

# URBAN ROAD SAFETY POLICIES : HOW TO MEASURE AND EVALUATE ?

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**Cerema** is the French major public Agency for developing and capitalising on public expertise in the fields of planning, regional cohesion, and ecological and energy transition.

**Université Gustave Eiffel** is a multidisciplinary university of national importance.

# CONTEXT

- **Why evaluate urban road safety policies?**
  - **Reminder : global figures in 2021**
  - In 2021, in metropolitan France, there were 2,944 dead and 239,986 injured on the roads
- **Accidents in urban areas are a major issue**
  - In urban areas (2021): 2/3 of the injured and 1/3 of the people killed (140,000 injured and 963 killed).
  - 2/3 of those killed are vulnerable road users (pedestrians, cyclists, motorcyclists).
- **Lack of global evaluation of urban security policies**

⇒ **Need for evaluation of these policies**

# OVERALL GOAL

- **Study the effects of urban road safety policies in 70 French cities over an extended period (1987-2017)**
  - Highlight the links between urban mobility policies and road safety through the study of urban mobility plans
  - Study of the Evolution of accidentality in these urban areas

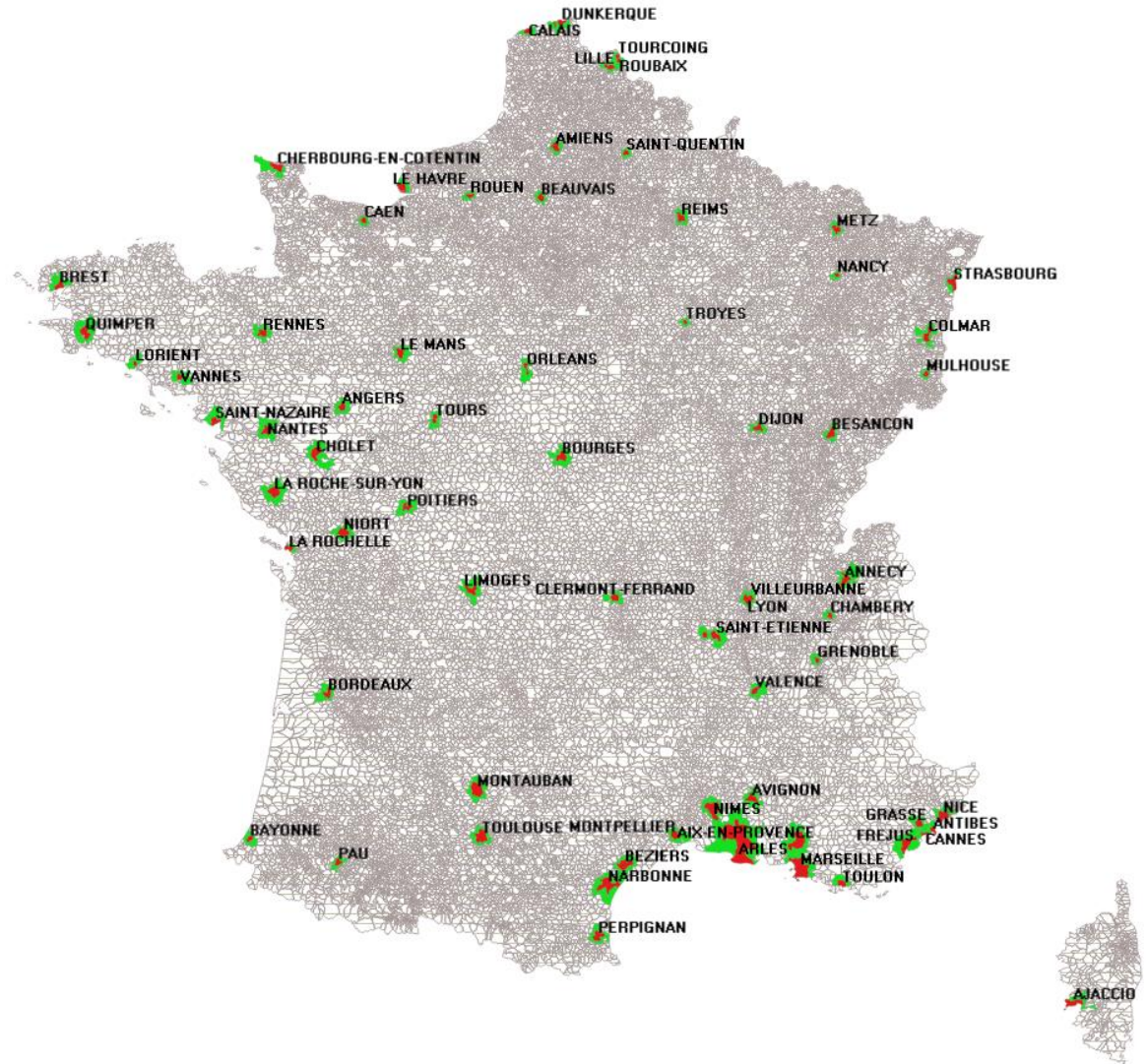


⇒ **Which policies are more effective than others in reducing accidents?**

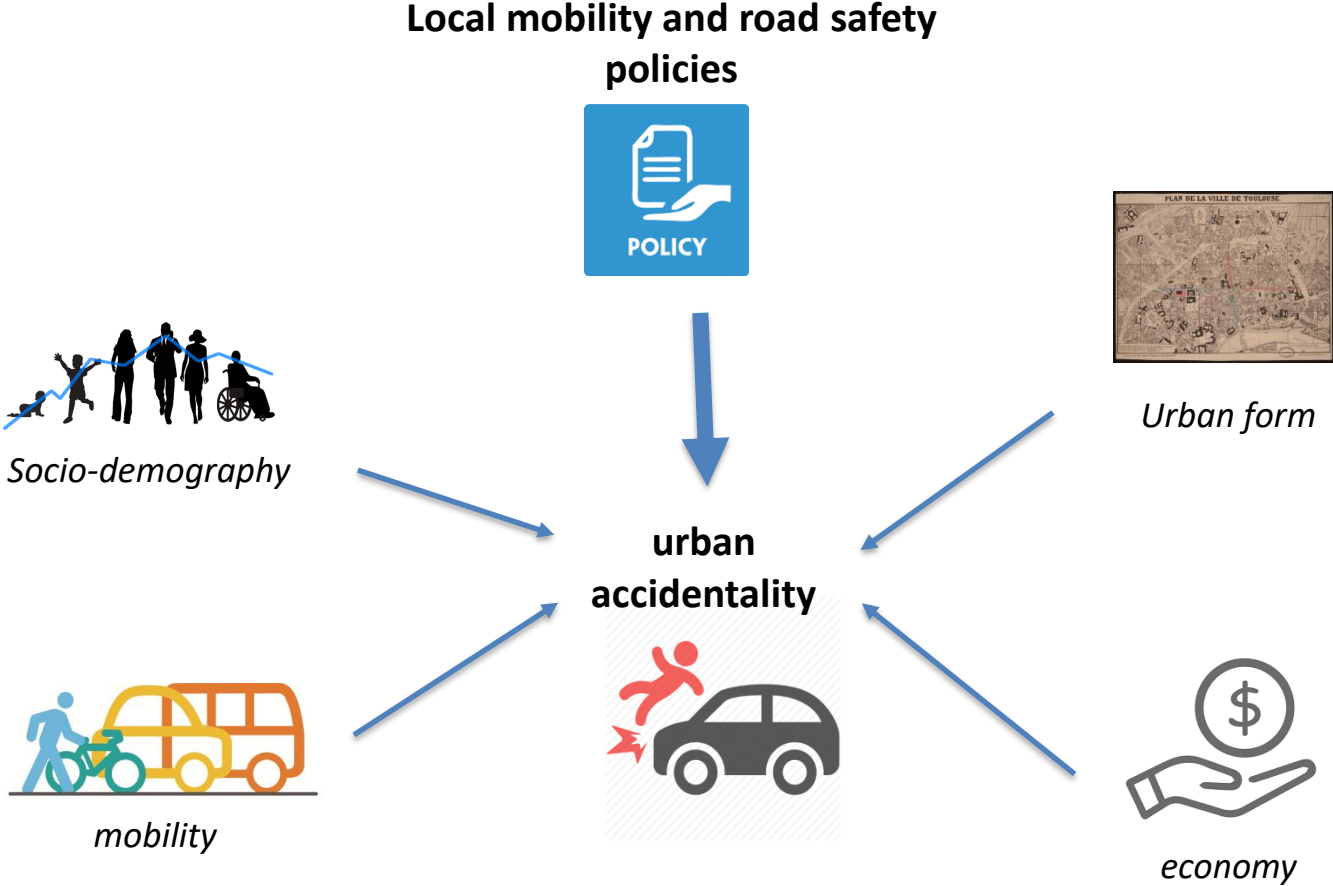
# SCOPE OF THE STUDY

## Study Sample

70 central cities (the city of Paris is excluded)



# What are the determinants of the evolution of road accidents in urban areas?



# DATA USED

- Data providing information on road accidents: national road traffic injury accident files for France (1987 – 2017);
- Urban form, socio-demographic, economic and mobility data: population censuses (INSEE) available for this period.
- urban mobility plan in each city of our sample: coding of road safety measures based on reading these plans (110 mobility plans)

## INDICATORS USED FOR ACCIDENTALITY

- number of deaths and accidents per inhabitant

## SELECTION OF VARIABLES FOR EACH THEME

- We had a large number of variables for each theme considered. For the quantitative variables, we removed the correlated variables by successively using a principal component analysis and an ascending hierarchical classification
- For the variables identified in the mobility plans, we removed those that were not very discriminating (highly widespread). We kept the variables that differentiated local road safety policies

# DETAILS OF THE VARIABLES CONSIDERED : QUANTITATIVE VARIABLES

Variable	Unity
population youth index	Number of young people per 100 seniors
employment coverage rate	Number of jobs per 100 active workers
unemployment rate	percentage
transport payment (tax on the payroll of companies in constant euros) reported to the population (1%)	Euros constants par habitant
Urban intensity	Number of jobs + inhabitants per hectare
Age of the existence of an accident observatory	years

**NB : Mobility-related variables (motorization rate and modal share) were excluded after eliminating correlations between variables. Other variables such as the rate of seniors or population density have also been eliminated.**

# VARIABLES CONSIDERED : QUALITATIVES VARIABLES (MOBILITY PLANS)

**We have coded a set of binary (yes/no) variables to qualify the urban road safety policy :**

➤ **Existence of an accident observatory, Level of programming mobility plan actions;**

**Measures in the mobility plan to :**

➤ **Sustain / strengthen the existing accident observatory ;**

➤ **Better know roads safety issues in the city ;**

➤ **Strengthen or improve control by the police ;**

➤ **Secure dangerous area and black spots;**

**Measures for :**

➤ **Pedestrians safety;**

➤ **PTW safety;**

➤ **Youth safety.**

➤ **Total of 9 qualitative variables**



# CONCEPTUAL FRAMEWORK



## Local mobility and road safety policies

- *Measures in mobility plans: reinforcement of the accident observatory, better knowledge of road safety issues, reinforcement/improvement of police control, securing black spots, safety of pedestrians, young people and PTW*
- *Level of programming measures of mobility plan*
- *Existence of an accident observatory*
- *Age of the accident observatory*



### Socio-demography

- *Population youth index*



### Urban morphology

- *Urban intensity*



## Evolution of urban road safety indicators



### Socio-economy

- *Unemployment rate*
- *Employment coverage rate*
- *Transport payment (tax on the payroll of companies in constant euros) = city's ability to invest in public transport*

# CHOICE OF THE ECONOMETRIC MODEL TO APPLY

- We tested the Poisson regression, a generalized linear model (GLM), adapted for estimating two “counting” type variables, namely the number of accidents and the number of people killed in cities.
- This type of regression is tested with the two sets of data (64 cities to estimate the number of accidents and 70 cities to estimate the number of people killed).
- The problem of overdispersion was solved by using quasi-likelihood estimation.
- This model is applied from 1987 to 2017

# RESULTS

Variable	Type	Model 1 (number of accidents)		Modèle 2 (number of deaths)	
		effect	IC 95 %	effect	IC 95 %
Year	time variable	-6%	[-6;-5]	-5%	[-6;-5]
Police control	qualitative variables related to mobility plans	-12%	[-20;-4]	-18%	[-26;-8]
Measures for securing dangerous areas and black spots		21%	[10;33]	25%	[12;40]
Measures for pedestrian safety		-20%	[-26;-14]	-14%	[-23;-4]
Measures for the safety of motorized 2-wheelers		NS	NS	24%	[11;39]
Measures for a better knowledge of road safety issues in the territory		-23%	[-30;-17]	-11%	[-21;0]
Measures to sustain/strengthen the existing accident observatory		NS	NS	-23%	[-34;-10]
Measures for the youth safety		28%	[18;40]	NS	NS
unemployment coverage rate		Quantitative variables	NS	NS	NS
urban intensity	NS		NS	-0,39%	[-0,48;-0,31]
population youth index	-0,45%		[-0,53;-0,37]	-0,33%	[-0,38;-0,27]
Age of the existence of an accident observatory	0,76%		[0,25;1,27]	1,37%	[0,68;2,04]
employment coverage rate	-0,24%		[-0,34;-0,13]	NS	NS
transport payment (tax on the payroll of companies in constant euros) reported to the population (1%)	0,15%		[0,08;0,23]	NS	NS

# DISCUSSION

**Significant effects of the SR measures identified in the mobility plans (number of accidents et number of deaths) :**

- **Strong measures for pedestrian safety (resp. -20% and -14 %)**
- **Strong measures for a better knowledge of road safety issues in the city (resp. -23 % and -11 %)**
- **Measures to strengthen or improve control exercised by the police (resp. -12% and -18 %)**
- **Measures to sustain or strengthen the existing accident observatory (resp. NS and -23 %)**

# DISCUSSION

## Significant effects of other variables (smaller effects)

- Employment coverage rate (number of jobs in the center city per 100 active residents of the VC) (reduces accidents) → difficult to explain: Perhaps this variable favors local, softer mobility.
- urban intensity (reduces mortality)

## Action on speed moderation / congestion / lanes reserved for public transports

- Youth index (reduces accidents and mortality)

Young people are more resistant to shock, which is not the case for seniors (increased severity rate). In addition, many minor accidents involving young people are not recorded by the police.

# DISCUSSION

## Unexpected effects (increased accident rate):

- Strong measures on the treatment of “black spot” (place of accumulation of accidents)

Cities often perform localized interventions to treat the “black spot” but this generates route avoidance strategies due to the drop in speed after intervention on the “black spot”. An overall intervention is needed to avoid the occurrence of an accident on the crossroads and roads around the place of accumulation of accidents.

- Strong measures for PTW safety

These measures reflect first of all an awareness of the problem due to the significant use of PTW on the territory. These measures are often not directly focused on PTW and cannot significantly reduce the number of accidents generated by heavy use of PTW. New ideas are necessary to explore in order to improve PTW safety.

# DISCUSSION

- **Measures for communication campaign aimed at young people about road safety and securing access around schools**

**The importance of the young population within a city can play a role (population naturally oriented towards risk-taking). The localized road treatment to improve road safety near schools can produce the same deleterious effect as the treatment of black spots on adjacent roads. Accidents mainly take place on the way to school, close to home rather than around schools.**

**THANK YOU FOR YOUR ATTENTION**

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# DISCUSSION

Improve the collection of accident data through better training of the agents concerned

The importance of partnerships between local road safety actors

Developing an road safety policy at the local level: a legitimate approach that produces results

A culture of road safety assessment to be developed as part of mobility plans

The usefulness of having dedicated road safety services participating in a transversal vision in city organizing authority

New ideas to explore to improve PTW safety

An overall vision to adopt for the treatment of certain road safety issues

# DETAILS OF THE VARIABLES CONSIDERED : QUALITATIVES VARIABLES (MOBILITY PLANS)

Variable	modality
<b>Existence of an accident observatory</b>	<b>No:</b> no observatory <b>Yes:</b> observatory
<b>Level of programming of mobility plan actions (funding and monitoring indicators)</b>	overall assessment in the form of a score between 0 and 2 (0; 0,5; 1;1,5;2) <b>No :</b> no plan or score less than 2 (low funding or imprecise indicators) <b>Yes :</b> score equal to 2
<b>Measures in the plan to sustain/strengthen the existing accident observatory</b>	<b>No :</b> no measures <b>Yes :</b> Measures to sustain the observatory / develop the missions of the observatory (mapping, road safety club, broader analyzes than soft mode accidents) / Creation of new partnerships to feed the observatory (insurers, firefighters, police) / Change of scale of the observatory, transition to an agglomeration scale with more SR indicators
<b>Measures in the mobility plan for a better knowledge of road safety issues in the territory</b>	<b>No :</b> no measures or simple monitoring of a few road safety indicators without additional analyzes or studies <b>Yes :</b> Regular production of road safety studies and reports. Analysis of specific issues (pedestrians, motorized two-wheelers, etc.)
<b>Measures in the mobility plan to strengthen or improve control by law enforcement</b>	<b>No :</b> no measures <b>Yes :</b> parking and / or speed control measures

# DETAILS OF THE VARIABLES CONSIDERED : QUALITATIVES VARIABLES

Variable	modality
<b>Measures in the mobility plan for securing dangerous areas and black spots</b>	<b>No</b> : no measures <b>Yes</b> : measure to identify and treat areas and axes identified as dangerous
<b>Measures in the mobility plan for pedestrian safety</b>	<b>No</b> : no measures <b>Yes</b> : measures in favor of pedestrian safety with the production of technical guides for pedestrian facilities
<b>Measures in the mobility plan for the safety of motorized 2-wheelers</b>	<b>No</b> : no measures <b>yes</b> : measures for the safety of motorized two-wheelers relating to the reduction of speed, prevention among young people. Production of technical guides on developments related to the safety of motorized two-wheelers
<b>Measures in the mobility plan for the youth safety</b>	<b>No</b> : no measures <b>yes</b> : awareness-raising measures for young people AND securing of road facilities around schools

NB : Several variables such as the promotion of active modes, the control and calming of speeds, the safety of cyclists were excluded because they were too widespread in the mobility plans