COMMISSARIAT GÉNÉRAL AU DÉVELOPPEMENT DURABLE

le point sur

n° 103
Mai
2013

RECHERCHE ET INNOVATION
TRANSPORT

Socio-geographical disparities in urban road risk

The work of the "Banlieues 89"[(1)] mission ("suburbs 89") demonstrated the extent to which suburban social housing districts were overloaded with major transport infrastructure, including motorways. One consequence could be that these districts are overexposed to road risk, i.e. the risk of being involved in an accident.

Other, more behavioural factors (age, use of motorcycles, etc.) also play a part. A study conducted in five Sensitive Urban Areas (ZUS) in metropolitan Lille and, for comparison, five further districts selected from among more advantaged areas, estimates the additional risk incurred by the inhabitants of the sensitive areas compared with the inhabitants of the other areas at 36%. Analyses revealed the differences depending on population characteristics, age, gender, socio-economic category, mode of travel, distance between home and the accident site, typical scenarios etc.

These analyses shed new light on important issues in urban policy and transport policy.

Accident research shows that driving errors often result from a system combining infrastructure, the vehicle and the driver. Lack of road safety must thus be approached as a symptom of failures intransport systems. Correspondingly, road safety policy must cover all the factors of accident prevention, including the layout of urban space.

Road safety was one of the three priorities of the research and innovation programme for land transport[(2)] for the period 2002-2007. This programme, known as Predit 3, included research on the theme of "Planning and safety" as part of a programme relating to new knowledge about road safety, including the "Spatial disparities in road risk" research project (2008-2011) presented in this document.

Political decisions on actions to promote safety need to be based on an analysis of the exposed populations that is differentiated in terms of their risk. In particular, this means including the socio-economic and spatial aspects of risk. In terms of road safety, the disparities associated with urban morphology and the socio-economic make-up of the population play a key role.

On one hand, urban spaces differ in their design (age and shape of buildings, road widths, presence of playgrounds, parking spaces etc.) and are crossed by networks that link them together, all these factors influencing exposure to road risk.

On the other hand, each urban space is distinguished by its socio-economic make-up, with populations that have different characteristics, lifestyles and degrees of mobility, which in turn condition their access to resources (employment, housing and shops).

Exposure to risk: the residential district, a decisive variable?

Research has shown that travel habits vary according to socio-economic profile but also to residential area. These differentiated habits thus give rise to new forms of inequality: the poorest social groups have more limited access to mobility and the least mobile categories are over-represented in economically disadvantaged districts.

The inhabitants of these districts thus accumulate factors of inequality: income level, access to employment etc. They are also more affected by disturbances and pollution. Do these inhabitants have the same exposure to road risks as the populations of more advantaged areas? In other words, is the number of inhabitants involved in traffic accidents during a given period as a proportion of the total population of the area higher in disadvantaged neighbourhoods?

To answer these questions, we must place the phenomenon of an "accident" in its global context and direct preventive action at the root causes of risk to achieve better organisational safety. The "Spatial Disparities in Road Risk" project[(3)] aimed to contribute to this thought process.

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Several research projects, mainly Swedish and British, have shown that accident rates per head of population are higher in the most disadvantaged districts, with accidents affecting mainly pedestrians and children and the severity of the accidents involving pedestrians being higher in these areas. Explanations for this include the high level of pedestrian mobility among residents inside the neighbourhood, the high proportion of children and young people in the population and the spatial design (lack of playgrounds, high-traffic routes).
Socio-economic factors also have an influence on the accidentology: low incomes, unemployment, single-parent families and family composition.
Other studies in the UK have shown that the populations of disadvantaged neighbourhoods were more likely to be victims of road accidents. A special fund, the Neighbourhood Renewal Safety Initiative, was set up in 2002 to try to improve road safety in areas eligible for Neighbourhood Renewal, the British equivalent of France's "Politique de la ville" (urban renewal policy).
The measures taken to support a change in behaviour were combined with urban planning actions: the spatial analysis of accidents carried out in Rochdale, north of Manchester, revealed a high concentration of accidents involving child pedestrians near green spaces.

Measuring the risk and linking it to the local context

The project's ambition was to analyse risk and preventive action through a global approach. The research into territorial inequalities and safety was designed to extend the study beyond the physical characteristics of the spaces to explore several factors influencing mobility and thus safety.

Firstly, the morphological characteristics, socio-economic make-up and urban location of the area being considered lead to specific types of mobility and thus of risk. Secondly, the ways in which the surrounding space is appropriated and used by its inhabitants play a role in the risk observed. Finally, local governance affects planning strategies and thus accident prevention.

The project thus set itself three objectives:

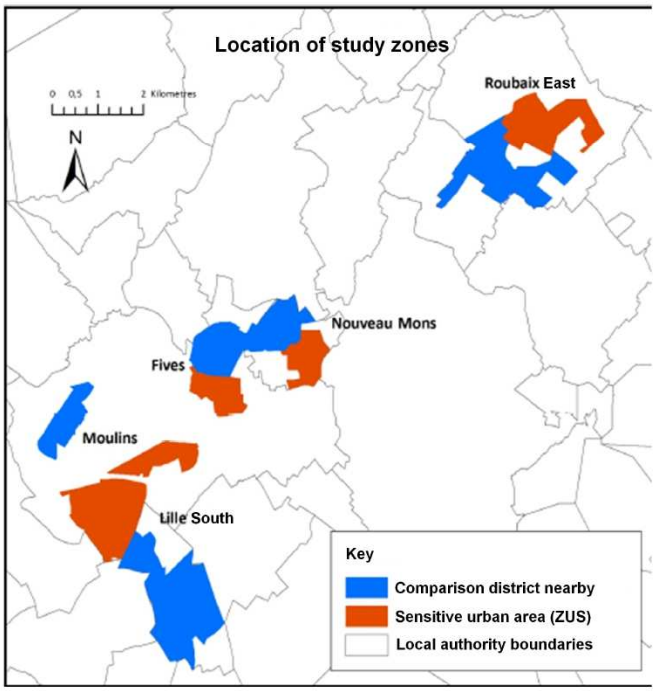
- **Measuring the road risk faced by the inhabitants of disadvantaged neighbourhoods** compared with the risk in more advantaged areas nearby in order to analyse not only the location in urban space but also the socio-spatial aspect of the risk;
- **Placing the risks in context**, by relating the different levels of risk to socio-economic characteristics, mobility and the urban environment when an accident takes place, not forgetting social and spatial data;
- **Conducting a spatialised analysis to guide public planning decisions** and specify ways of combating road risks by acting on the infrastructure.

Carried out based on this definition, the project is the first phase of a more global project, **ATSERR** (Territorial and Socio-Economic Approach to Road Risk), which, unlike traditional studies focusing on unsafe spaces, prefers to analyse the impact of the district of residence on accident risk. The second phase of the study, examining the correlations between risk and the local economy, employment and mobility, is in progress.

Comparing five ZUS and five more advantaged districts

The choice of the area to study, the Urban Community of Metropolitan Lille (LMCU), was especially fortunate in that the local authority took great interest in the project and provided access to multiple sources of information. The research was conducted thanks to collaboration between the Accident Mechanisms department of the National Institute of Transport and Safety Research (INRETS), the GEOSYSCOM laboratory at the University of Caen and the Mediterranean and Nord-Picardie Technical Infrastructure Study Centres (CETE).

Sensitive Urban Areas (ZUS) are administrative entities characterised by deteriorating housing and a strong imbalance between habitation and employment in the terms of the 14 November 1996 urban regeneration pact. The locations of the five study areas in five ZUS, compared with five more advantaged areas nearby, are illustrated below.

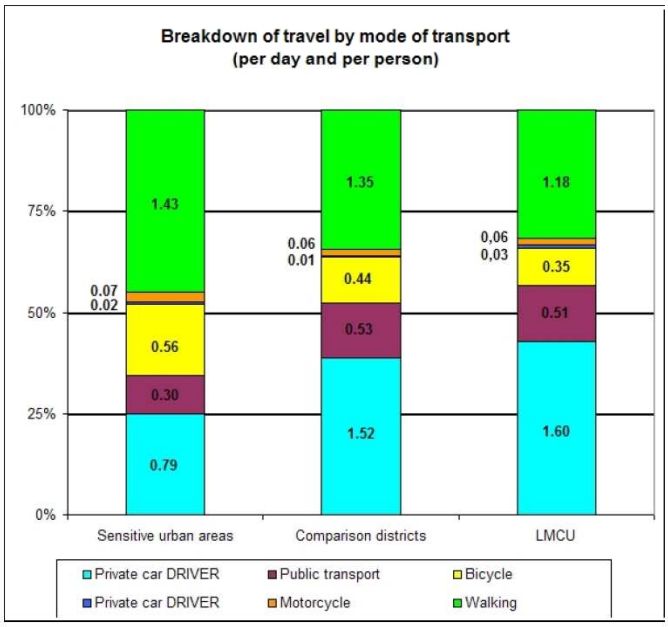


Analysing the links between socio-spatial inequalities and risk is complex, because it requires several different types of data to be brought together: accidents[4], the socio-economic characteristics of the population, the urban environment when the accident took place, mobility.

The use of a Geographical Information System (GIS) made it possible to link together a large amount of spatialised data from a variety of sources: the 1999 census published by the National Institute of Statistics and Economic Studies (INSEE), the 2006 household travel survey, a database listing the roads of metropolitan Lille, the local planning scheme etc.

For identical characteristics (educational level, age, rate of car ownership), compared with the populations of the more advantaged areas, the ZUS inhabitants:

- travel less,
- travel more for voluntary, cultural and sporting reasons,
- use cars less frequently,
- walk more.



Significant scientific barriers were overcome to bring social and urban data together and identify the characteristics of the people involved in accidents. The methodology defined several phases for the work:

- bibliographic research into territorial inequality and mobility;
- selecting disadvantaged neighbourhoods and then more advantaged areas nearby;
- spatial analysis to describe the characteristics of the space;
- bringing the data together at several different levels of analysis;
- analysing reports on accidents involving inhabitants of the districts;
- conducting interviews with local stakeholders.

The excess risk per head of population of being involved in an accident for a ZUS resident compared with a resident of a more advantaged district **is 36% overall** and varies according to gender and age. For men living in a ZUS, the excess risk of being involved in an accident is 44%, while it is only 17% for women.

ZUS residents aged 20 to 39 have an excess risk of 46%, while the figure is only 28% for over-40s. The risk of being involved in an accident for a child living in a ZUS is 10% higher than the same risk for a child living in one of the comparison neighbourhoods. This risk difference is relatively low, but as children are more numerous in disadvantaged areas, with a quarter of the population under 15, the result is still a high number of accidents involving children. This is thus a considerable road safety challenge.

People over 60 who live in a ZUS are also particularly vulnerable, with their risk of being involved in an accident being 47% higher than that of people of the same age living in more advantaged neighbourhoods.

Excess accident risk: behavioural factors

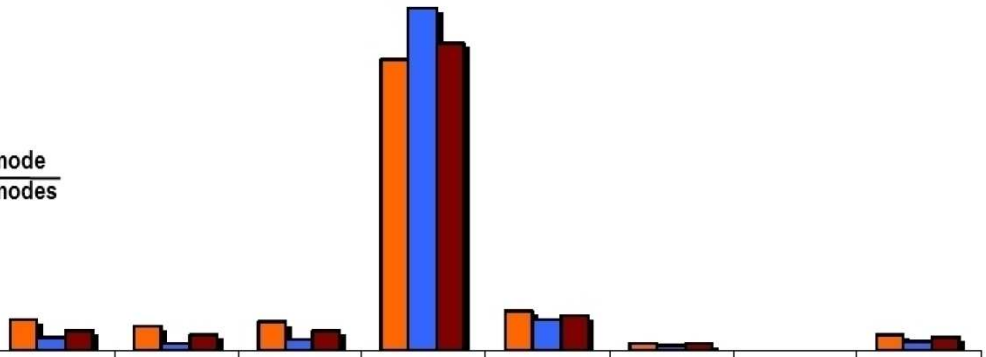
The influence of age and gender has a behavioural dimension: young men are involved in accidents more often due to their tendency to take more risks. In addition, as the proportion of road users committing offences, mainly driving without insurance and leaving the scene of an accident, is high in the ZUS population, we cannot exclude the hypothesis of a link between accidents and offending behaviour.

Other factors of disparity also influence accidentology. For example, road risk is linked with mobility. Across all modes of transport, ZUS residents are more likely to be involved in an accident. Examining individual modes of transport sheds an interesting light on this.

Across all the districts studied, the risk of having an accident while cycling is more than twice as high as the overall risk of having an accident, and this risk is even higher for ZUS residents. Even though they travel more by car, residents of more advantaged districts have relatively fewer accidents with this mode of transport.

However, the risk of having a motorcycle accident, which is 20 times higher than the overall risk of having an accident, is lower for ZUS residents. The characteristics of car travel in the ZUS – older vehicles, thus less safe, and with a higher occupancy rate, higher young population associated with speed – reinforces the inequality still further. Although walking is generally a low accident risk, this mode of travel, dominant in the ZUS, still presents a significant number of accidents and constitutes a road safety challenge. Pedestrians and passengers are more frequently involved in accidents in the ZUS than in the comparison zones.

Accidents by mode / Trips by mode
Accidents, all modes / Trips, all modes



	Driver	Passenger	TOTAL private cars	Motorcycle	Bicycle	Walking	Public transport	TOTAL
Sensitive urban areas	2.28	1.90	2.18	22.26	3.06	0.54	0.01	1.24
Comparison districts	0.98	0.52	0.86	26.33	2.29	0.29	0.04	0.72
All districts studied	1.55	1.15	1.44	23.67	2.74	0.44	0.02	1.00

Risk of being involved in an accident by district of residence and mode of travel

An analysis by social category supports the hypothesis of widespread excess risk in the ZUS. The proportion of manual workers in the population involved in an accident is significantly higher than their proportion of the total population (46.5% compared with 35.5%). For executives and intellectual professions in the ZUS, conversely, these figures are 5.5% compared with 8.3%. In the so-called control zones (ZC), the corresponding figures are 22.1% for the 14.8% of manual workers in the total population and, contrasting again, 17.7% for the 24.4% of executives and similar categories. Manual workers represent 25.7% of the total ZUS + ZC population and 37.3% of people involved in an accident, while these figures are 15.9% and 10.1% respectively for executives. We note therefore that while the risk is always higher for manual workers than for executives, whatever the district, it is always higher in the ZUS for both social categories.

People involved in an accident who live in a sensitive urban area	a more advantaged district
▪ are pedestrians or passengers	▪ are drivers ▪ use motorcycles
▪ own vehicles that are less safe	▪ own vehicles that are recent
▪ are involved at night	▪ are involved in the morning
▪ have slight injuries	▪ have injuries associated with rear impacts
▪ are young and male	▪ are over 40
▪ are unemployed or manual workers	▪ are working, executives or ▪ retired
▪ commit offences	

These trends are explained by the characteristics of the populations of sensitive urban areas: more young and unemployed people and more pedestrians

In general, the results indicate a higher level of involvement of ZUS residents in accidents, regardless of gender, age and social category. In terms of road safety, going beyond risk, it is essential to consider the issues: the high number of accidents involving children in the ZUS is a major challenge for accident prevention, militating in favour of targeted actions to improve the way space is handled in the ZUS.

More globally, the results of the research project shed particular light on the actions taken in priority districts as part of major urban projects. Bringing together economic problems, educational level and employment with the lack of social diversity and the isolation of individual areas leads to actions to open up the districts concerned, and particularly to facilitate the penetration of traffic inside underprivileged areas. This results in an increase in the number of vehicles and an even higher risk for the residents, with a large number of accidents associated with the local activities of pedestrians, and especially young pedestrians, in these neighbourhoods. It is therefore important to re-examine policies intended to support the districts by incorporating the "risk disparity" dimension into a more global vision. The research conducted, complemented by a study of the situation in the UK, where accident reduction in poor neighbourhoods is stimulated by a dedicated fund, makes clear the excess risk incurred by ZUS residents regardless of the socio-economic criteria selected.

Sociology, mobility and improved access: excess risk for disadvantaged districts

In the ZUS, the population aged under 14 constitutes a serious issue given its high proportion of the global population. People aged 20-39 and men also run a very significant relative risk, as do pedestrians and the drivers and passengers of older vehicles.

The hypothesis of a link between mobility, safety and territory is thus confirmed, underlining the need for specific action for underprivileged areas and the populations that live there. The high level of accidents observed doubtless results partly from planning policies that have located these residential areas on the edges of city centres and then provided access by road, and partly from the relative underestimation of road safety issues in these districts.

Présent pour l'avenir

(1) Initiated in 1983, the work of this mission, led by the architects Roland Castro and Michel Cantal-Dupart and coordinated with local authorities, aimed to give the suburbs a degree of autonomy from their big city neighbours. It developed new perspectives for these districts, with projects in line with residents' aspirations and far removed from the monumental projects of the 1970s.

(2) Predit Site : http://www.predit.prd.fr/

(3) Final report http://portail.documentation.developpement-durable.gouv.fr/dri/document.xsp?id=Drast-DRIOUV00020143

(4) The accidents considered here are those in the period 2001-2007 in which one of the road users involved, either as a driver, pedestrian or passenger, lives in one of the ZUS or control zones specified by the study. Most of the accidents (93%) took place within the LMCU territory.

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Imprimé sur du papier certifié écolabel européen. www.eco-label.com

ISSN : 2100-1634

Dépôt légal : novembre 2011