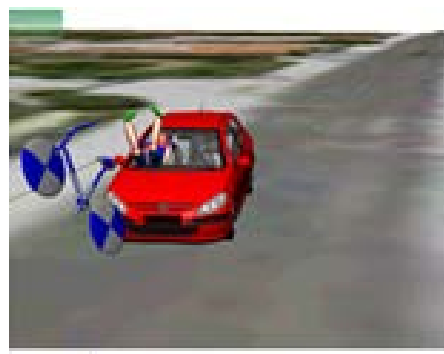


## Risk factors for bicycle-motor vehicle collisions in Portugal

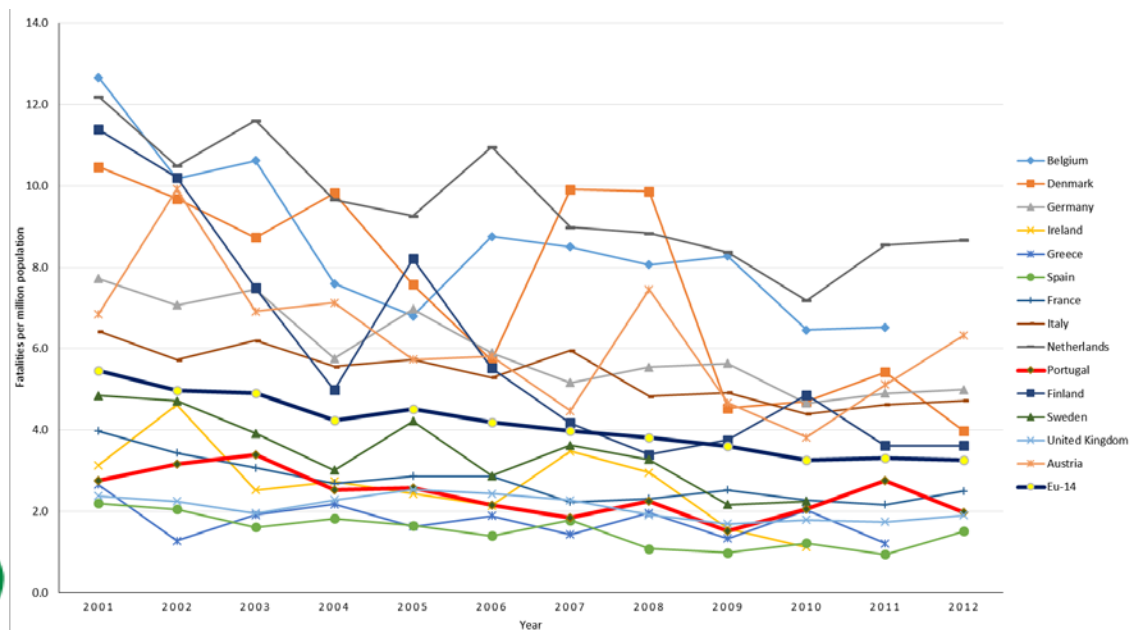
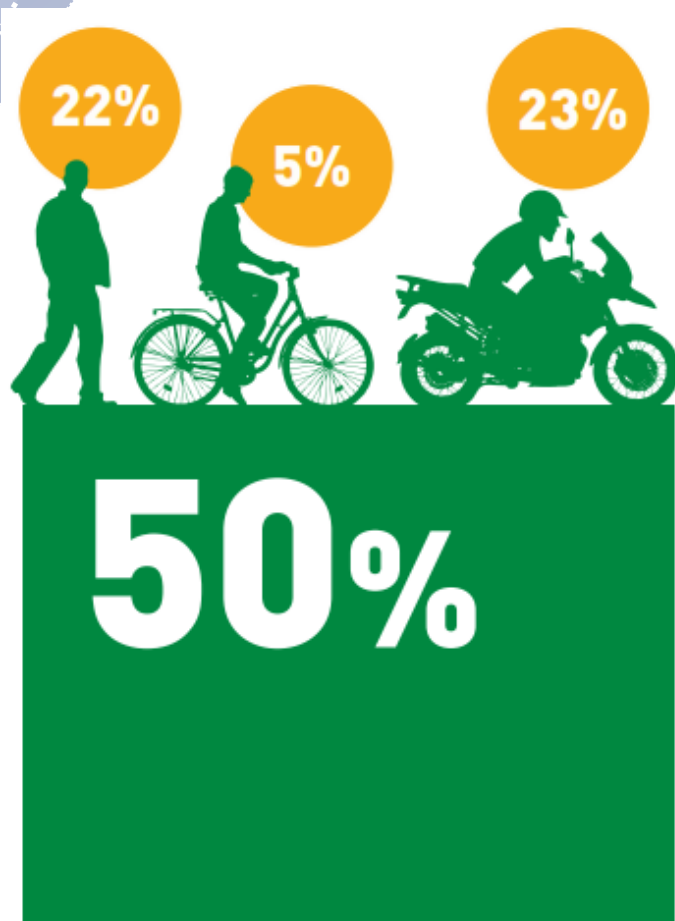


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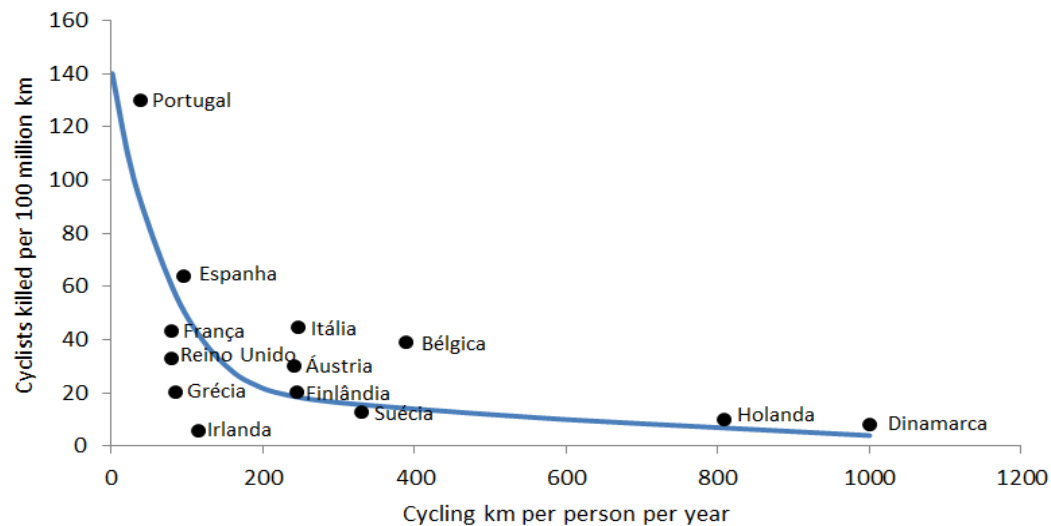
- Motivation
- Retrospective accident analysis
- Risk factors affecting bicycle riders' injuries based on Portuguese's data.
- In-depth investigation and reconstruction of bicycle accidents.
- Countermeasures to reduce bicycle accidents in Portugal
- Conclusions



Number of fatalities per million of inhabitants in Europe (2000-2012)

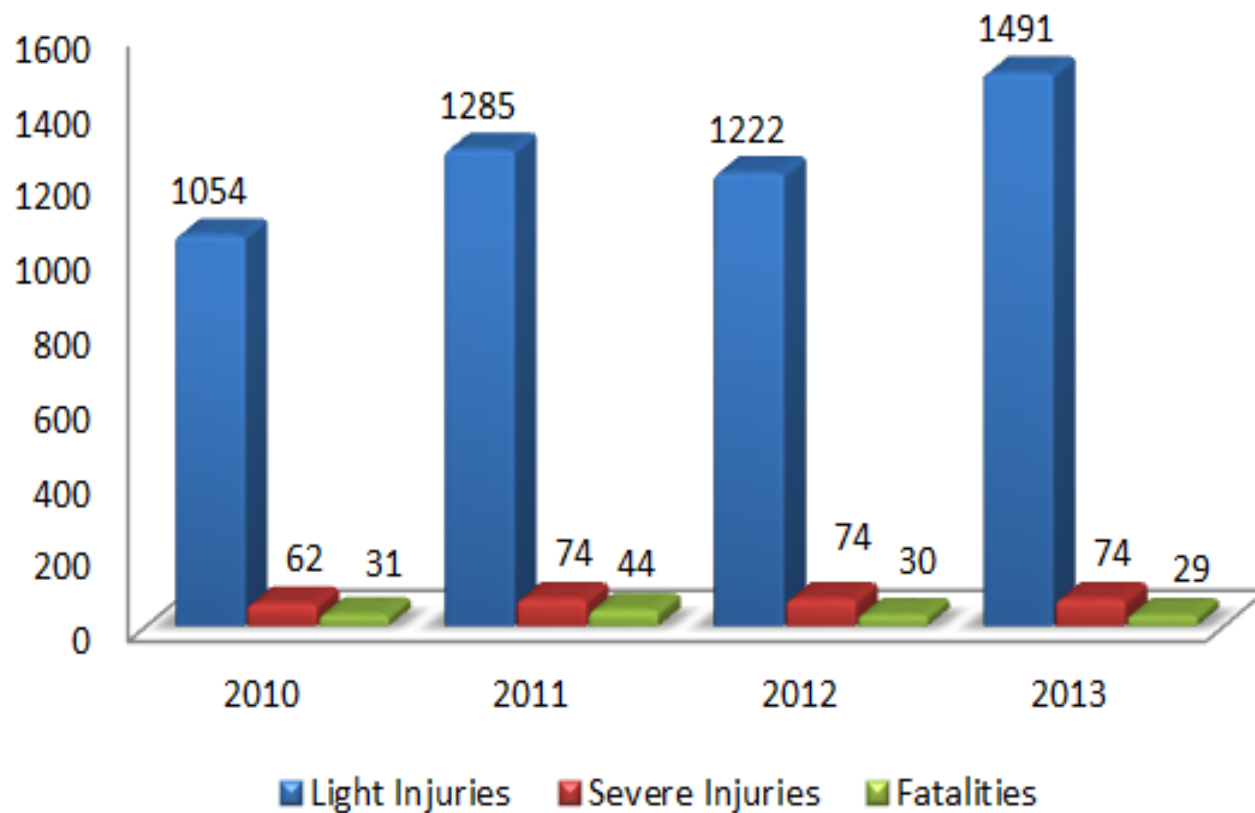
Distribution in Portugal is similar to the world distribution: 22.1 (pedestrians), 4.5 (cyclists), 22.4 (PTW) in 2012.

Source: WHO, Global Status Report on Road Safety 2013

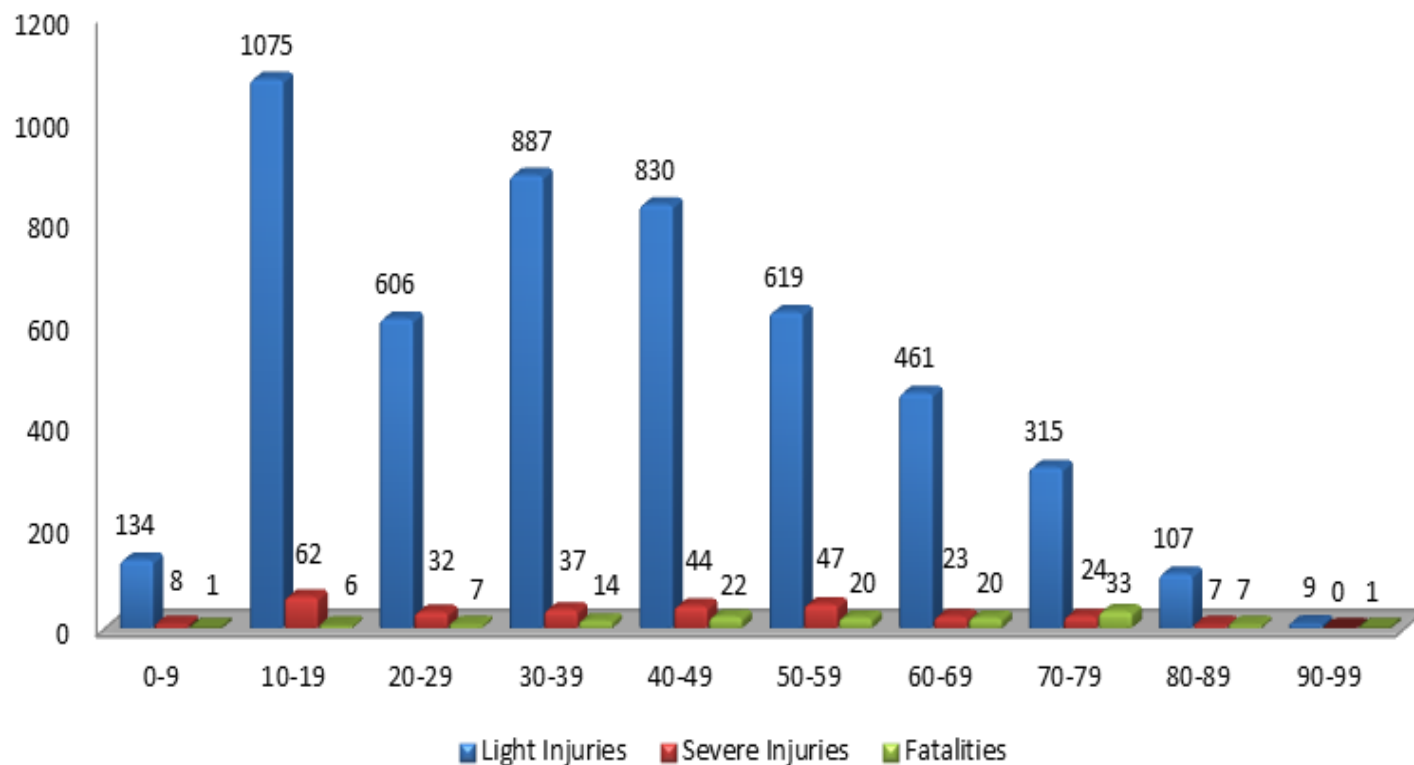


Source: CTC – Safety in numbers

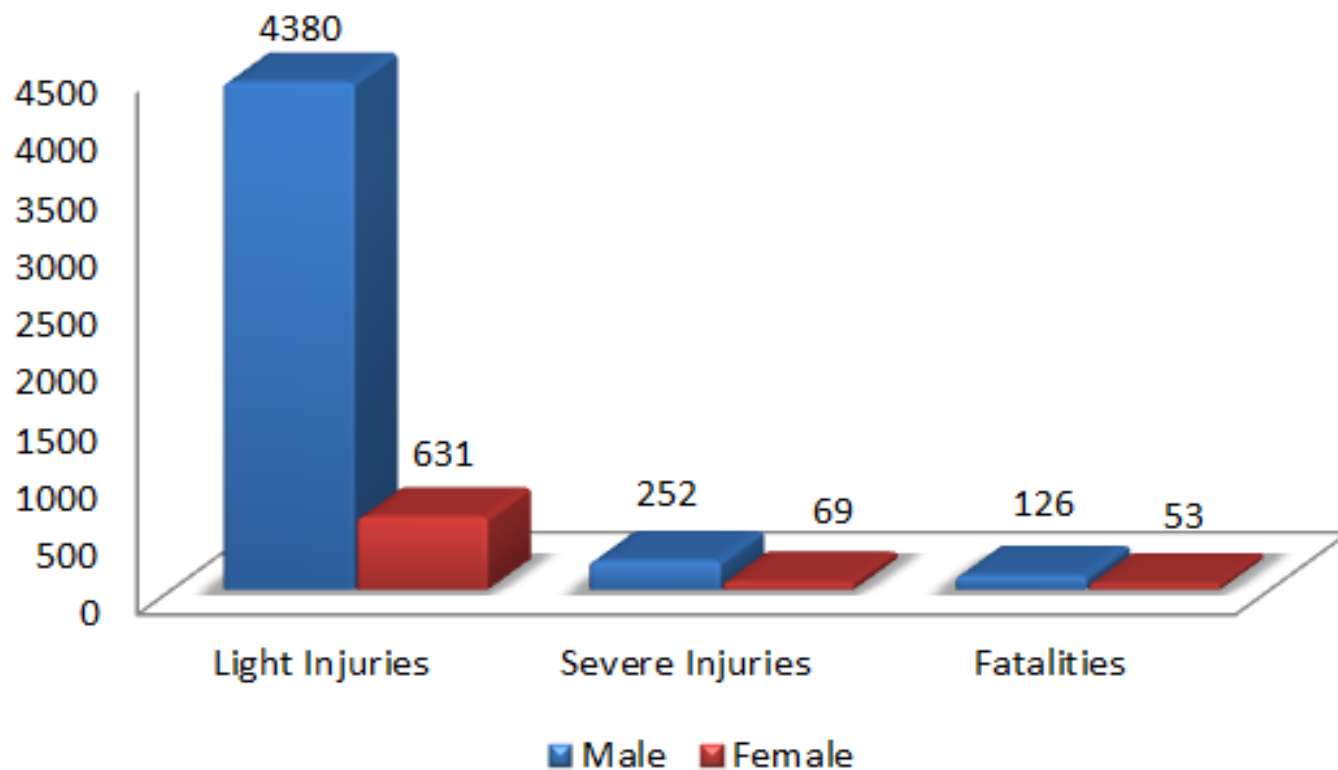
- Portugal has fantastic weather conditions for cycling.
- The number of cyclists is rising quickly.



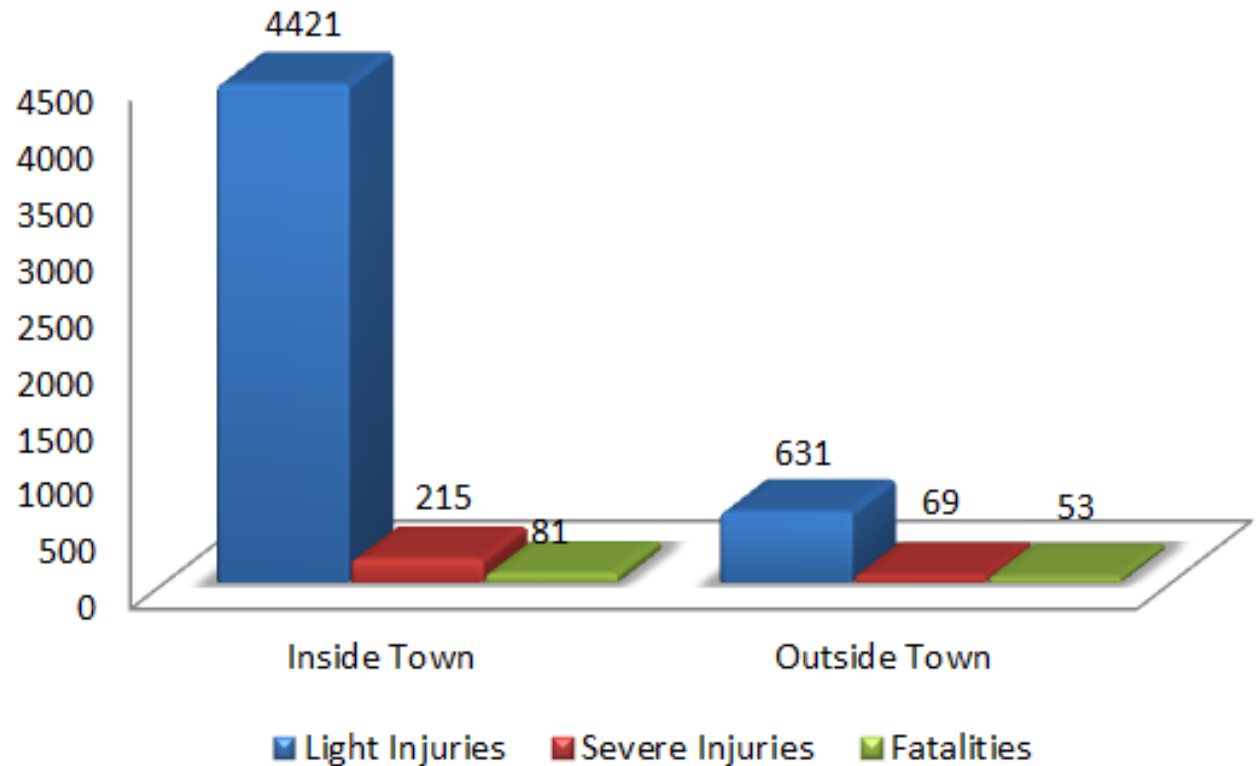
- Bicycle use is increasing, also the number of injured people.



- Youngers represent a large number of victims, but people older than 60 represents about half of the fatal victims.

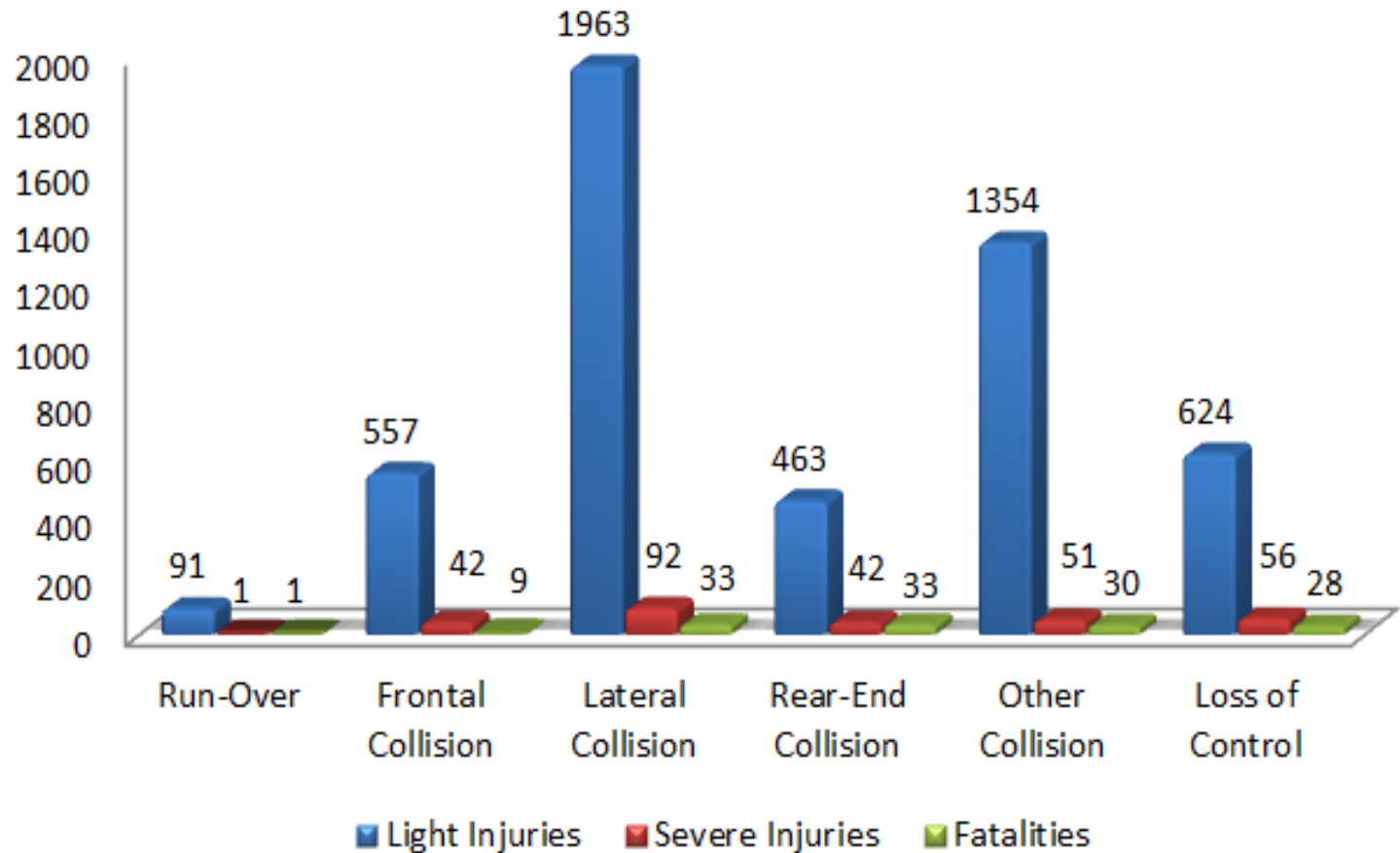


- Cycling is mainly a male task.

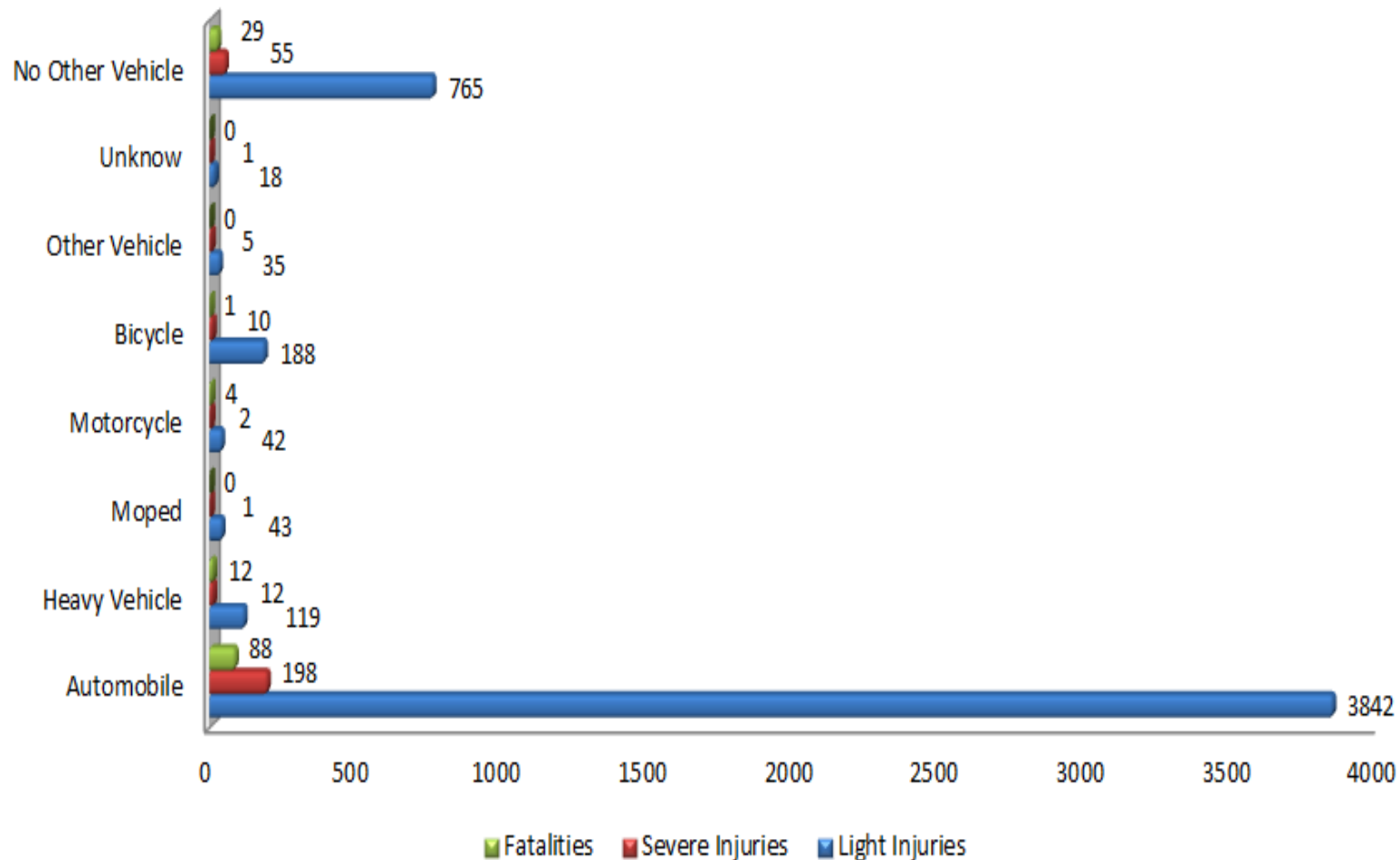


- Urban Areas: 60.5 % of the fatalities, 75% of the severe injuries, 87% slight injuries.





- Accident configuration: Side and rear collision represents more than 50% of the fatalities.



- Other vehicle involved: Cars represent 65% of the fatal injuries, 69% of the severe injuries and 76% of the slight injuries. Single accidents represents less than 20% of the injuries and fatalities.

## Goals

Find the factors affecting the severity of the injuries of bicycle riders and quantify this relationships

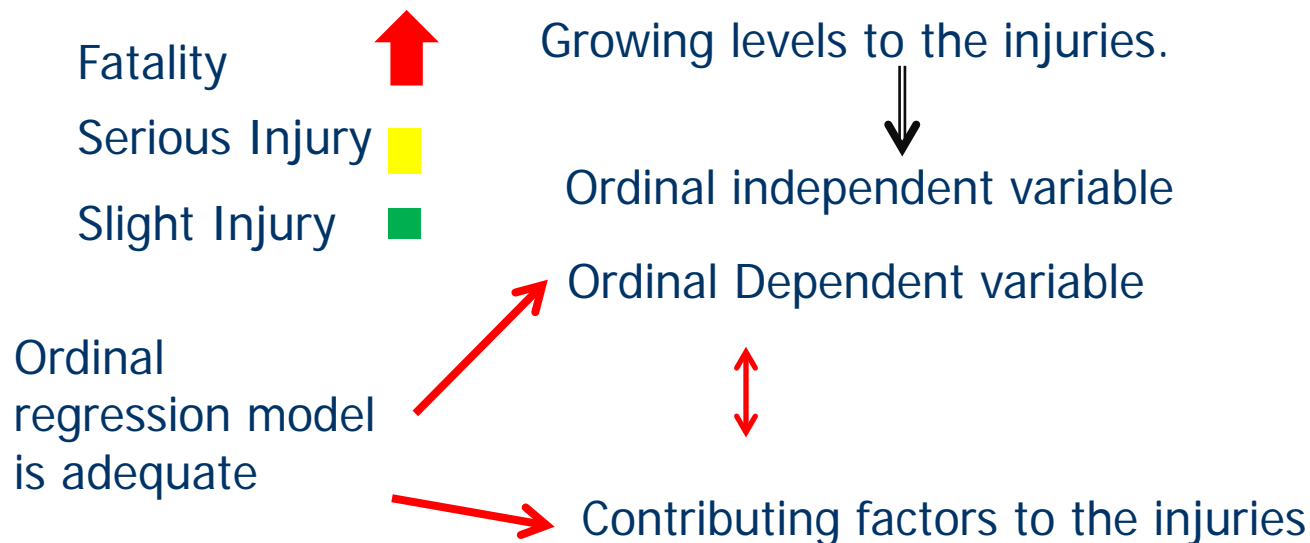


## Steps

- 1) Retrospective simple analysis
- 2) Retrospective statistical analysis
- 3) In-Depth analysis and investigation of real accidents

## Statistical Method

In the accident database the level of injuries is recorded according

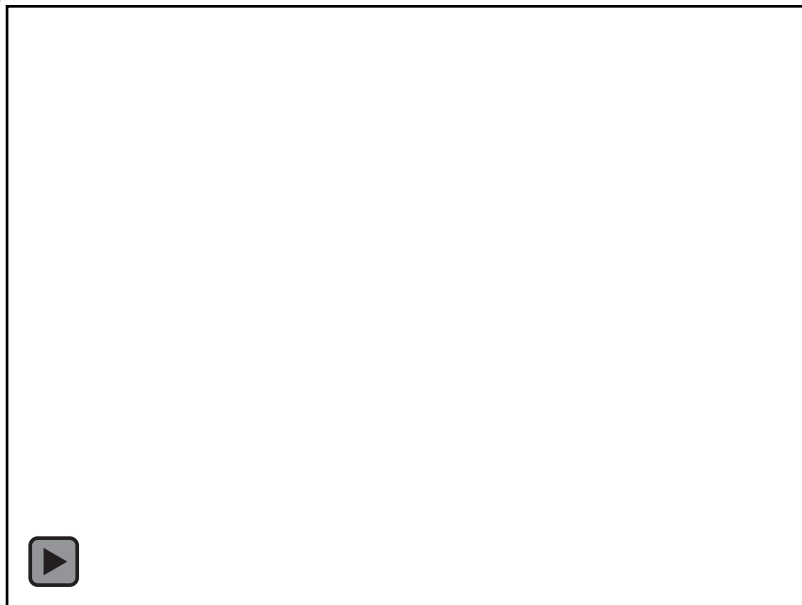


- Has been possible to identify the factors influencing the injuries and evaluate the odd ratios
- Software; SPSS version 22.
- Confidence interval of 95% and a statistical significance ( $p < 0,05$ ).

- Results for accident data 2011-2012

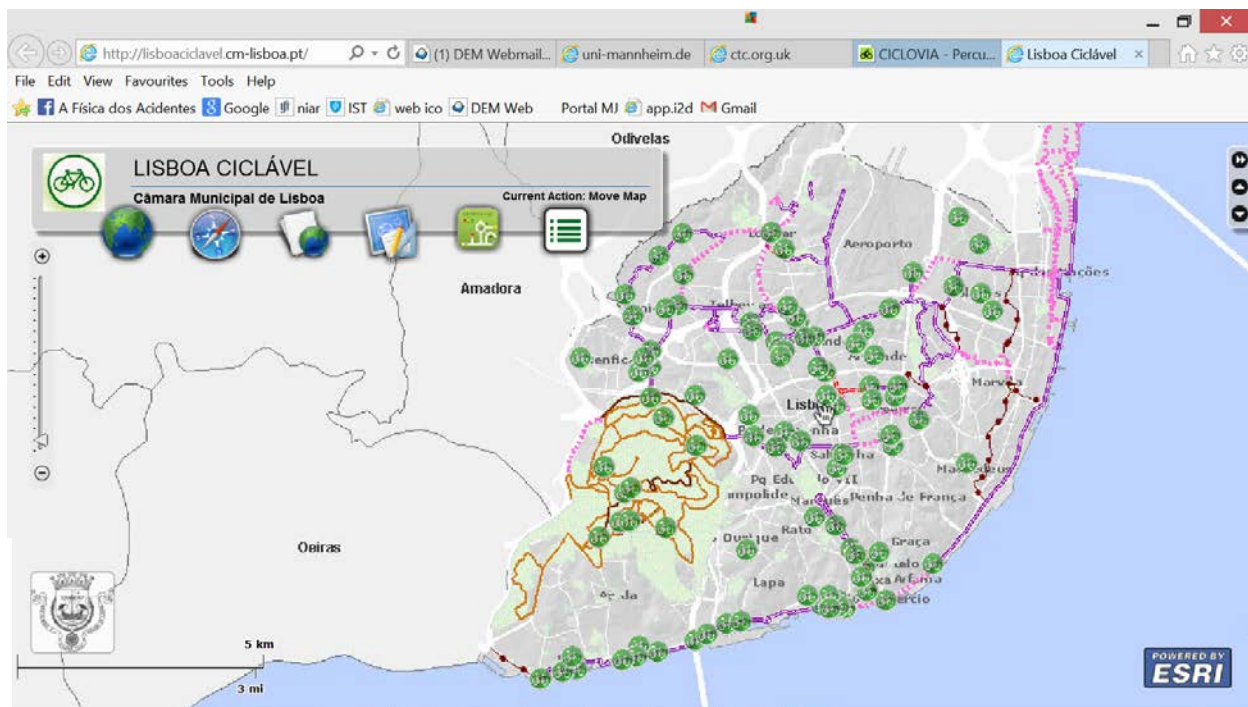
Variable	Description	OR	p-Value	95% Confidence Interval	
Type of Road	EM – Municipal Road	1.86	0.042	1.02	3.38
	IC – Complementary Itinerary	4.23	0.029	1.16	15.37
	Road (reference)	--	--	--	--
Nature	Rear end collision with another vehicle	2.24	0.001	1.41	3.58
	Lateral collision with another vehicle (ref)	--	--	--	--
Location	Outside town	1.84	0.014	1.13	2.99
	Inside town (ref)	--	--	--	--
Illumination	Night, without illumination	2.91	0.001	1.53	5.56
	Day (ref)	--	--	--	--
Road configuration	In roundabout	0.28	0.010	0.11	0.74
	Outside an intersection (ref)	--	--	--	--
Driver's age	>=70	2.61	0.001	1.48	4.62
	30-39 (ref)	--	--	--	--
Driver's actions	Crossing the street	3.00	0.000	1.66	5.41
	Going in the opposite way	2.79	0.014	1.23	6.37
	Abrupt change of direction	2.61	0.039	1.05	6.49
	Right turn	3.07	0.022	1.18	8.00
	Exiting a parking space	2.93	0.017	1.21	7.08
	Normal driving (ref)	--	--	--	--
Gear	Without bicycle helmet	2.37	0.032	1.08	5.24

- Analysis with 2010-2013 data undergoing ("mathematical issues")



- Accident reconstruction is very important to determine the dynamic conditions of the accidents including the speed.
- Biomechanics shows that, reducing the impact speed, the chance of survival increases tremendously.

- Safe roads for cycling are rare in Portugal.



- The **bicycle use as a transport mode** is increasing in Portugal. So the number of accidents involving bicycles is also increasing.
- **Single accidents** account for less than **20% of the injuries**. Cars are the main type of vehicle causing cyclists injuries. **Side collisions and rear collisions** are the main cause of fatalities, that occur largely in **urban areas**.
- Recent improvements on the **road code** gives more safety for the cyclists, as the same rights of the other drivers at crossroads, or a minimal distance of 1.5 meters when overtaking.
- **Urban areas** in Portugal must be **redesigned** in order to promote safe cycling. Bike lanes, use of bus lanes when there's no bike lanes, and general traffic calming measures, including the generalization of shared areas and 30 km/h areas.
- **Education and enforcement** are necessary to reduce the speed of cars and motorcycles.



- This work was developed in the project “Safety of Vulnerable Road Users” supported by the National Road Safety Authority, Portuguese Institute of Insurances, and Ministry of Internal Administration.



## THANK YOUR VERY MUCH FOR YOUR ATTENTION

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