Evaluation of road safety policies and counterfactual approach

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Road safety remains an international issue, with more than 1 million people dying on the world's roads every year. The cost of road safety is generally between 2% and 5% of a country's GDP, depending on its level of economic development. High-income countries are also affected. In 2024, almost 3,200 people died on French roads. The progress made in recent years remains limited.

Safe System Approach

Today, the Safe System approach is considered best practice for achieving a high level of safety. This systemic approach consists of intervening simultaneously on different pillars. These pillars concern the safety of road infrastructure, vehicles and users, post-accident intervention and safety management.

The management pillar includes the implementation of institutional structures to take responsibility for road safety, such as the establishment of a lead agency and bodies for cooperation and consultation with stakeholders. It also involves ensuring that reliable statistics are collected to guide public policy. This management must also be based on the definition of performance criteria for the use of resources, the achievement of results and their comparison with accident trends. Evaluation of the measures taken by the authorities is also necessary, both to ensure the sustainability of effective measures and to justify their extension. It is also necessary to make the necessary corrections or to justify stopping action.

The consequences of evaluation: the introduction of the 'state of the world' concept

Evaluating a measure involves comparing a period before and after its implementation, i.e. two 'states of the world'. This conception of evaluation assumes that the previous period would have remained unchanged if the measure had not been implemented, or that it would have followed a specific dynamic (an unchanged state of the world). It also implies the ability to identify a new 'state of the world'. In short, evaluation involves comparing a 'new state of the world' with the one that would have existed if the measure had not been implemented. It is part of a counterfactual approach, a source of many challenges.

States of the world and road safety measures

To address the issues associated with the counterfactual approach, we refer to two emblematic road safety measures implemented in France over the last 20 years, for which evaluation documents exist.

In July 2002, President Chirac announced the introduction of automated enforcement in the coming months. Hundreds of these devices are gradually being put into operation. At present, almost 4,000 devices are operational. This policy of systematic speed enforcement has been the subject of 3 different but instructive counterfactual evaluations. The first covered the first few years of operation and was limited to a restricted evaluation perimeter, making it possible to control for confounding factors but raising the question of the generalisability of the results. The second involved a socio-economic approach based on aggregated values, using a 'law' or so-called Nilsson relationship, making it possible to estimate the 'counterfactual' effect that may be associated with an 'imaginary state'. The third evaluation was limited to the impact of automated speed enforcement on road accidents. This last evaluation is based on an econometric approach consisting of projecting a 'state of the world' from the past and comparing it with a 'state of the world' including the implementation of the measure.

In January 2018, Prime Minister Philippe announced to the Interministerial Road Safety Committee that speed limits would be changed on part of France's urban road network. The speed limit. This measure will come into force in August of the same year. This measure was contested by a section of the French population. The political decision-makers very quickly decided to accompany it with a mid-term and two-year evaluation of its implementation. These two documents are interesting in terms of the counterfactual approach used (simplified chronological analysis, comparison and approximation). A third evaluation, based on an econometric approach disaggregated by department, will make it possible to refine the expected impact of the measure.

States of the world and methodological issues

The 'state of the world' can be seen as a simplified expression of reality. It is characterized by a reduced number of dimensions that allow comparison between states when the initial state is affected by an event that is considered exogenous. It compares dimensions that relate to states. In the context of the road safety measures studied, the aim is therefore to document and refer to changes in, for example, speeding practices and road accident rates. In this context, it is of little importance to consider the element at the origin of the change. For example, the intensity of the enforcement policy, its partial implementation or the correct implementation of the new rules are of little importance. It is the final impact that needs to be considered. It is only in the second stage, that of assessing the significance of the change, that the characterization of the exogenous event takes on its importance.

Some results on the counterfactual approach used

The different evaluations are based on different counterfactual approaches. The first technique is to compare changes in accident rates before and after the measure, without considering any environmental control measures. Implicit in this approach is the assumption that there are no changes other than the measure that could explain the evolution of the 'state of the world' under consideration.

Using evolution ‘laws’ makes it possible to project an imaginary ‘state of the world’ considered to be true, making it possible to compare two states, and to estimate the impact of the measure. This is another way of using the counterfactual approach, which assumes empirical generalization of the law, its universality, and its transferability.

Another way of proceeding is to compare an investigated area benefiting from the measure with another area not concerned. However, while the quasi-experimental approach consists of ensuring the comparability of the ‘sets’, this proves much more difficult when the measure concerns the entire population, so that there is no control set.

The econometric approach is another possibility. The approach based on the projection of series from past data consists of considering long- and short-term trends and assuming that they can explain a coherent counterfactual over the period covered by an intervention. Measuring the effect involves comparing the state of the real world with a projected state of the world. There are many possible projections, and the choice of model is based on a ‘probability criterion’ which ultimately depends on the model's ability to account for past data. It is the (most) probable character that enables the model to be considered suitable.

The limits of counterfactual analysis

A first limitation lies in the existence of confounding factors. There are indeed consequent exogenous events that can disrupt projections of the new state of the world (Containment, Yellow Vests crisis, energy crisis), and which can be difficult to control when there is no tracked information or when it is a one-off event.

Another limitation concerns the interaction of road safety measures. An important feature of interministerial road safety committees is the announcement of a large number of simultaneous measures. Obviously, they do not all carry the same weight, but they can be the source of a form of statistical noise, making it difficult to identify the impact.

Projecting a new state of the world presupposes that the data on which it is based is of good quality and available. Issues of data availability and granularity must be taken into account. The consequences of this must also be determined.

Limits relating to the context of action

The counterfactual approach also has to deal with limitations relating to the context of action. These are external to the approach itself.

Firstly, the political context of the measures may limit access to certain data, making it impossible to monitor all the dimensions of the environment. The context of the assessment may lead to constraining choices concerning both the temporal and spatial dimensions. Access to disaggregated data may be impossible.

Secondly, counterfactual analysis may be made impossible or difficult by the absence or lack of an evaluation culture. In short, those who have access to the data do not necessarily have the skills, time or resources to carry out in-depth work.

Thirdly, the results of the counterfactual analysis may not be of interest to the decision-maker, the media or the general public. The inherent complexity of the mental process of comparing states of the world, one of which consists of projecting what would have been without the measurement, is a difficult obstacle.

Finally, the counterfactual approach can come up against a narrative logic, whose foundations are based less on an attempt to objectify the states of the world, than on a search for coherence with pre-established values that give meaning to the world. As a result, simplistic, even erroneous, representations of the world are favored, with the advantage of confirming preconceptions.