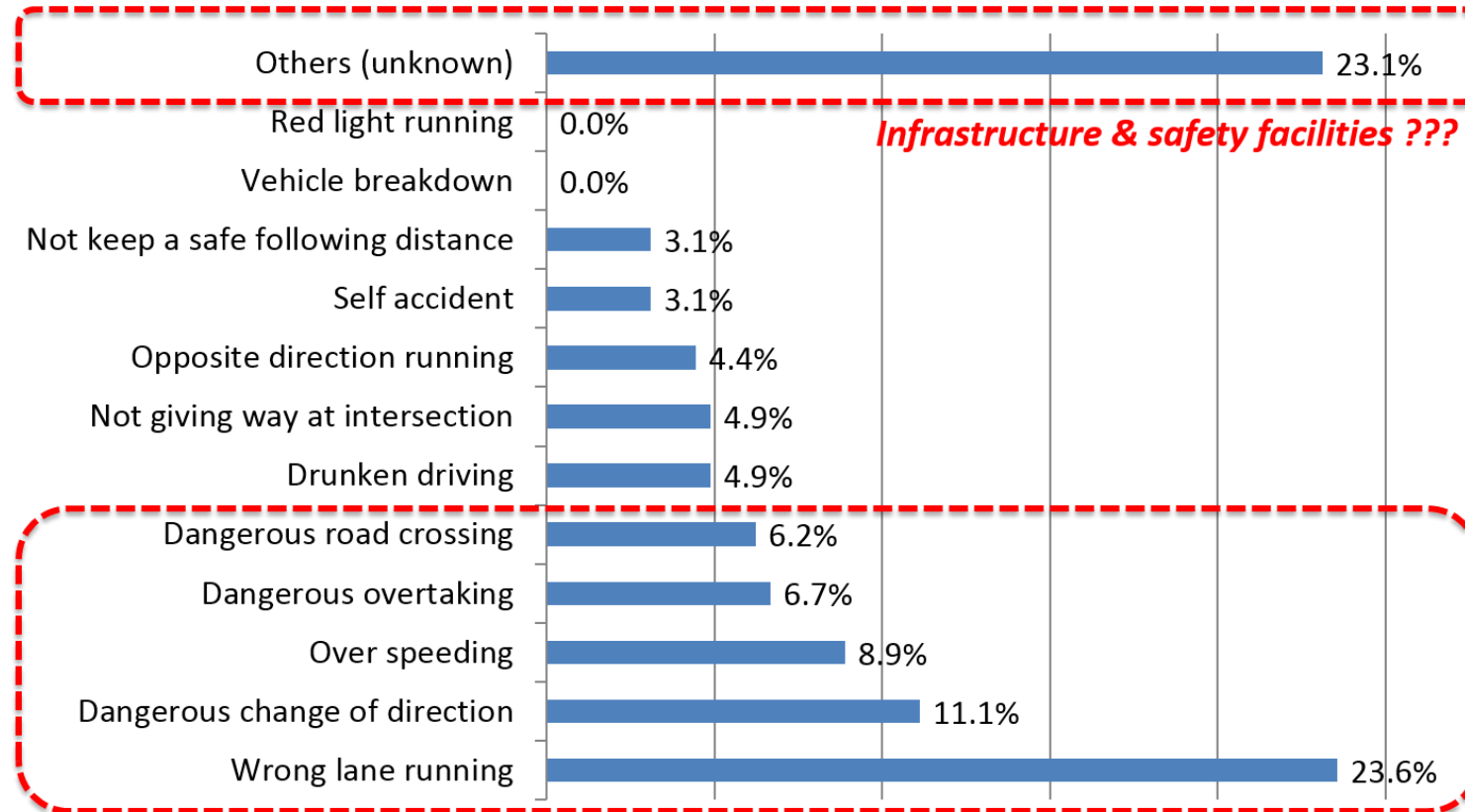
The rate of traffic accidents by self-driving



The rate of traffic accidents by self-driving in groups

Main Causes of Children Traffic Accidents

The five main causes of children traffic accidents are **Wrong lane running, dangerous change of direction, over speeding, dangerous overtaking, dangerous road crossing.**



Main Causes of Children Traffic Accidents

Children Traffic Accident Causes by Age Groups

The traffic accidents related to children has different main causes in the 04 student groups.

Main Cause	Kinder		Primary		Secondary		High	
Wrong lane running	1	10.0%	1	9.1%	13	29.5%	38	23.8%
Over speeding	1	10.0%	0	0.0%	6	13.6%	13	8.1%
Dangerous overtaking	0	0.0%	2	18.2%	1	2.3%	12	7.5%
Dangerous change of direction	3	30.0%	2	18.2%	4	9.1%	16	10.0%
Dangerous road crossing	1	10.0%	1	9.1%	3	6.8%	9	5.6%
Not giving way at intersection	2	20.0%	1	9.1%	0	0.0%	8	5.0%
Not keep a safe following distance	0	0.0%	0	0.0%	3	6.8%	4	2.5%
Self accident	0	0.0%	1	9.1%	0	0.0%	6	3.8%
Opposite direction running	0	0.0%	0	0.0%	2	4.5%	8	5.0%
Drunken driving	0	0.0%	0	0.0%	1	2.3%	10	6.3%
Vehicle breakdown	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Red light running	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other (unknown)	2	20.0%	3	27.3%	11	25.0%	36	22.5%
Total	10		11		44		160	

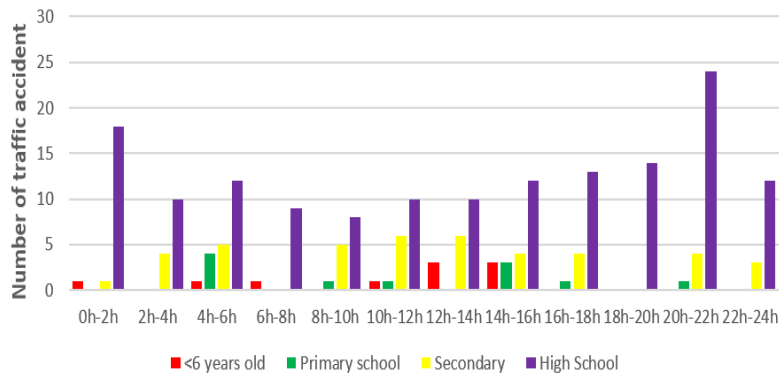
Children Traffic Accident Causes by Age Group

Distribution of Child-Related RTAs by Time



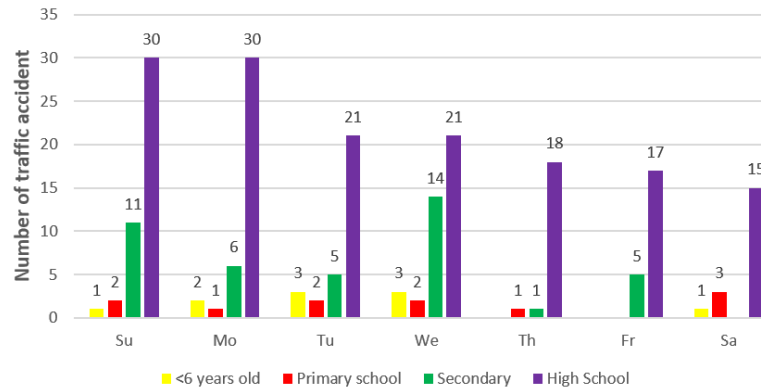
- RTAs related to **secondary school student** occurs from **10am to 2pm**
- RTAs related to **high school student** happen from **6pm to 2am of the next day**
- RTAs involving children **increase on weekend**
- RTAs involving children **rise up on summer months**

Child-related traffic accident distribution by hour



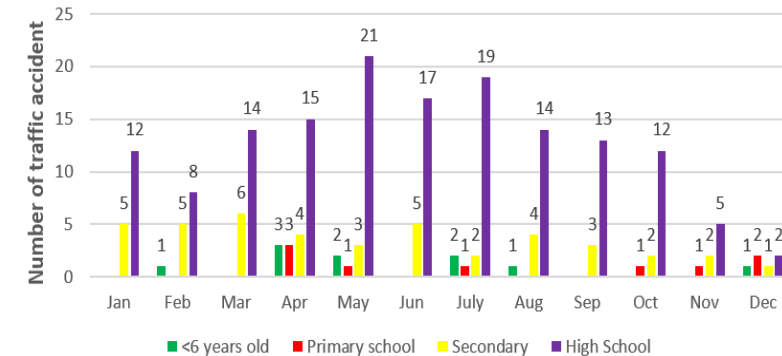
Child-related traffic accident distribution by hour

Child-related traffic accident distribution by weekdays



Child-related traffic accident distribution by weekdays

Child-related traffic accident distribution by month

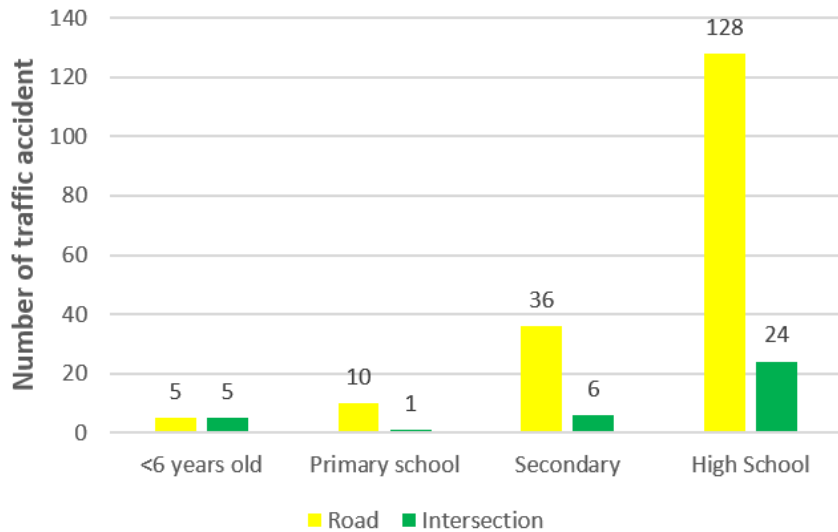


Child-related traffic accident distribution by month

Distribution of Child-Related RTAs by Location

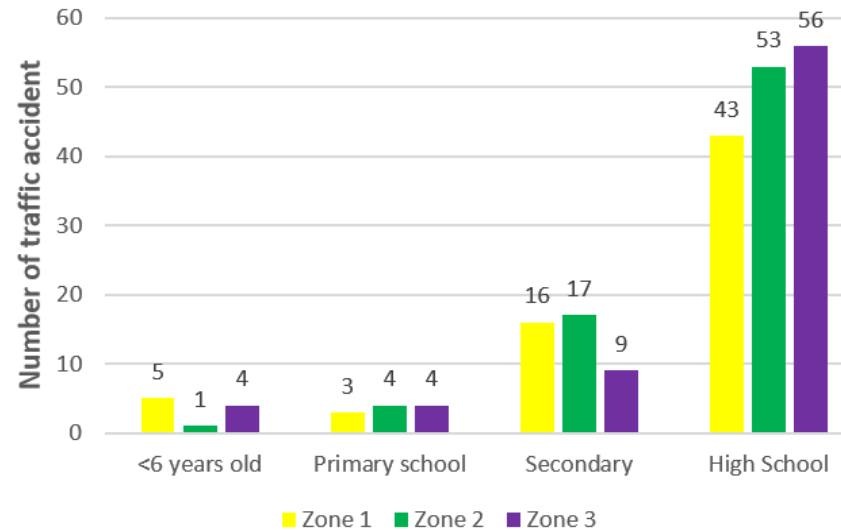
- Child-related traffic accidents occur **82% on road segments**, and **18% at intersections**.
- Traffic accidents have no difference in the number of cases between regions.

Child-related traffic accident distribution by locations

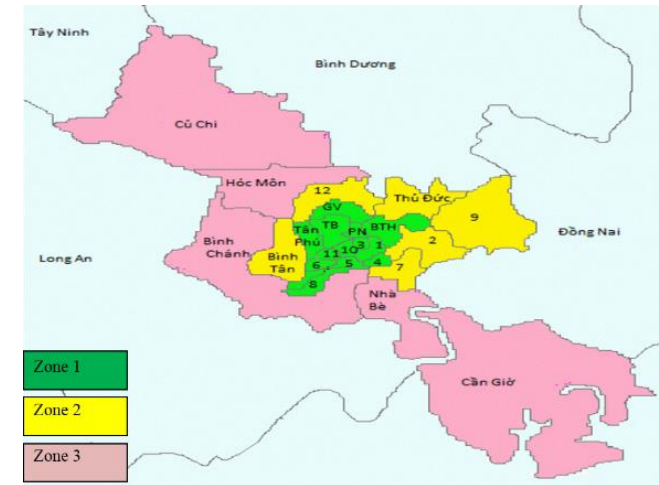


Child-related traffic accident distribution by locations

Child-related traffic accident distribution by zones



Child-related traffic accident distribution by zones



03 Zones of HCMC

Review of Measures in HCMC

No.	Measure	Being implemented	Fully implemented	Implemented, but stop now	Will implement
I	INFRASTRUCTURE				
1	Road infrastructure improvements	o			o
2	“Black spot” improvement			o	o
3	Surveillance camera system				o
4	Bicycle lane	o		o	o
5	Pedestrian infrastructure (sidewalk improvement)	o			o
II	TRAFFIC MANAGEMENT				
6	Lane reorganization				o
7	Signal system adjustment & intersection improvement				o
8	Traffic management in school area				o
9	Provision of road facilities (signs, crossing lane, etc.)	o			o
III	VEHICLE				
10	Vehicle audit				o
11	Shuttle bus, school bus services	o			o
12	Public transport	o			o
13	Control of private vehicle use				o
IV	EDUCATION & ENCOURAGEMENT				
14	Strengthening traffic safety campaign and education	o			o
15	Innovation in traffic safety education				o
16	Traffic safety education in Kindergarten & Primary schools	o	o		o
V	ENFORCEMENT				
17	Improvements in driver training program				o
18	New regulations and rule in the traffic law				o
19	Strengthening police patrol, violation detection, enforcement	o	o		o

Conclusion

- The majority of child traffic accidents contributed by **high school children** (>70%), followed by **secondary school** ones (nearly 20%), and **primary school** and kindergarten ones (5% each).
 - More than 85% accidents involving **Male children**.
 - 80% accidents occurred while the children were driving by themselves, only 20% happened while the parents were driving.
 - The top 5 main causes of child accidents:
 - Wrong lane running
 - Dangerous change of direction
 - Over speeding
 - Dangerous overtaking
 - Dangerous road crossing
- Need to observe other frequent violations.
- Need to focus the **behavioral study** of the parents (who carry kinder and primary) and high school and secondary school children.

Analysis Results

Trend, patterns and causes of RTAs
(Trend, Pattern, Cause, Age, sex, location, time)

RTAs Database in the past
(PC67, HCMC road traffic police, 2010-2015)



Traffic characteristics and traffic violation of children & parents

Camera Survey
(15 schools & 10 roads)



Factors impact on risky behaviours

Interview
(600 parents, 1000 students, 93 teachers)

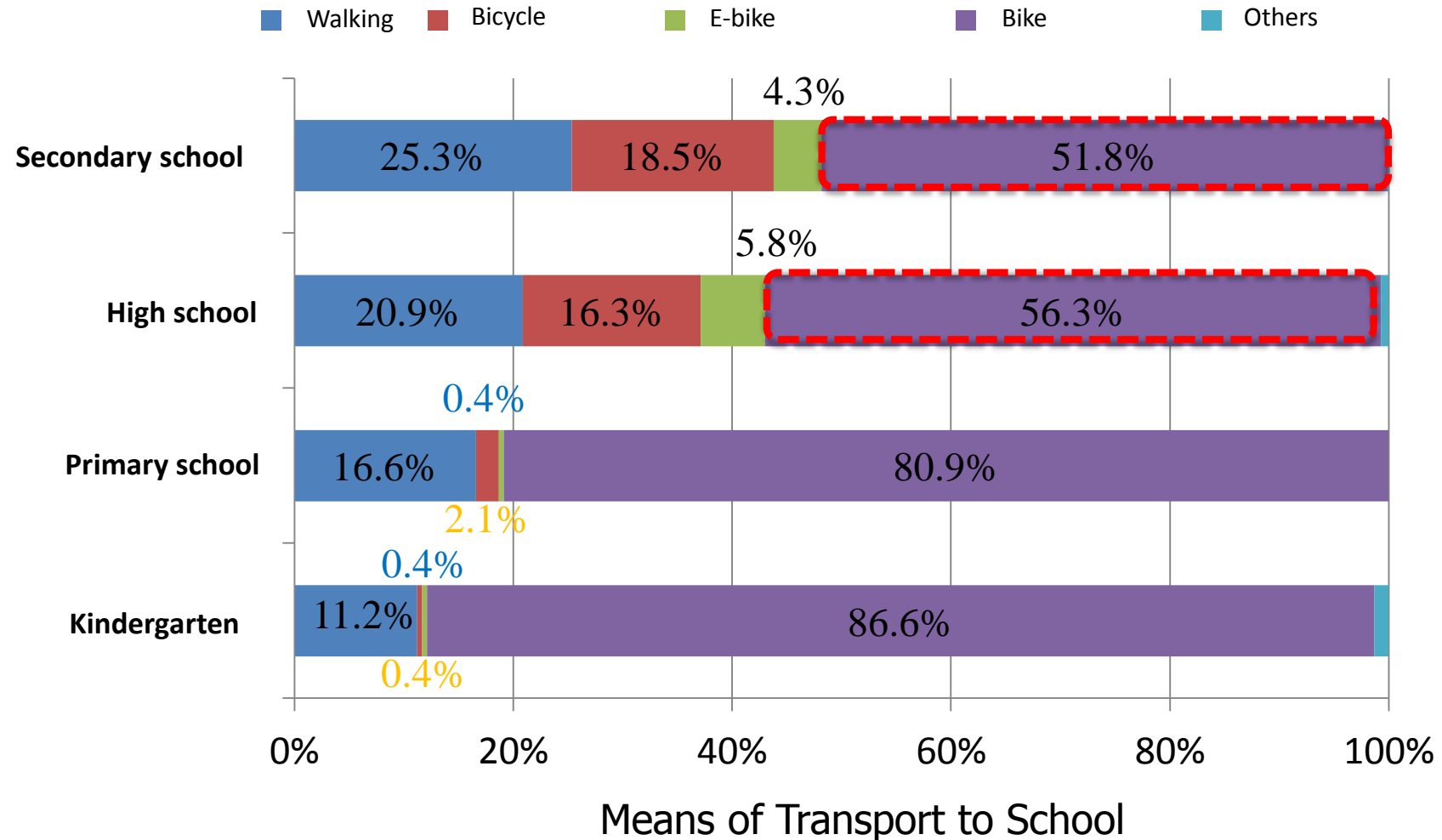


Propose practical solutions to improve children traffic safety

Review and evaluate solutions
(Domestic and international experience)

Means of Transport to School

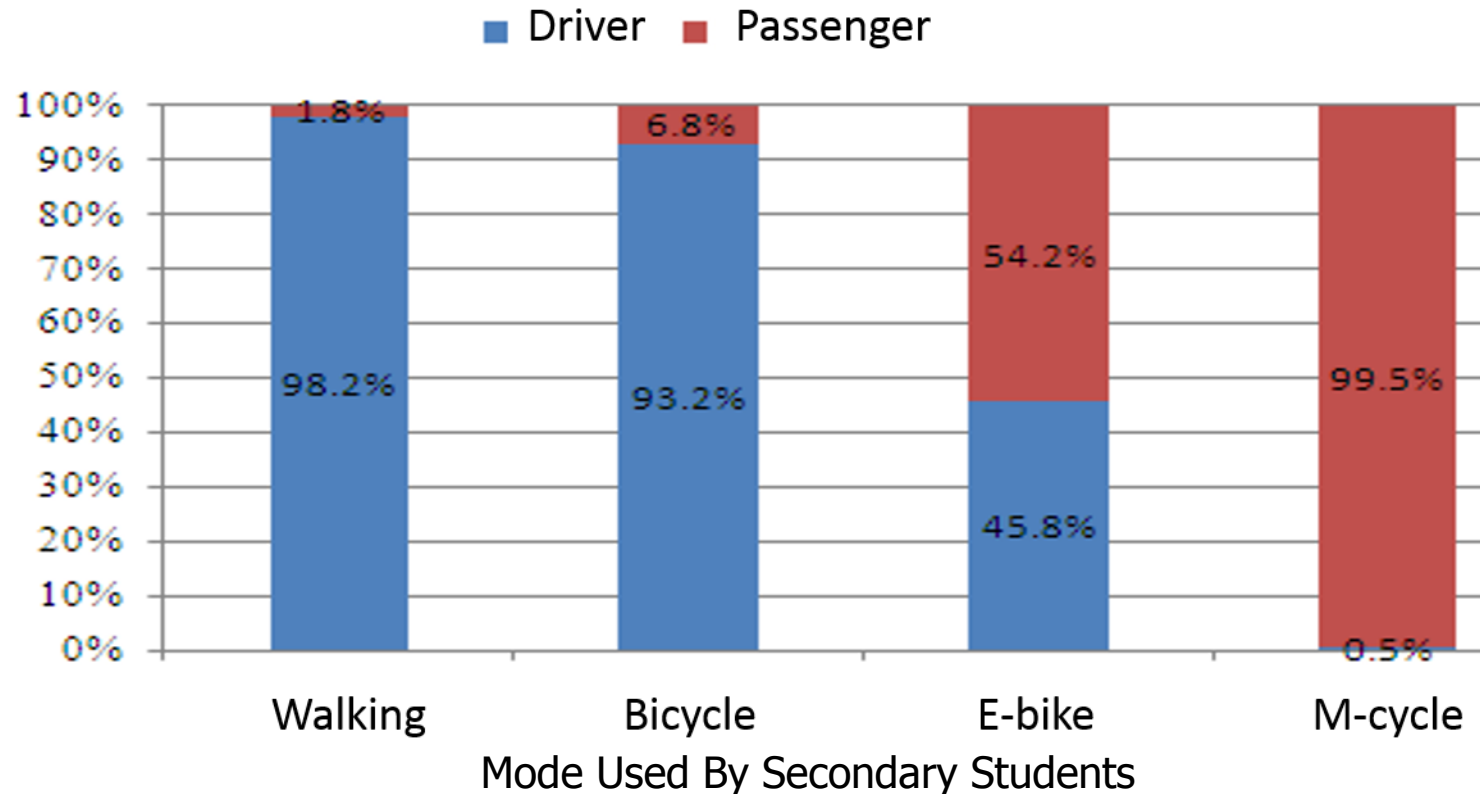
(Observed 6,800 students at 15 schools & 10 roads in HCMC)



Mode Used By Age Group (1)

(Observed 6,800 students at 15 schools & 10 roads in HCMC)

- Kindergarten: 100% as passenger or walking with parents
- Primary school: 100% as passenger, or walking with parents (57%)
- Secondary school:



0.5% self driving

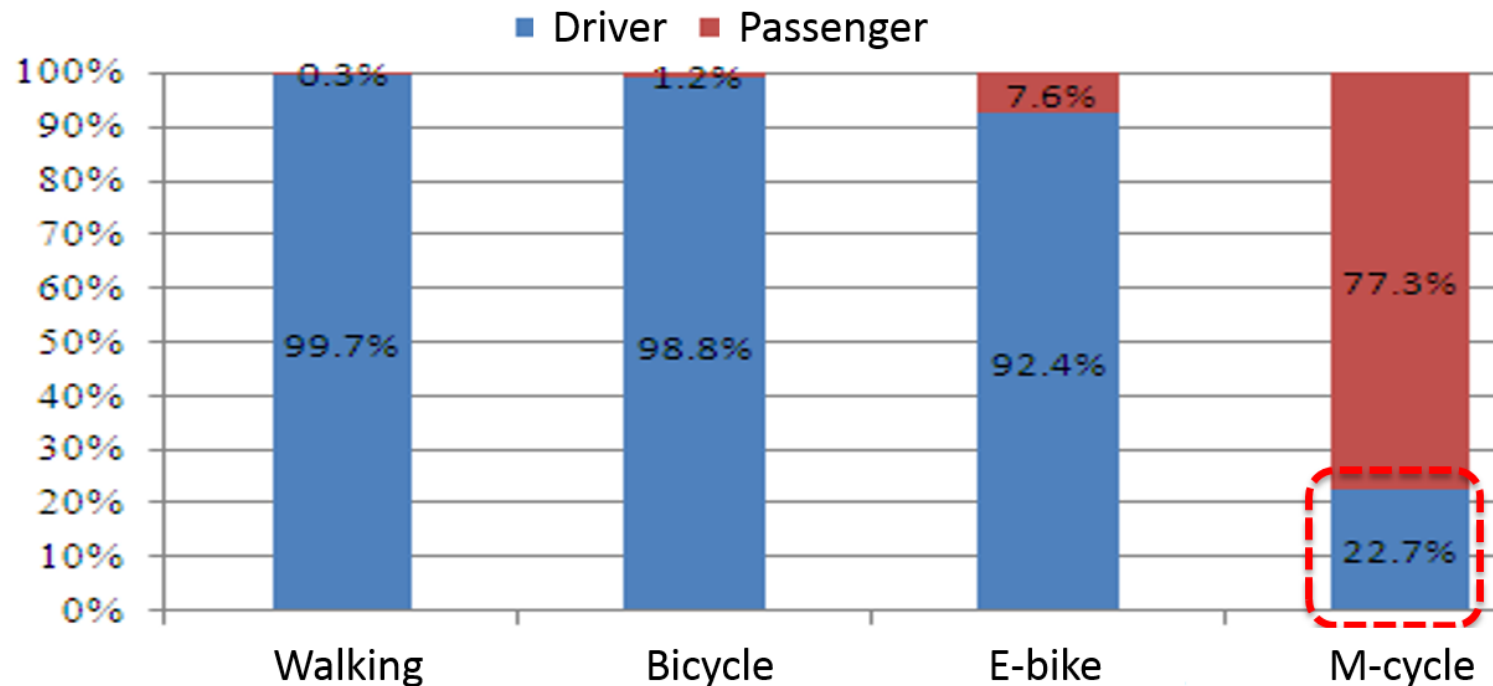


**Strengthen the patrol,
supervision and
punishment**

Mode Used By Age Group (2)

(Observed 6,800 students at 15 schools & 10 roads in HCMC)

- High school: significant number of pupils driving motorcycle



Mode used by high school students

~23% self driving



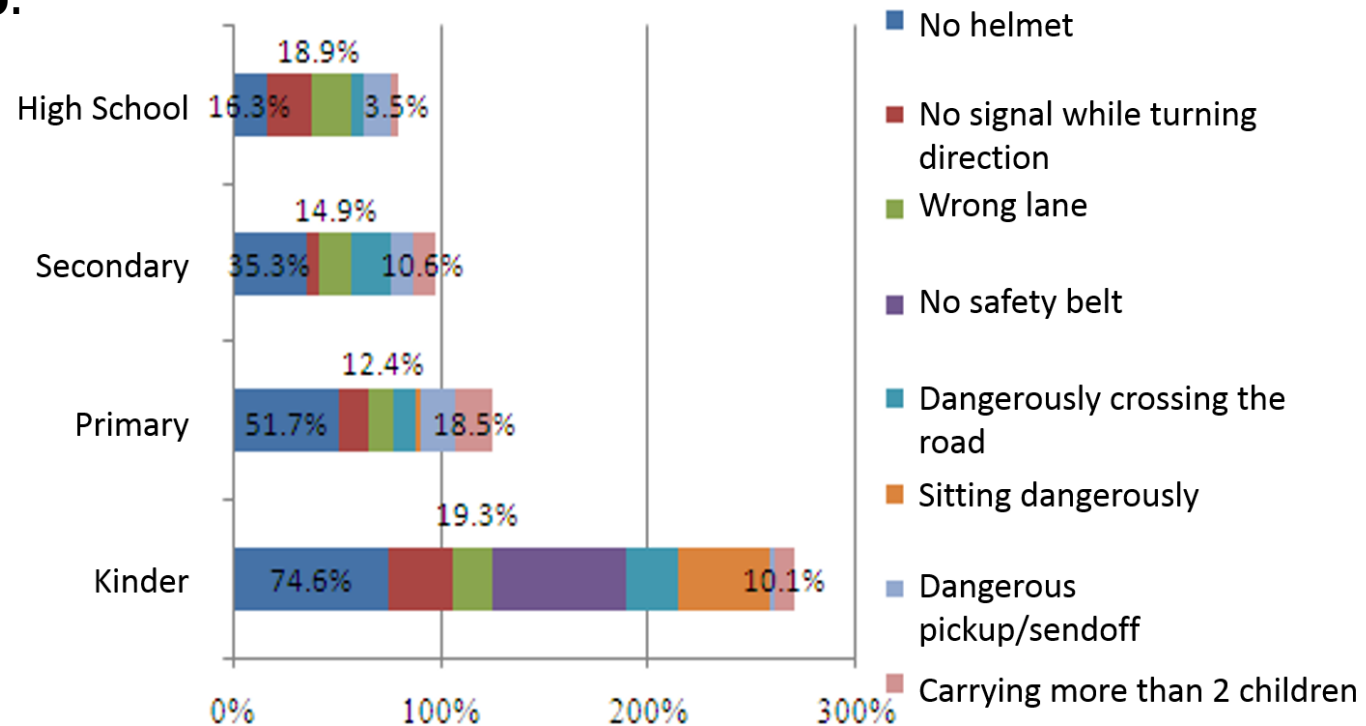
**Strengthen the patrol,
supervision and
punishment**

→ How to encourage primary & secondary school walking or cycling to school?

Traffic Safety Violations (Observed)

(Observed 6,800 students at 15 schools & 10 roads in HCMC)

- **No helmet** and **No safety belt** are the two safety violations have the very high rate in **Kidergarden group**
- **No helmet** is also the safety violation has the highest rate in the **Primary and Secondary group**
- **No helmet**, **No signal while turning direction**, **Wrong lane** are the the three safety violations have the high rate in **high school group**.



Traffic Safety Violations by Student Groups

Inadequate Traffic Organization in the School Areas

▪ Infrastructure

- The pavement is damaged;
- Parking is not available or limited, causing parents park on road and cause traffic disruption;
- No waiting area for students around school zones.

▪ Traffic organization

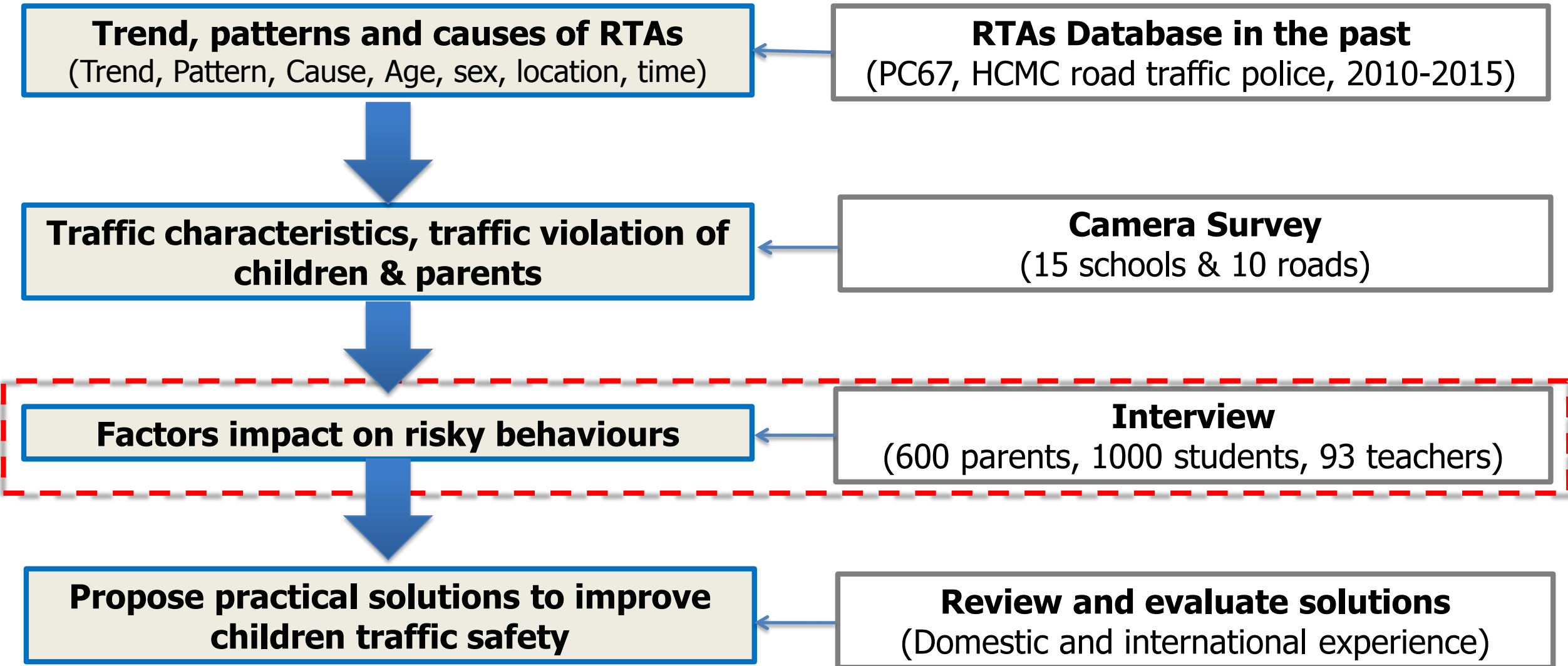
- No regulator, lacking of signal lights, zebra-crossing, no road humps around school zones;
- Inadequate planning: the zebra-crossing for students and parents is not reasonable;
- Encroaching the sidewalk to do business (street vendor) → makes students and pedestrians have to go down the road, ...



Review of Measures in HCMC

No.	Measure	Being implemented	Fully implemented	Implemented, but stop now	Will implement
I	INFRASTRUCTURE				
1	Road infrastructure improvements	0			0
2	“Black spot” improvement			0	0
3	Surveillance camera system				0
4	Bicycle lane	0		0	0
5	Pedestrian infrastructure (sidewalk improvement)	0			0
II	TRAFFIC MANAGEMENT				
6	Lane reorganization				0
7	Signal system adjustment & intersection improvement				0
8	Traffic management in school area				0
9	Provision of road facilities (signs, crossing lane, etc.)	0			0
III	VEHICLE				
10	Vehicle audit				0
11	Shuttle bus, school bus services	0			0
12	Public transport	0			0
13	Control of private vehicle use				0
IV	EDUCATION & ENCOURAGEMENT				
14	Strengthening traffic safety campaign and education	0			0
15	Innovation in traffic safety education				0
16	Traffic safety education in Kindergarten & Primary schools	0	0		0
V	ENFORCEMENT				
17	Improvements in driver training program				0
18	New regulations and rule in the traffic law				0
19	Strengthening police patrol, violation detection, enforcement	0	0		0

Analysis Results



Interview Samples

- Parents (Kindergarten and Primary): 600 samples
 - Over speeding: 200 samples
 - Child without helmet: 200 samples
 - Child sitting dangerously: 200 samples
- Secondary & high school children: 1,000 samples
 - Over speeding: 200 samples
 - Opposite direction running: 200 samples
 - Wrong lane running: 200 samples
 - Driving a motorcycle without driving license : 200 samples
 - No helmet: 200 samples
- Teachers: 93 samples
 - Kindergarten: 23 samples
 - Primary school: 22 samples
 - Secondary school: 24 samples
 - High school: 24 samples

Analysis Steps

Descriptive analysis

- For each behavior and each group
- Comparison between groups:
 - Sex (Male vs Female)
 - Traffic accident in the past (Yes vs No)
 - Type of vehicle used (Bycicle vs Bike) (analysis for student only)



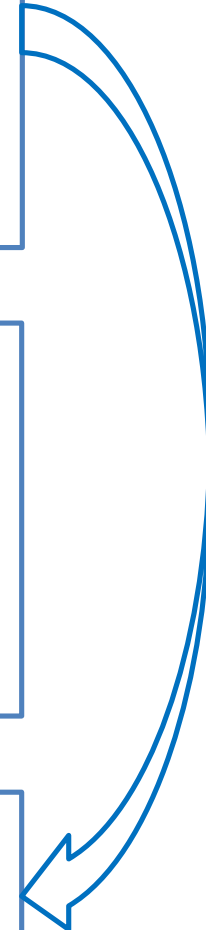
TPB analysis

- For each behavior and each group
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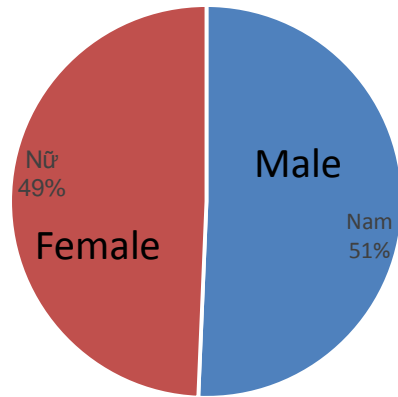
Policy meaning

- Education and Encourage
- Enforcement

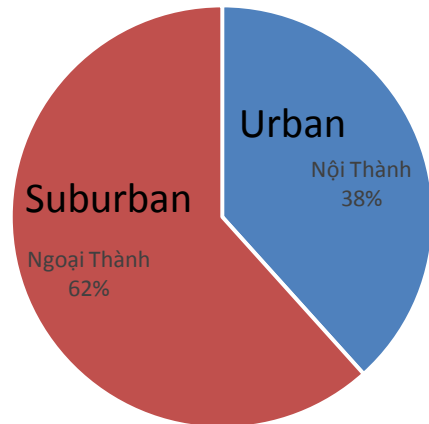


Parent Sample (N=600)

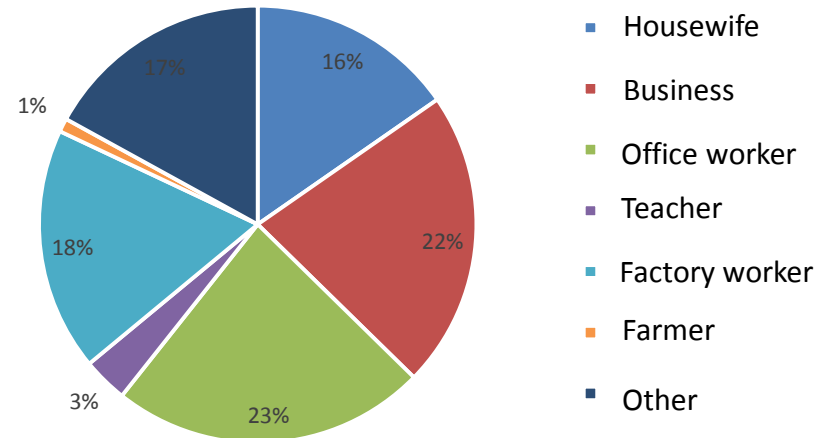
GENDER



RESIDENTIAL AREA

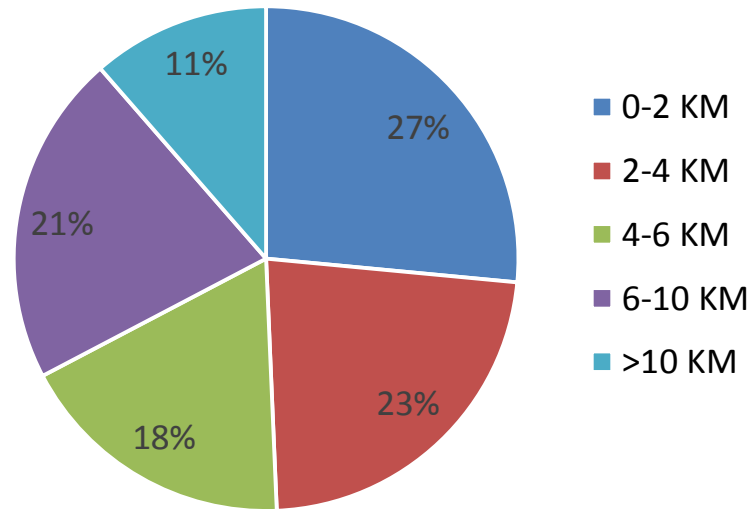


OCCUPATION

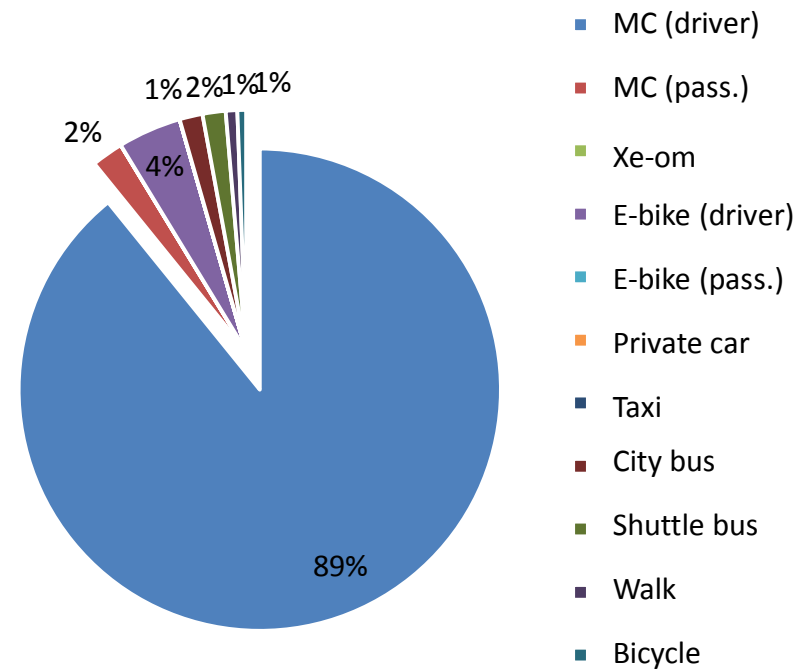


Parent Travel (N=600)

COMMUTING DISTANCE

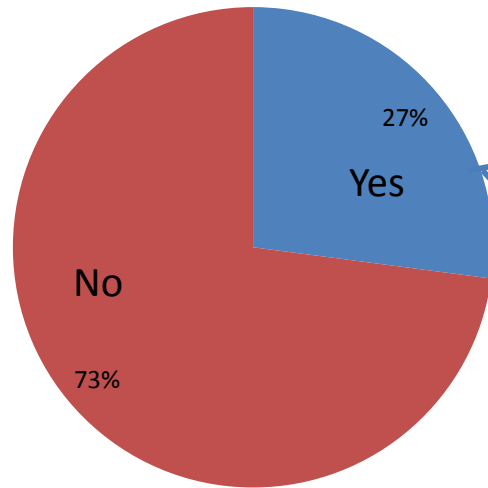


COMMUTING MODE

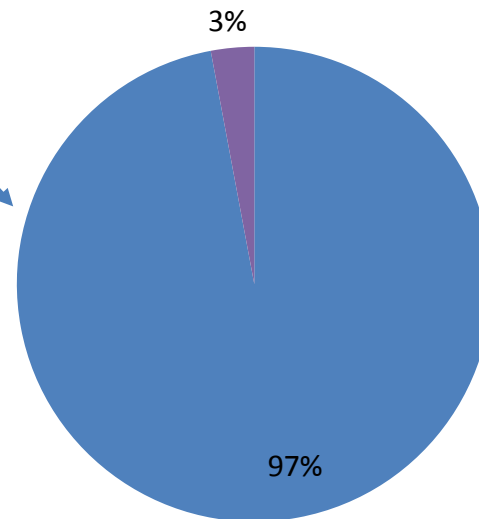


Parent Past Accidents (N=600)

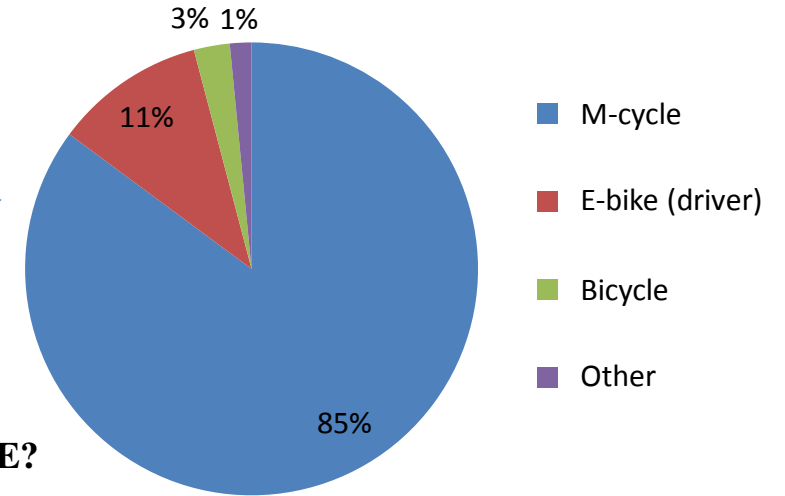
GOT AN ACCIDENT(S) IN THE PAST 2 YEARS?



WHO DROVE?



INVOLVED VEHICLE

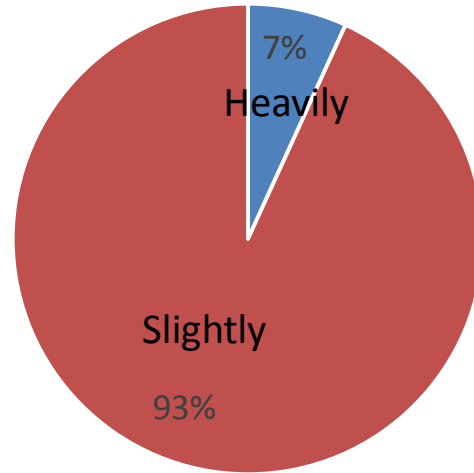


- M-cycle
- E-bike (driver)
- Bicycle
- Other

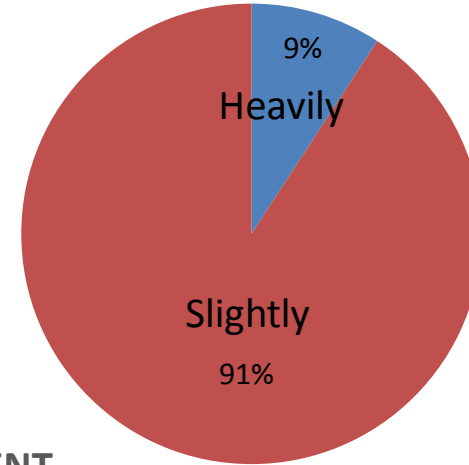
- Yourself
- A child
- Fiancé
- Other

Parent Past Accidents (N=600) (Cont.)

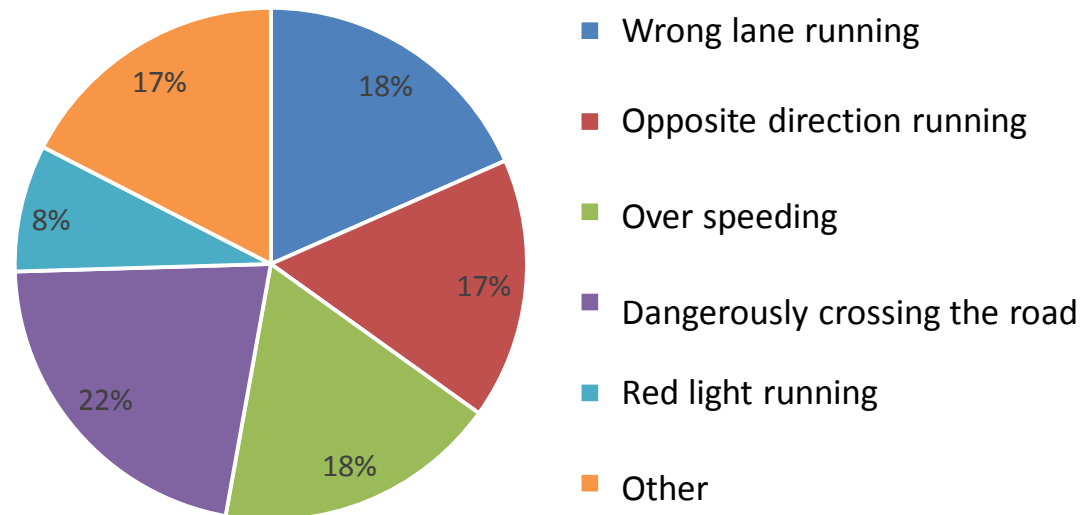
INJURED DRIVER



INJURED PASSENGER(S)

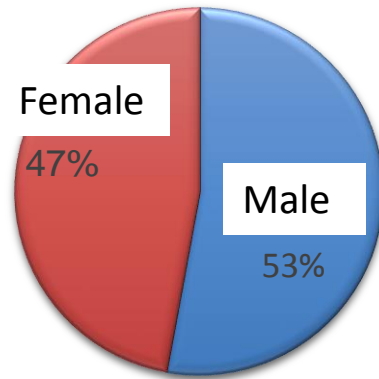


MAIN CAUSE OF ACCIDENT

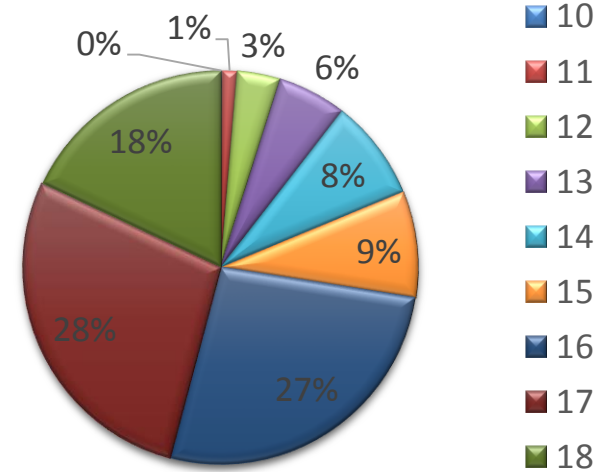


Child Samples (N=1000)

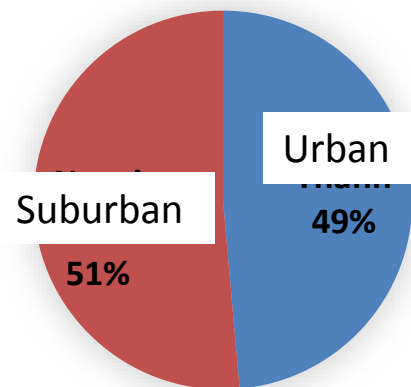
GENDER



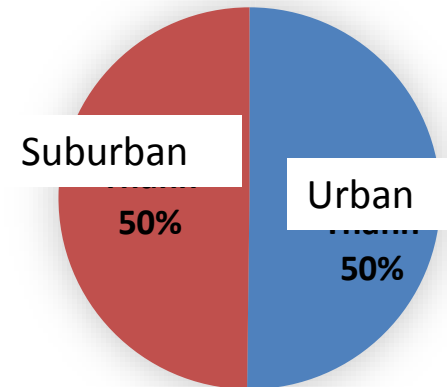
AGE



RESIDENTIAL AREA

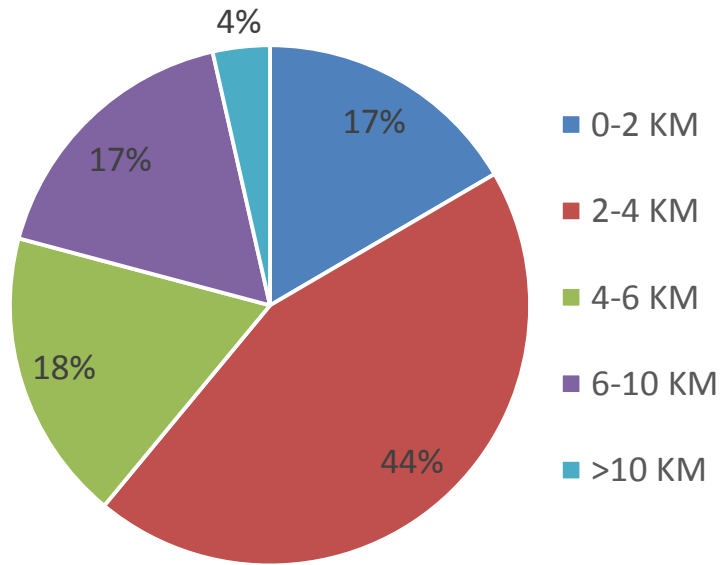


SCHOOL AREA

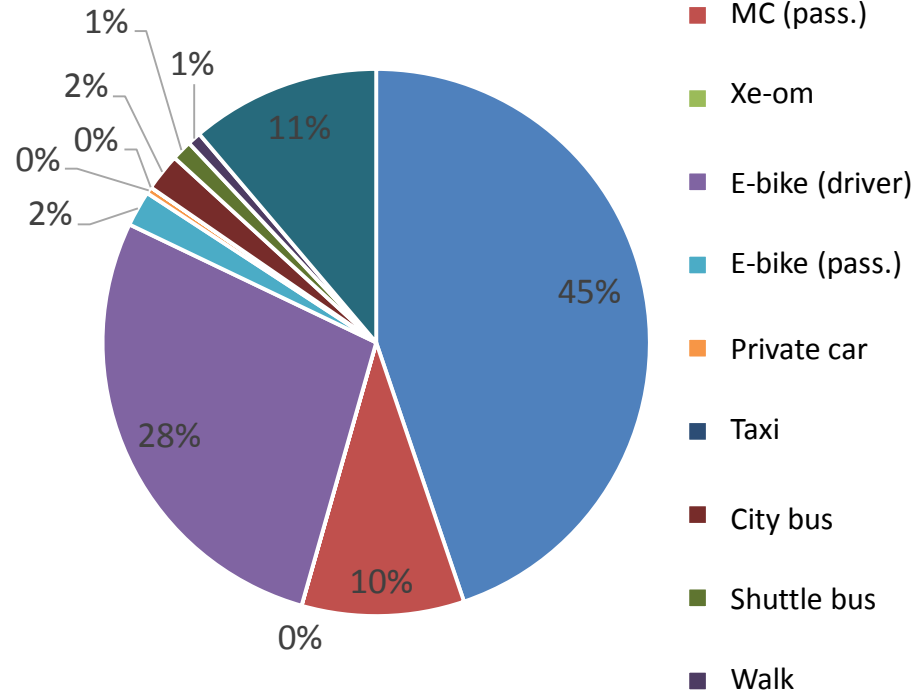


Child Travel (N=1000)

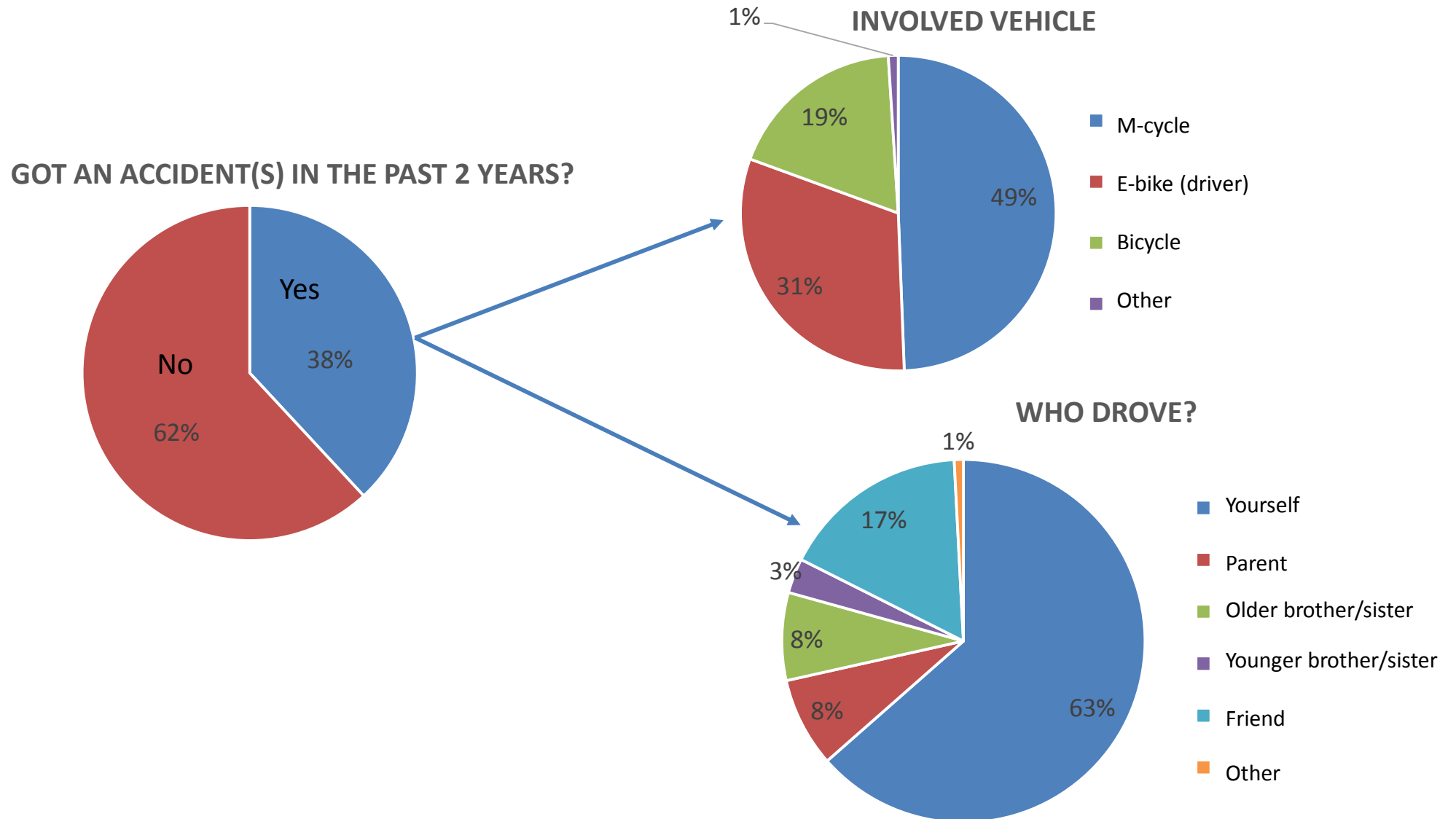
DISTANCE TO SCHOOL



MODE TO SCHOOL

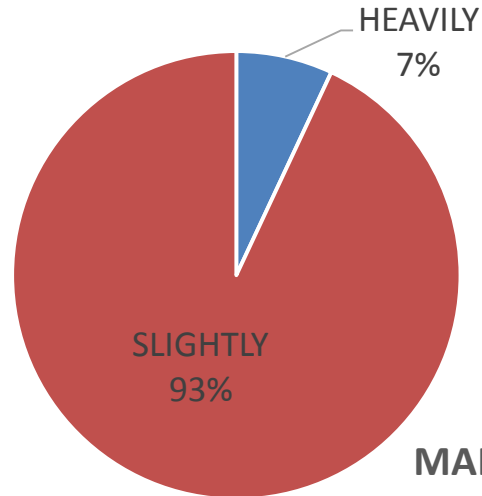


Child Past Accidents (N=1000)

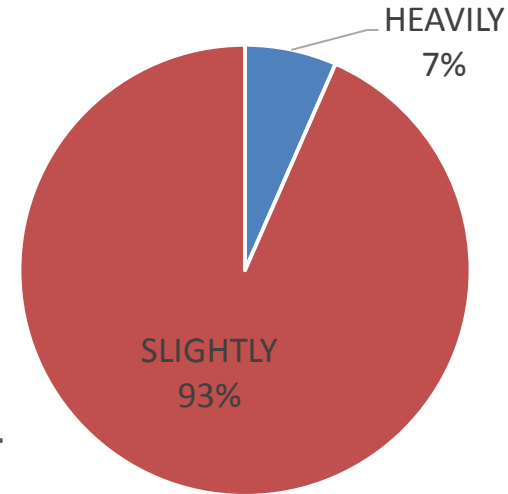


Child Past Accidents (N=1000) (Cont.)

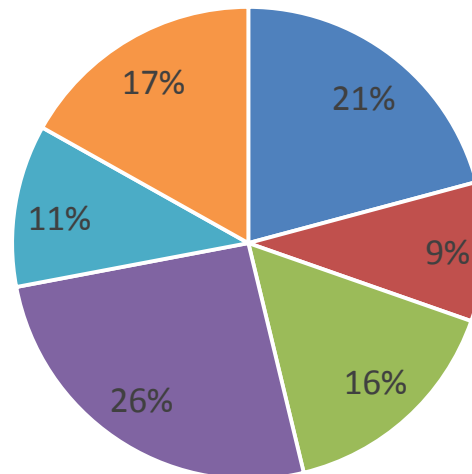
INJURED DRIVER



INJURED PASSENGER



MAIN CAUSE OF ACCIDENT



Wrong lane running

Opposite direction running

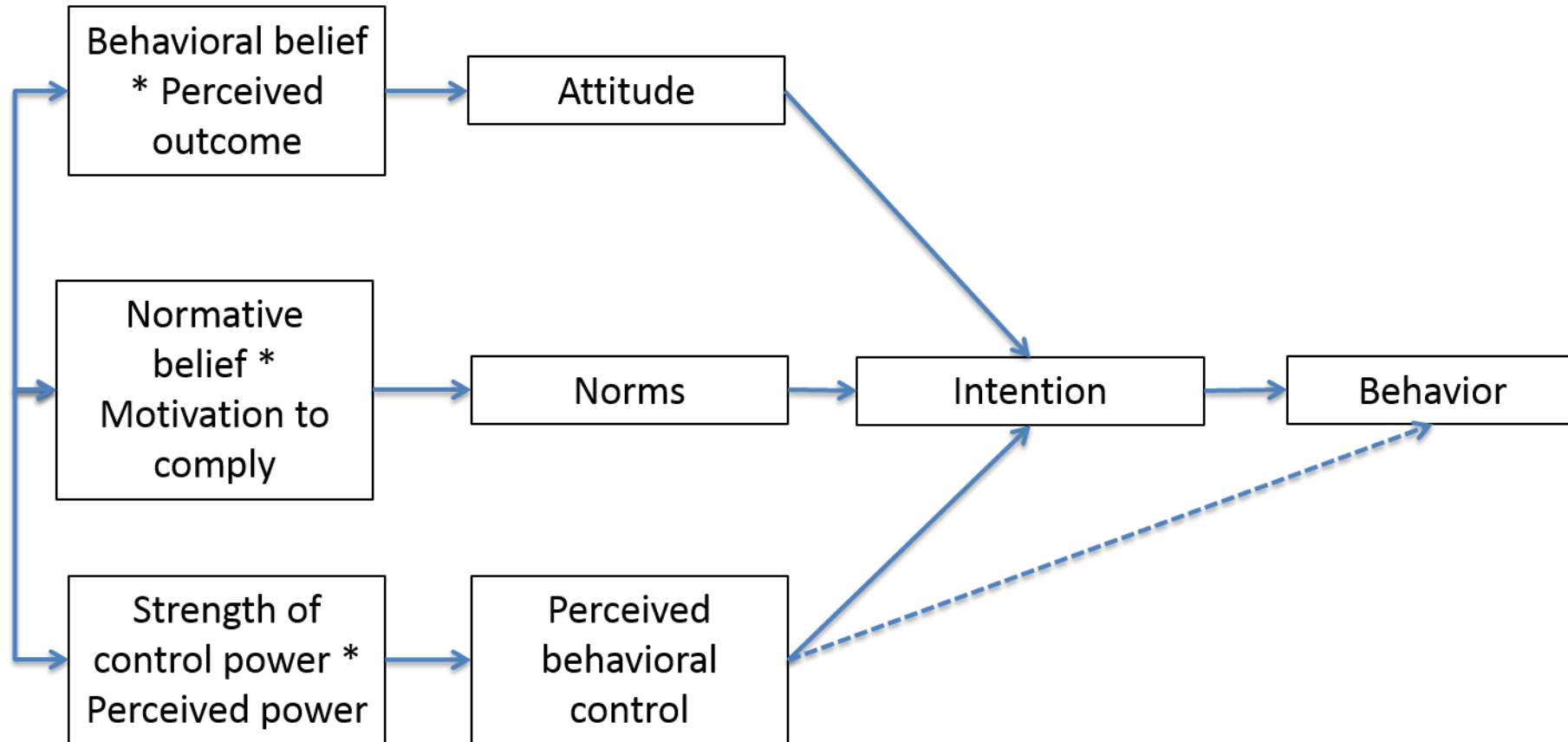
Over speeding

Dangerously crossing the road

Red light running

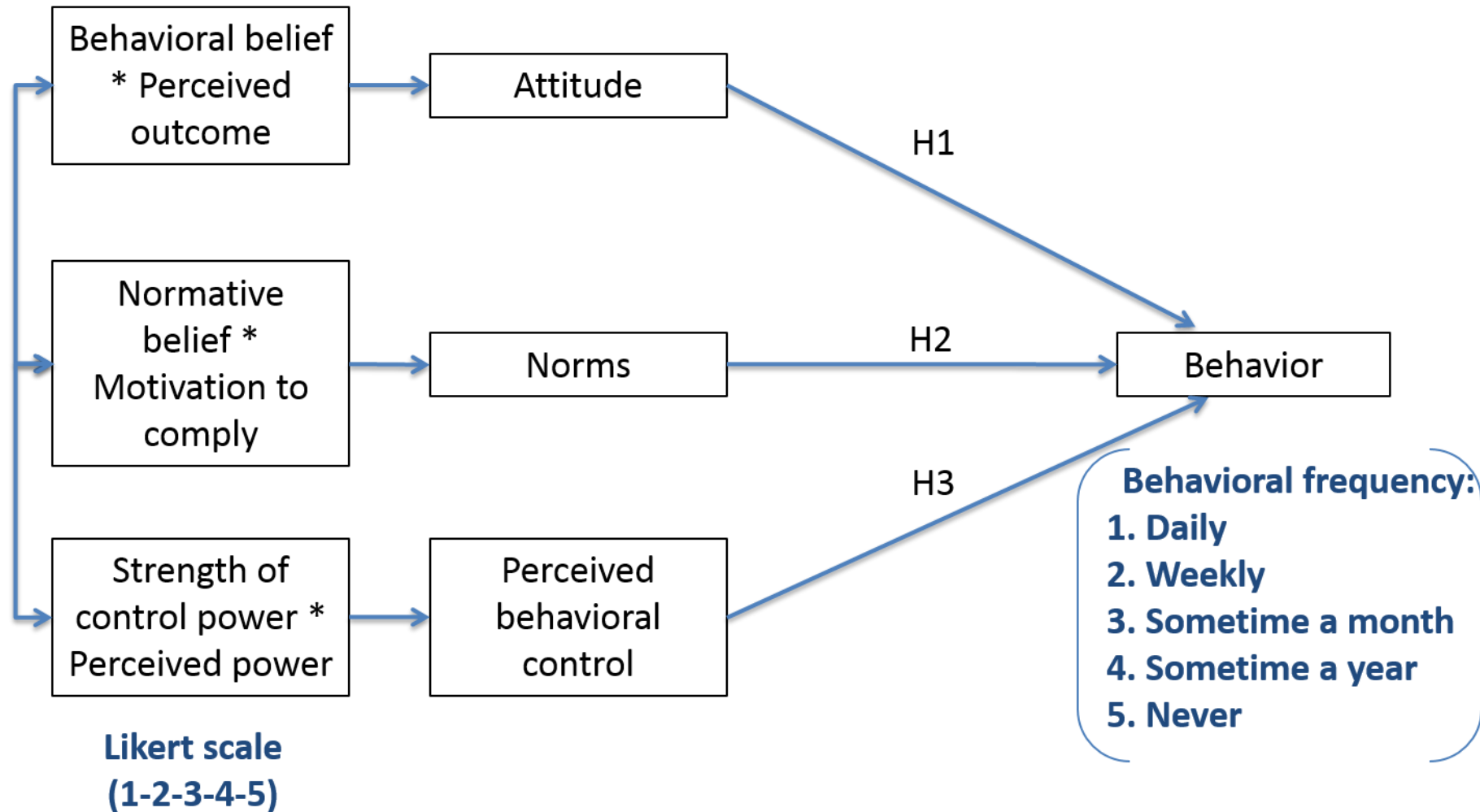
Other

Theory of Planned Behaviour

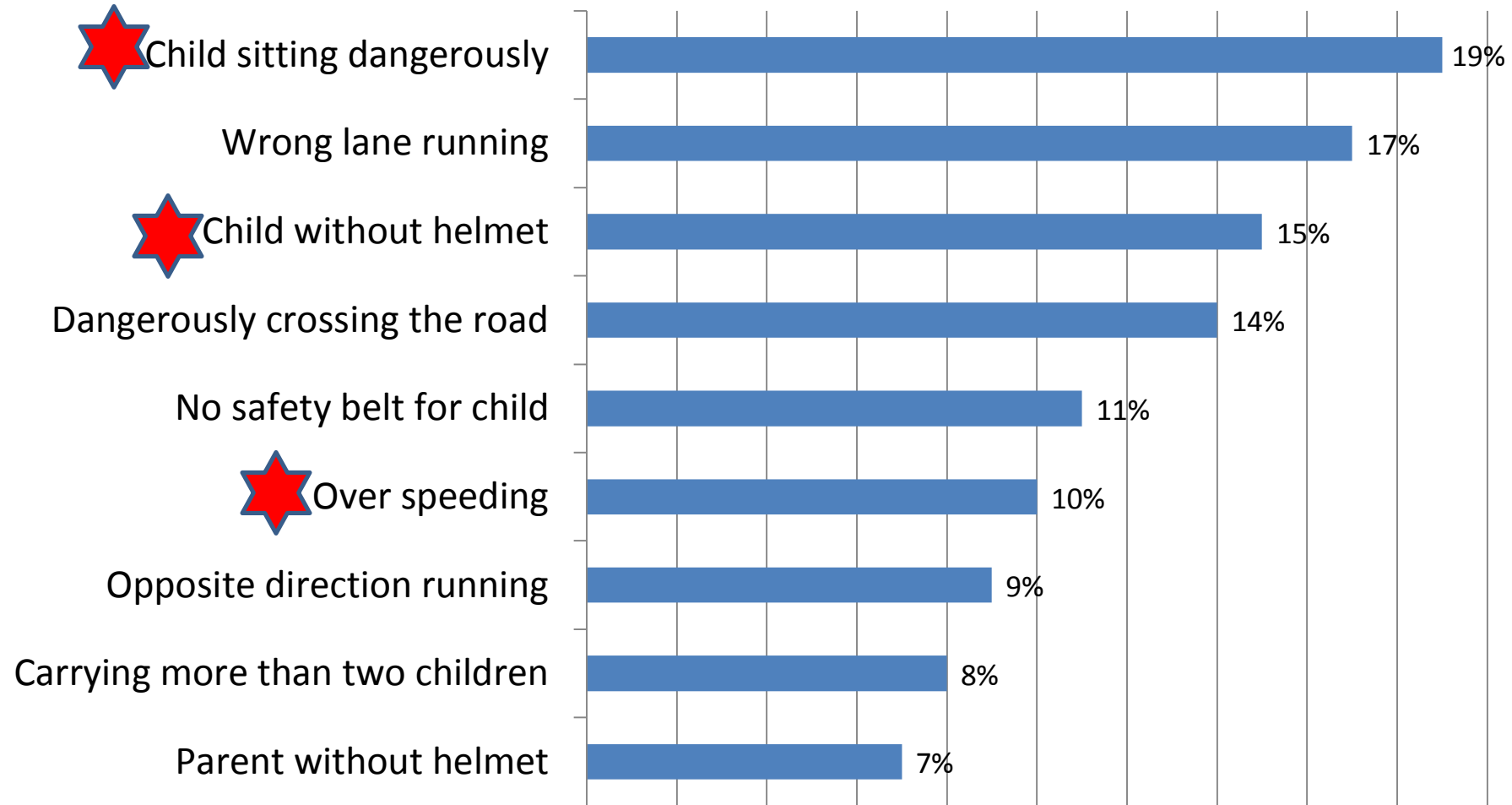


Source: Ajzen (1991)

Application TPB in The Study

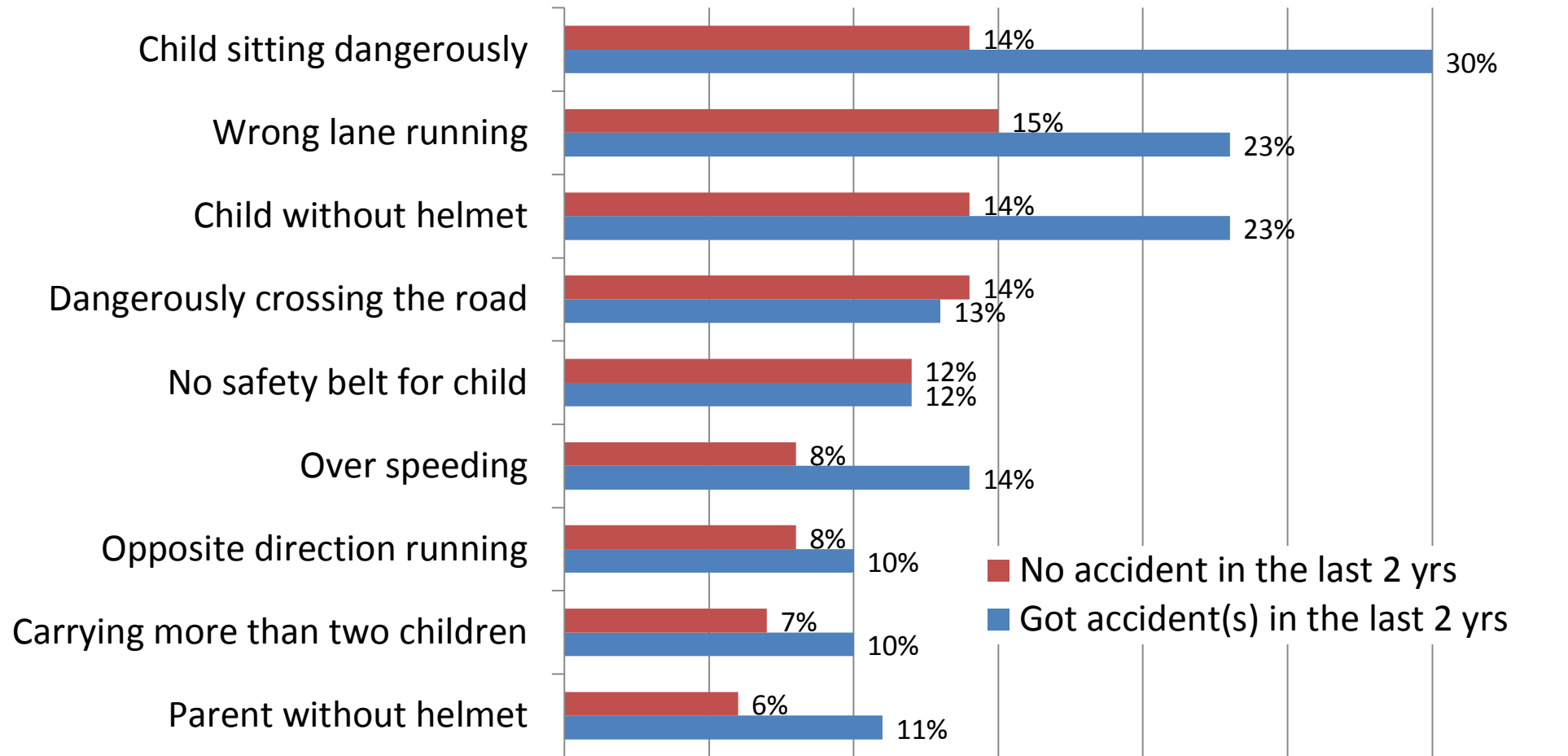


Parents Traffic Violations



(% violated Daily and Weekly)

Parents Traffic Violations by Past Accident



(% violated Daily and Weekly)

Estimated TPB Models for Parents

Factor	Over Speeding		Child sitting dangerously		Child no helmet	
	Beta	Sig.	Beta	Sig.	Beta	Sig.
Attitude	1 0.427	0.000	1 0.539	0.000	1 0.370	0.000
Norms	2 0.346	0.000	2 0.308	0.001	2 0.318	0.000
Perceived behavioral control	3 0.204	0.000	0.071	0.207	3 0.203	0.013
Sample Size (N)	200		200		200	
Adjusted R Square	0.930		0.884		0.894	

- **“Attitude” is the most influential factor**
- Followed by “Norms – Social pressure” (2nd influence)
- “Perceived behavioral control” (3rd influence)

General Attitude Toward “Over Speeding”

% “AGREE + VERY AGREE” that over-speeding is sometime acceptable

Sometime still acceptable

20%

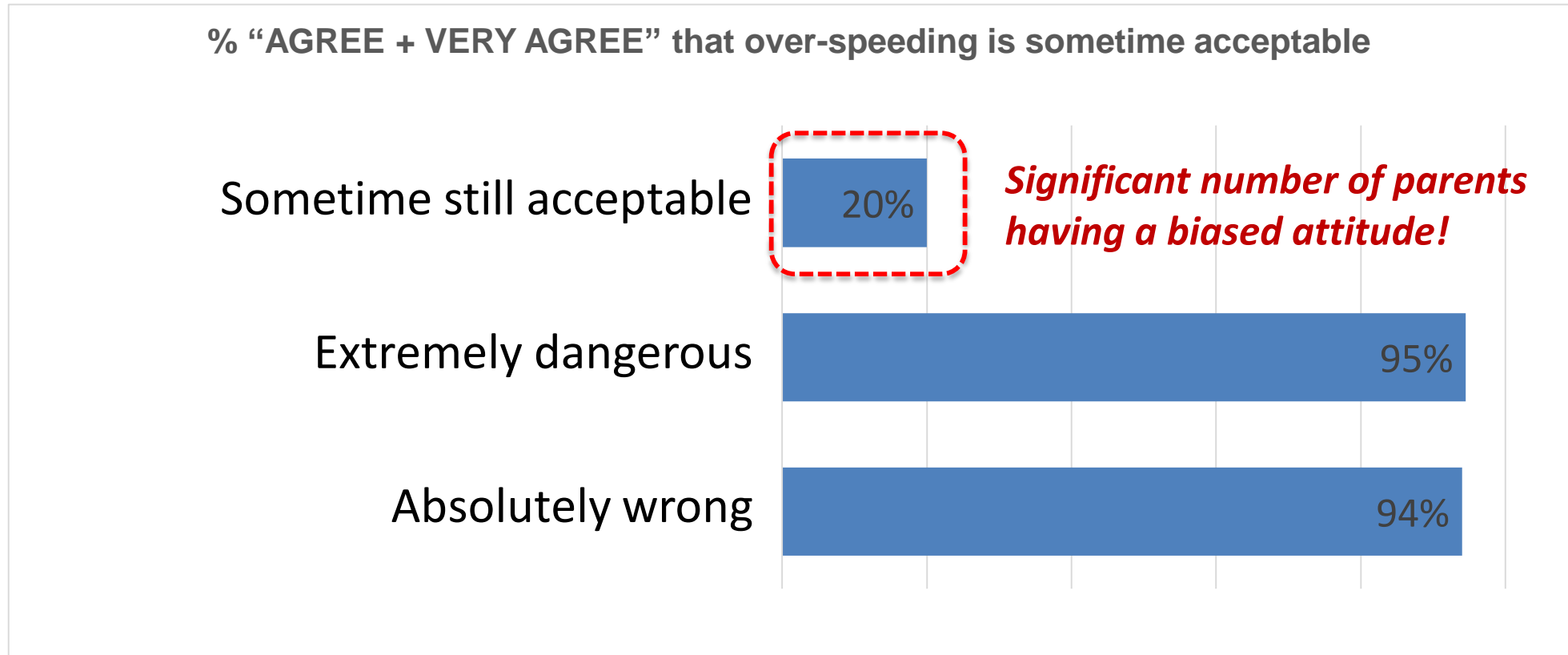
*Significant number of parents
having a biased attitude!*

Extremely dangerous

95%

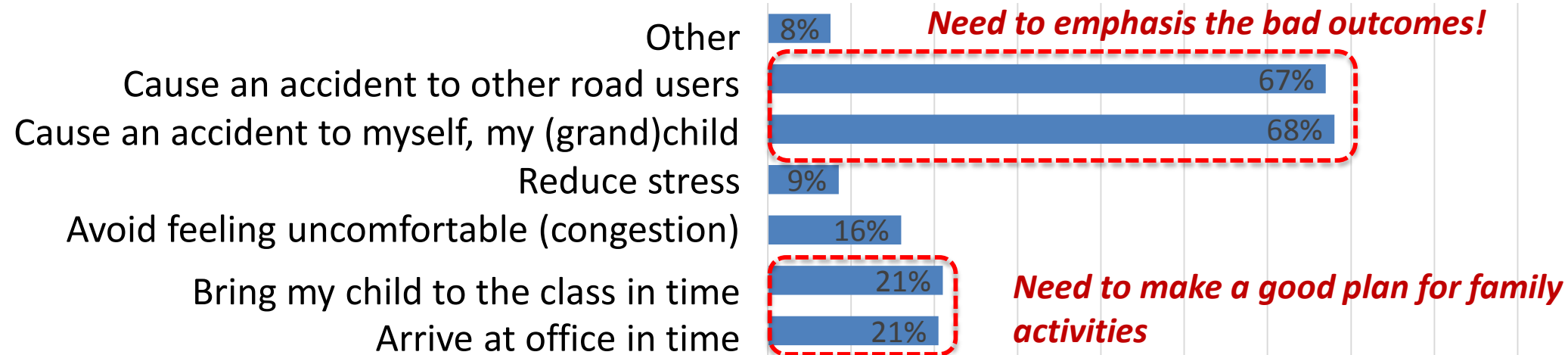
Absolutely wrong

94%

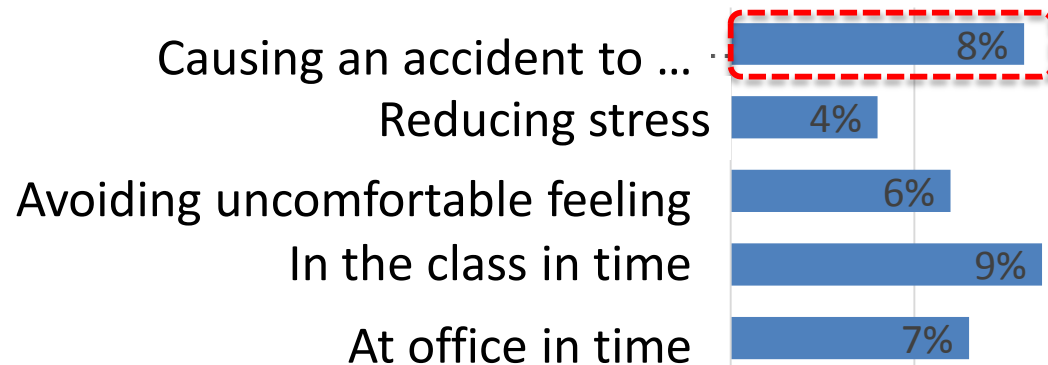


Behavioral Beliefs & Perceived Outcomes

% "AGREE + VERY AGREE" THAT OVER SPEEDING MIGHT HELP ...

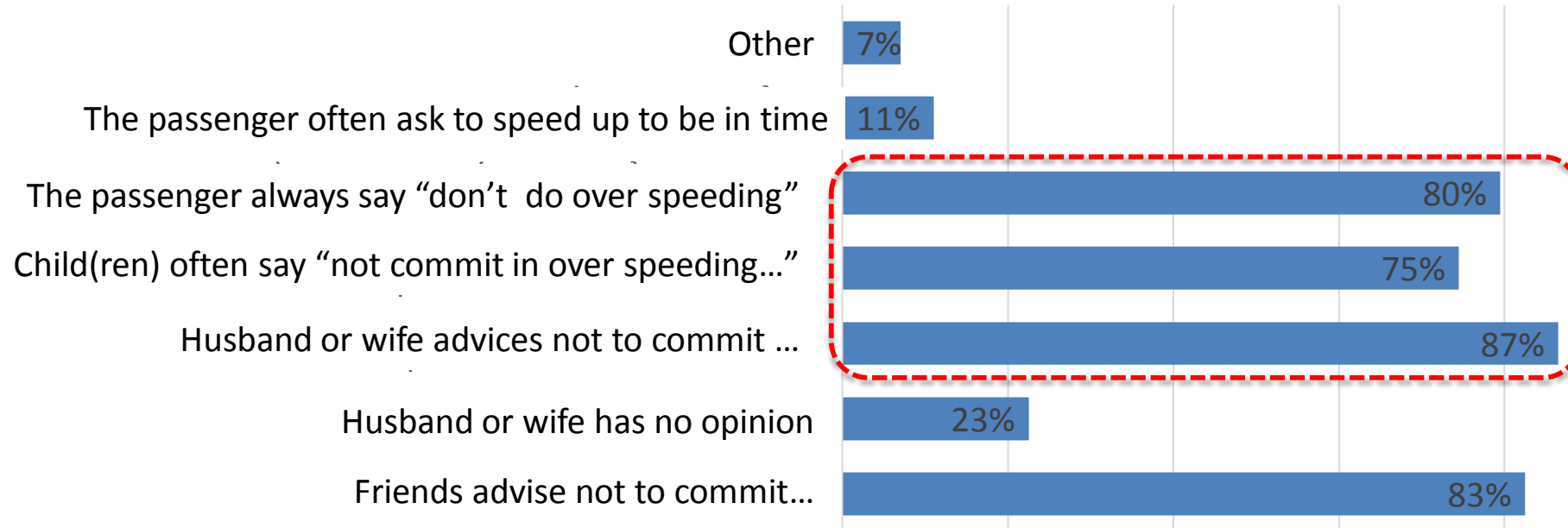


% PERCEIVED THAT THE OUTCOMES FROM OVER SPEEDING WOULD BE "GOOD + VERY GOOD" ...

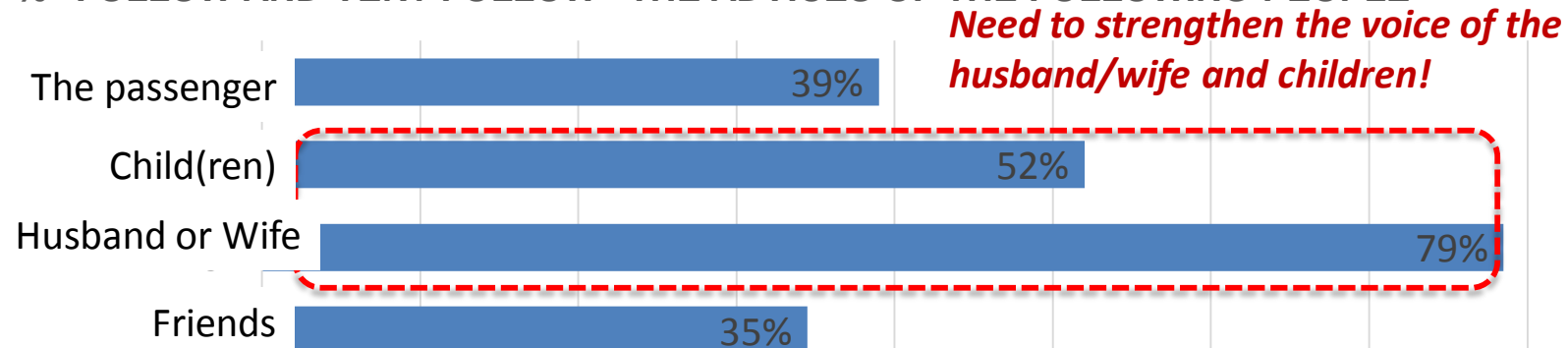


Normative Beliefs & Motivation to Comply

% "AGREE + VERY AGREE" THAT THE FOLLOWING PEOPLE OFTEN ADVISE ...

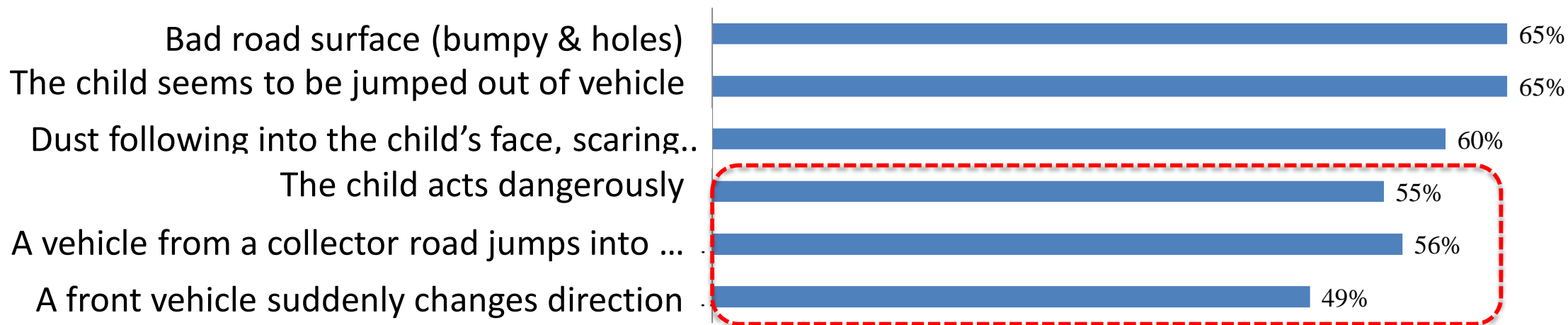


% "FOLLOW AND VERY FOLLOW" THE ADVICES OF THE FOLLOWING PEOPLE

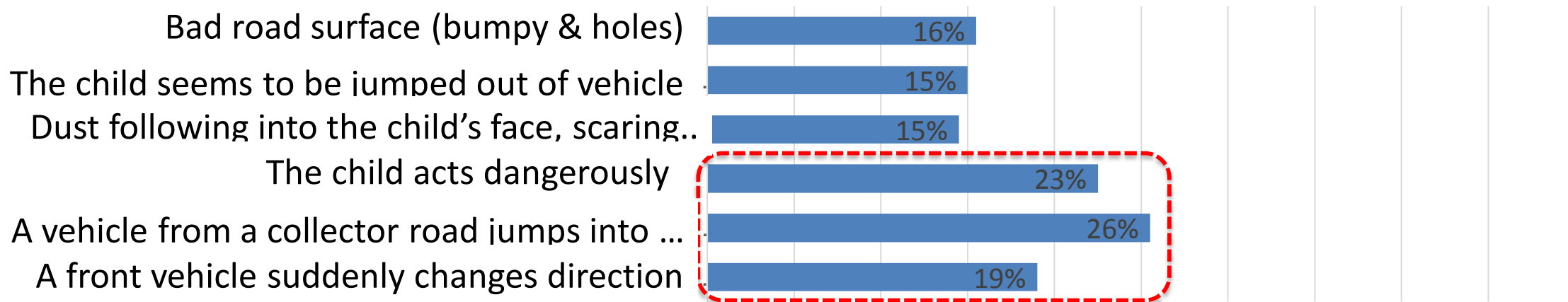


Strength of Control Power & Perceived Power

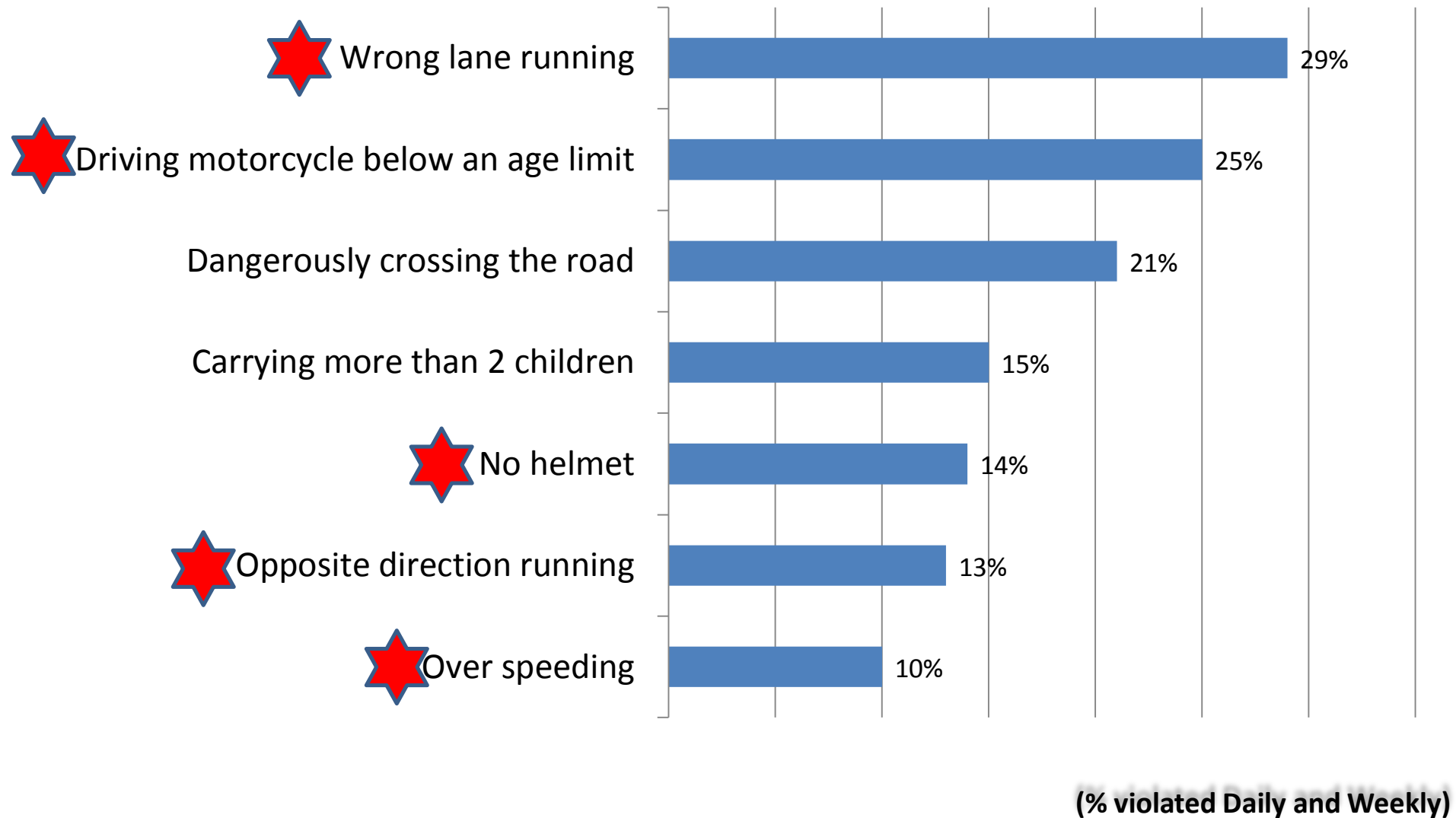
% "BEING NERVOUS + EXTREMELY NERVOUS" WHILE OVER SPEEDING AND FACE CASES:



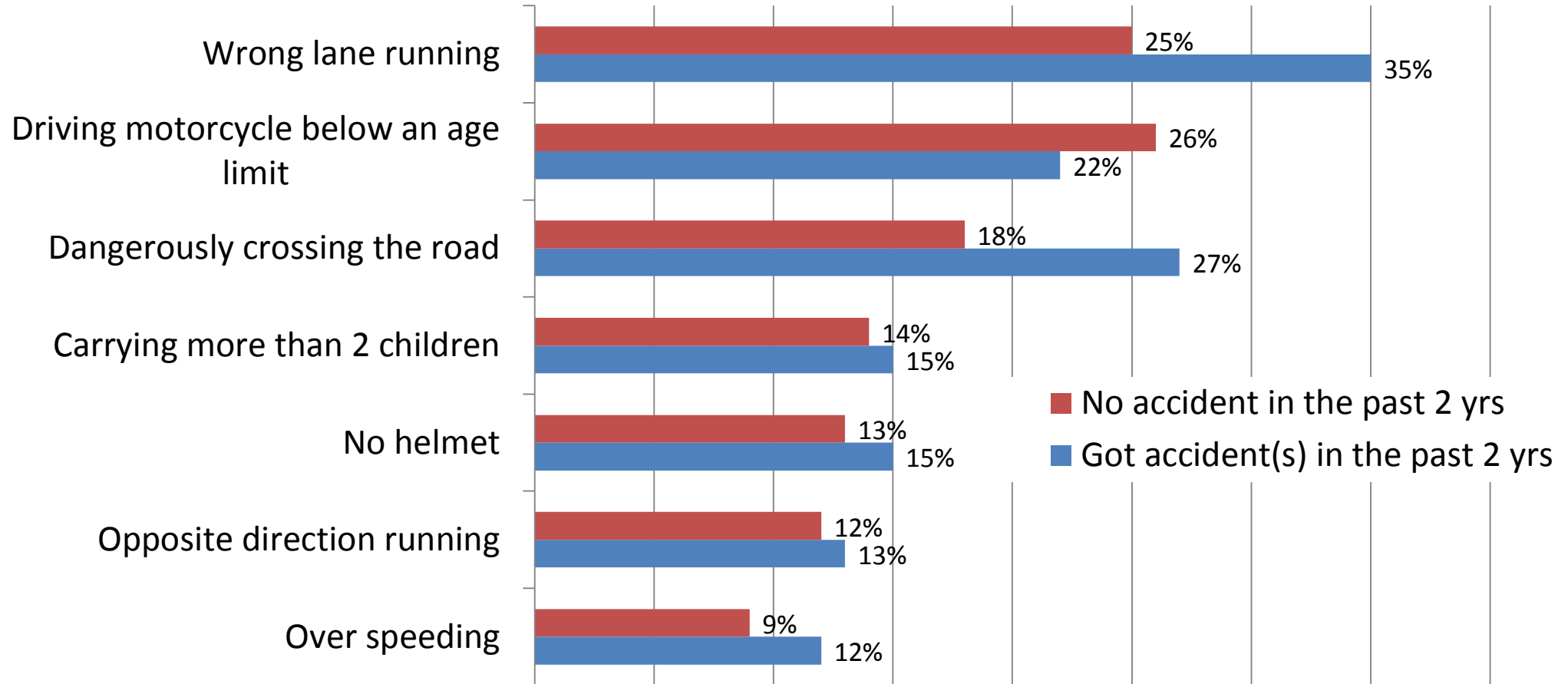
% "OFTEN + VERY OFTEN" MEET THE FOLLOWING CASES WHILE OVER SPEEDING:



Children Traffic Violations

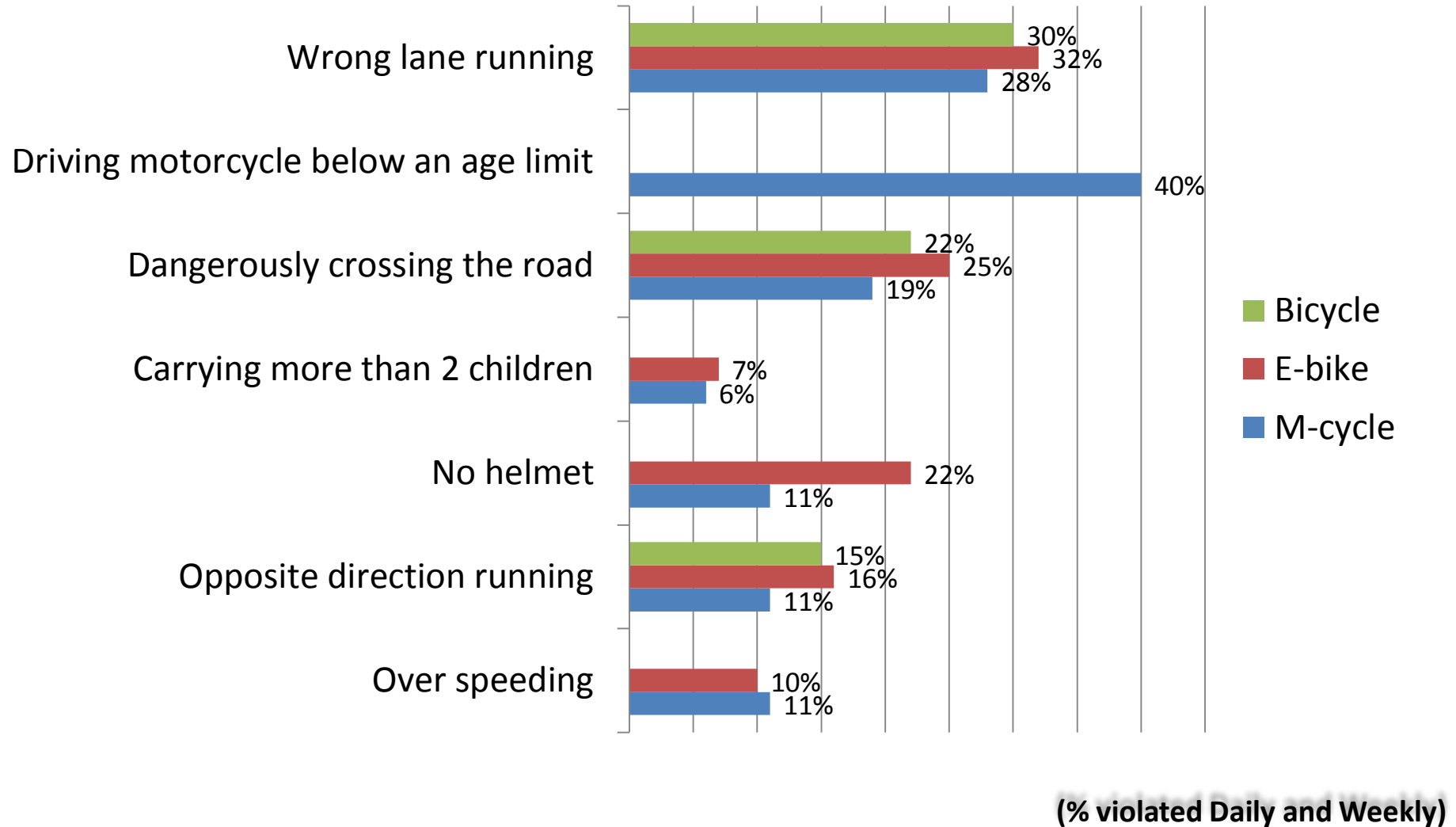


Children Traffic Violations by Past Accident



(% violated Daily and Weekly)

Children Traffic Violations by Vehicle



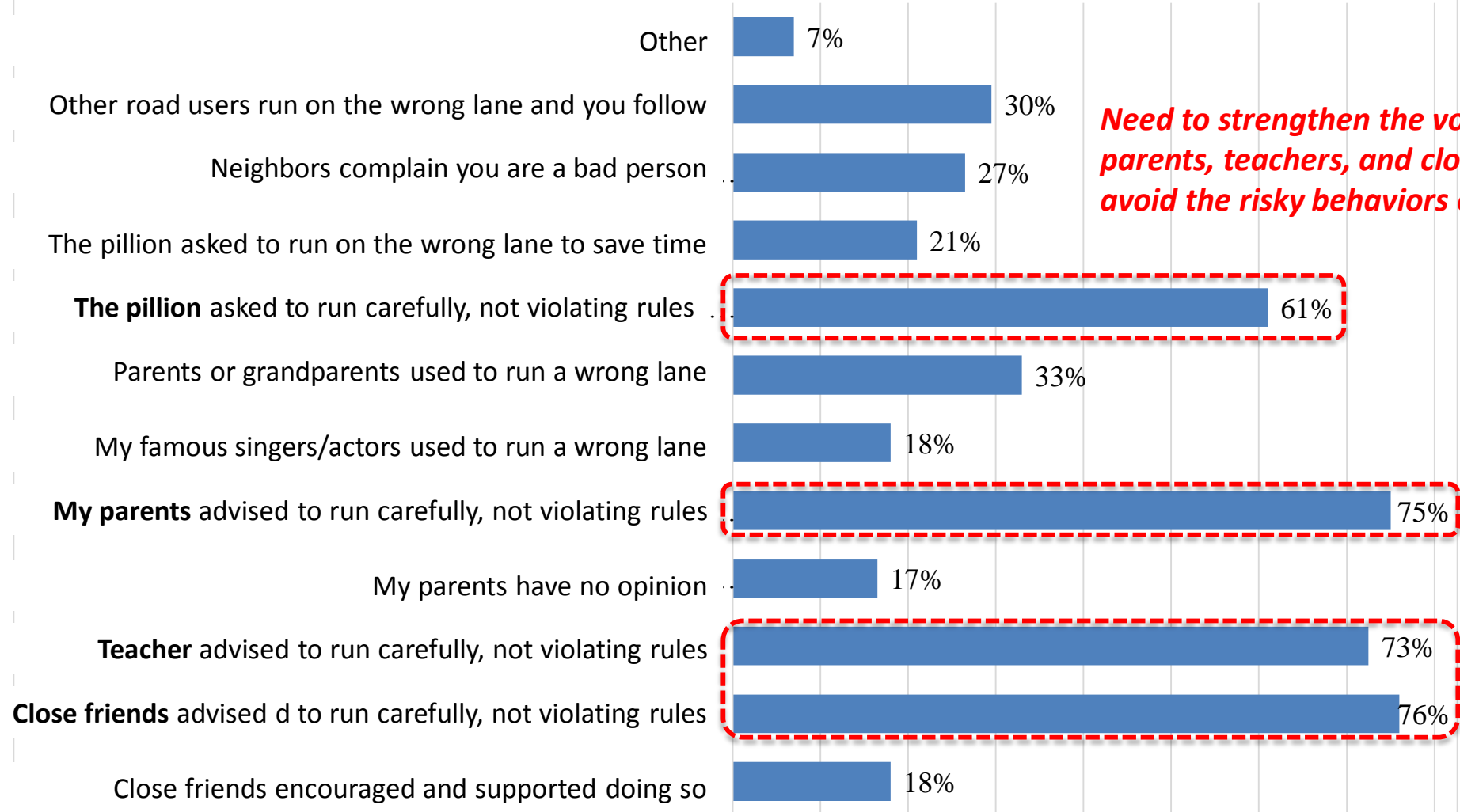
Estimated TPB Models for Children

Factor	Over speeding		Wrong lane		Opposite dir. running		Driving below allowed age		No helmet	
	<i>Beta</i>	<i>Sig.</i>	<i>Beta</i>	<i>Sig.</i>	<i>Beta</i>	<i>Sig.</i>	<i>Beta</i>	<i>Sig.</i>	<i>Beta</i>	<i>Sig.</i>
Attitude	1 0.612	0.000	3 0.235	0.043	2 0.329	0.001	1 0.343	0.014	2 0.445	0.000
Norms	2 0.216	0.000	1 0.320	0.006	1 0.408	0.000	2 0.282	0.045	1 0.495	0.000
Perceived behavioral control	3 0.179	0.017	2 0.267	0.005	3 0.195	0.007	0.150	0.054	0.036	0.643
Sample size (N)	199		193		190		200		200	
Adjusted R Square	0.942		0.805		0.892		0.750		0.879	

- Different from the parents, **for children “Norms - Social Pressure” is the most influential factor** (3 out of 5 behaviors)
- Followed by “Attitude” (2nd influence)
- “Perceived behavioral control” (3rd influence)

Normative Beliefs (*wrong lane by child*)

% "AGREE + STRONGLY AGREE" THAT THE FOLLOWING PEOPLE HAVE INFLUENCED YOU



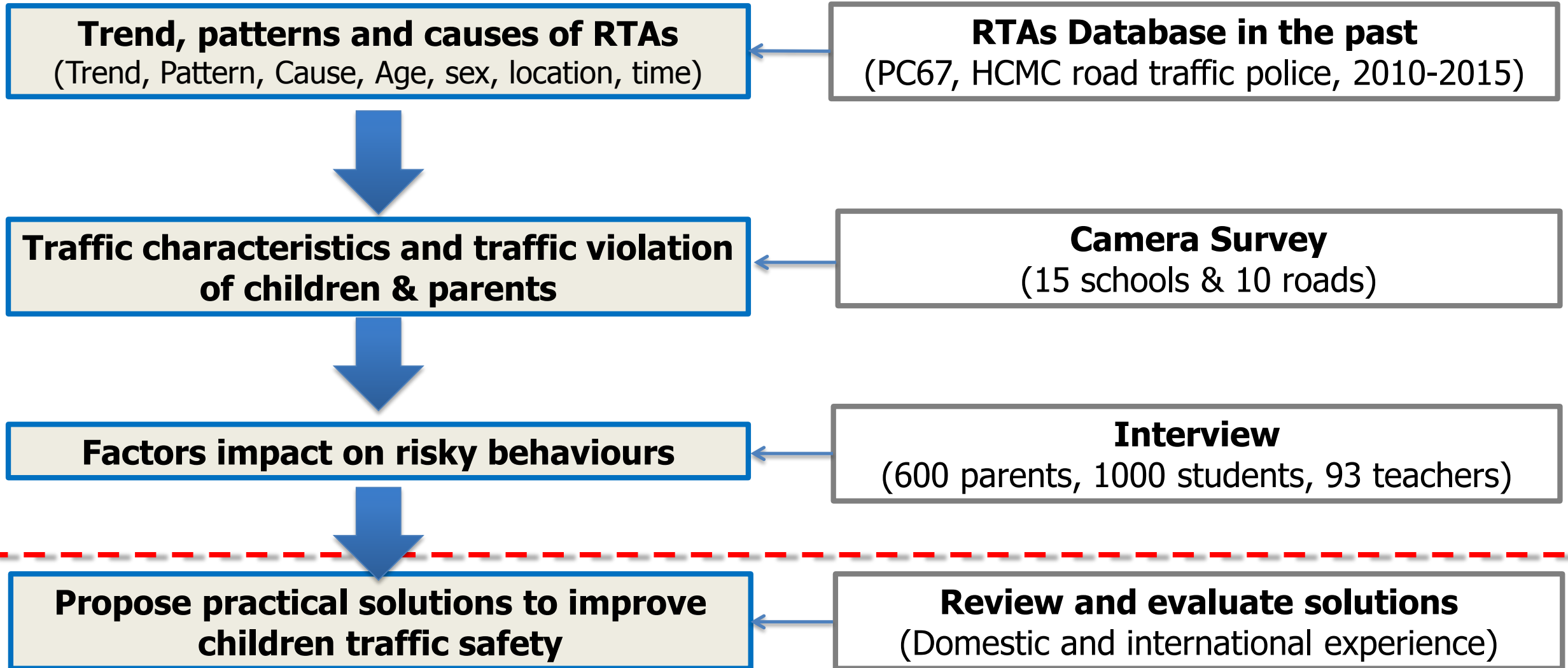
Need to strengthen the voice of the parents, teachers, and close friends to avoid the risky behaviors of students.

Review of Measures in HCMC

No.	Measure	Being implemented	Fully implemented	Implemented, but stop now	Will implement
I	INFRASTRUCTURE				
1	Road infrastructure improvements	o			o
2	“Black spot” improvement			o	o
3	Surveillance camera system				o
4	Bicycle lane	o		o	o
5	Pedestrian infrastructure (sidewalk improvement)	o			o
II	TRAFFIC MANAGEMENT				
6	Lane reorganization				o
7	Signal system adjustment & intersection improvement				o
8	Traffic management in school area				o
9	Provision of road facilities (signs, crossing lane, etc.)	o			o
III	VEHICLE				
10	Vehicle audit				o
11	Shuttle bus, school bus services	o			o
12	Public transport	o			o
13	Control of private vehicle use				o
IV	EDUCATION & ENCOURAGEMENT				
14	Strengthening traffic safety campaign and education	o			o
15	Innovation in traffic safety education				o
16	Traffic safety education in Kindergarten & Primary schools	o	o		o
V	ENFORCEMENT				
17	Improvements in driver training program				o
18	New regulations and rule in the traffic law				o
19	Strengthening police patrol, violation detection, enforcement	o	o		o

→ No education program for Parents and Secondary School Children

Analysis Results



Review of Measures in HCMC

No.	Measure	Being implemented	Fully implemented	Implemented, but stop now	Will implement
I	INFRASTRUCTURE				
1	Road infrastructure improvements	0			0
2	“Black spot” improvement			0	0
3	Surveillance camera system				0
4	Bicycle lane	0		0	0
5	Pedestrian infrastructure (sidewalk improvement)	0			0
II	TRAFFIC MANAGEMENT				
6	Lane reorganization				0
7	Signal system adjustment & intersection improvement				0
8	Traffic management in school area				0
9	Provision of road facilities (signs, crossing lane, etc.)	0			0
III	VEHICLE				
10	Vehicle audit				0
11	Shuttle bus, school bus services	0			0
12	Public transport	0			0
13	Control of private vehicle use				0
IV	EDUCATION & ENCOURAGEMENT				
14	Strengthening traffic safety campaign and education	0			0
15	Innovation in traffic safety education				0
16	Traffic safety education in Kindergarten & Primary schools	0	0		0
V	ENFORCEMENT				
17	Improvements in driver training program				0
18	New regulations and rule in the traffic law				0
19	Strengthening police patrol, violation detection, enforcement	0	0		0

03 Groups of Solutions to Improve Traffic Safety for Children for HCMC

1. Strengthen surveillance patrols to dramatically reduce traffic safety violations in children:

- Strengthen punishment of risk-taking behaviors of children when riding, especially with the male group of the high school and secondary school.
- Compulsory helmet using for the 3-5 year-olds children group.

2. Promote culture of walking and cycling for children, especially primary and secondary school students:

- Reestablish the pavement order, to renovate the sidewalk pavement
- Study and build bicycle lanes so that children can ride bicycles safely and comfortably to school.

3. Improving traffic safety for secondary and high school children by:

- Raising the voice and influential power of Parents, Teachers and Close Friends
- Raising the voice of husband/wife and children to parents group
- Increasing perceptions about risks while violating traffic rules
- Improving traffic law knowledge, skills for safe traffic participation

ACTION TO KEEP KIDS SAFE

