

Philippe LESIRE using supports from LAB, CEESAR and MHH 30/10/2019



TODAY'S TIMELINE



HUMAN BEHAVIOR



Events included:

F: Accident with at least one collision.D: Events where a passenger is injured (including driving manoeuvers)

Vehicle type: **F:** Buses coded according to architecture **D:** Buses coded according to actual use Type of potential restraint systems : City buses, coaches and minibuses are part of the sample Period of data collected Sample for National data used in this study: 2008-2012 GIDAS: 2005-2014 VOIESUR: 2011 CEESAR: before 2005

National statistical data from DESTATIS and SETRA Severely and fatally injured children in different transport modes Severely and fatally injured children in road Severely and fatally injured children in road traffic accidents in France 2008-2012 traffic accidents in Germany 2008-2012 1,2% 1,2% 12,5% 23,7% 31.2% 35,6% Car (n=5744) Car (n=3 436) Pedestrian (n=4 894) Pedestrian (n=10625) Cyclist (n=7550) Cyclist (n=1 210) Bus (n=287) Bus-coach (n=118) 50.7% 43,9%

Percentage of severely and fatally injured children in buses is low for both countries

National statistical data from DESTATIS and SETRA



Lower percentage of accidents on motorways of both countries

Completely different repartition of accident location between the 2 observed countries

National statistical data from DESTATIS and SETRA



In general injury severities are low

Tendency to higher injury severities in France for children older than 4 years of age

German national statistical data (DESTATIS)

Accident kinds in Germany with injured children (2008-2012)

	inside city limits (n=4511)	<pre>/s outside city limits (n=706)</pre>
01	ACCIDENT OF ANOTHER KIND 47,4% (mainly driving manouevers, often without collision)	COLLISION WITH VEHICLE AT INTERSECTION 26,3% Opposite vehicle is turning or crossing the road
COL	LISION WITH VEHICLE AT INTERSECTION 23,1% Opposite vehicle is turning or crossing the road	COLLISION WITH ONCOMING VEHICLE 21,8%
03	COLLISION WITH VEHICLE MOVING LATERALLY IN THE SAME DIRECTION 9,2%	ACCIDENT OF ANOTHER KIND 17,3% (mainly driving manouevers, often without collision)

French national statistical data (SETRA) Injury severity per type of vehicle in France (all ages) Killed Severely injured Slightly injured

Uninjured

0.00%

Uninjured passengers are included in statistics

Coaches Buses

10,00% 20,00% 30,00% 40,00% 50,00% 60,00% 70,00% 80,00%

Most buses and coaches passengers are uninjured - if injured, they are mostly slightly injured



Accidents from 2005 - 2014 Accidents with large buses (M3 – more than 8 seats, exceeding 5t) Accidents with injured child occupants (aged 0-14 y)

- 27 Accidents
- 51 documented injured child occupants

Location of ac	cident	n	%	Type of vehicle	n	%
Inside city limits		24	89%		1	4%
Outside city limits		3	11%		14	52%
Motorway		0	0%		12	44%

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GIDAS: Bus accidents				Case	Delta v	CDC1
				Frontal collision with a tree	25	12
Collision / vehicle maneuvre	n	%		Coll with car	1	11
Collision	3	11%		Coll with car	1	12
Rollover	1	4%				
Braking maneuver	21	78%				
Braking and steering maneuver	1	4%				
Steering maneuver	1	4%				

Most accidents are accidents without a collision (85%) or with a very light collision (4%)

GIDAS: 51 injured child occupants were documented



Age groups	n	%
0-3 years	11	22%
4-11 years	24	47%
12-14 years	16	31%

n	%	
20	50%	
20	50%	
0	0%	
	n 20 20 0	n%2050%2050%00%

3 of 20 children were in the buggy or stroller which fell over due to driving maneuver

High incidence of injuries to non-seated children.

Half of the injured children are not seated The other half is seated but not restrained

GIDAS: Injury overview of child bus occupants



- Majority of injuries were minor head injuries, mostly contusions or cuts to the face which were caused by contact with the front seat (by braking manoeuvres) or with grab poles inside the bus

- Not seated: High incidence of injuries to the arms from falling over (contusions, abrasion wounds)

In-depth data: VOIESUR French in-depth accident database



VOIESUR: Sample frame



Accidents with injuries studied from police reports – year 2011

- 84 buses and coaches
- ➤ 391 occupants of all ages

Distribution of impact buses and coaches



(938 with weight)

Frontal Side Rear Rollover

Other

Unknown

- Majority of impacts are frontal and side impacts
- Very few rollovers

n=391 occupants

In-depth data: VOIESUR French in-depth accident database

VOIESUR: Injury severities and body regions



- Children were mostly uninjured or with minor injuries

- If injured: High incidence of minor head injuries (over 80%)
 - Some injuries to the spine and upper limbs







Presentation done to EEVC WG18 by P. Botto and J.Sinnaeve in August 2005



Aim: Estimated potential benefit of seatbelt use for child passengers transported in coaches

Method and Sample





This study is based on the in depth investigation of 20 accidents involving at least one coach within at least one passenger has been injured.





Impact type







frontal tipover rollover rear

Age distribution of injured child victims (N=325 occupants, n=12 unknown):



The 13-15 year-old age group shows the highest number of victims.

Analysis of frontal impacts (n=13)





Distribution of injured children according to injury machnism in frontal impacts



INTRUSION and COMPLETE EJECTION cause all fatalities and most of the serious injuries in frontal impact.

Analysis of frontal impacts



38 M.AIS 3+ children: -28 with1 body region at AIS3+ level,

-8 had 2 regions

-1 child sustained AIS 3+ injuries to 3 body regions.

Analysis of frontal impacts: potential benefit of 2 point belt



2 pt belt would limit/avoid projection and complete ejection which are representing 78% of total number of children injured.

Analysis of tip over and roll-overs: potential benefit of 2 point belt



CONCLUSIONS

Summary

- > Children travel safely in buses and coaches
 - Children are rarely injured in buses and coaches
 - If injured, the injury severity is rather low
- > Many children are injured in buses by non-collision accidents
- > Most common injuries are minor injuries to the head

Can the number of injured children be reduced?

- > Provide seats for all passengers High incidence of injuries to non-seated children
- > Provide devices to secure prams and strollers
- > Seat belts or rearward facing seats can further reduce injuries
 - Most impacts are frontal impacts (Children fall off their seat and/or collide with the front seat)



QUESTIONS

