Can engineering measures decrease driver speeds and accidents on high-risk road sections?

**Intervention**
We will study the effect of three randomized engineering measures for decreasing driver speeds on road sections at which crash rates are higher than average:

(i) Reduce lane widths using, for instance, painted center island and edge line markings. This is very common road safety engineering approach and serves as benchmark for the behaviorally informed measures. Drivers are expected to slow down due to feeling constrained by narrower lanes.

(ii) Increase the perceived driving speed using optical illusion techniques (illustrated in the figure) such as installing transverse stripes perpendicular to the center, edge, or lane lines whose spacing is progressively reduced from the upstream to the downstream end of the marked portion of the lane.

(iii) Increase the perceived costs of damage to the vehicle using optical illusion techniques that make it look like there are barriers on the road such as speed bumps.

**Context**
Low and middle-income countries account for a disproportionate percentage of traffic-related fatalities and injuries. Traffic accidents are among the leading causes of death in Nicaragua. Speeding is one of the main contributors to traffic accidents and the risk of fatality increases at higher speeds. Fuel consumption, and consequently, the adverse environmental impacts of motorized traffic including greenhouse gas emissions are also greater at higher speeds.

**Year-over-year percentage increase in accidents**
(Source: Ministry of Transport and Infrastructure)
Traditional policies have mostly focused on increasing the odds of fining traffic violators and/or increasing the size of penalties. To date, there only exists limited rigorous experimental evidence on road safety interventions. This evidence is highly concentrated in developed countries. In Nicaragua, we are not aware of any impact evaluation examining road safety interventions. Road safety interventions such as engineering measures could exhibit a major cost advantage in developing country settings in which law enforcement commonly relies on manpower-heavy, and therefore costly, policing.

**Impact Evaluation Research**

The proposed impact evaluation (IE) aims to study the use of various (behaviorally informed) engineering measures for decreasing drivers’ speeds on road spots at which accident rates are much higher than the average. In a randomized control trial, we will compare three different strategies of road markings that drivers are exposed to when approaching a risky road spot.

These markings in part use physical adjustment as well as optical illusion techniques and vary by the degree of predictability (or surprise factor) for the drivers with expected trade-offs in terms of the duration and strength of the impact on speeding. For instance, markings to narrow the lane width around the risky spots is likely to have a marginal but steady effect on speeding because these changes are quite common and hence have less of a surprise effect. On the contrary, optical illusion techniques that make it look like physical traffic calming barriers on the road may cause minor damages to the vehicle if not slowing down, is likely to have strong and immediate impacts in the short term, but the impacts are expected to fade quickly given that drivers update their priors about the risks of vehicle damage as a result of speeding.

We compare these strategies among each other and to a control group in terms of their effects on driving speed and crashes using a large set of hazardous road sections. We also aim to assess the relevance of proposed interventions for hospital admissions and traffic fatalities using available administrative records.

**Policy Relevance**

This impact evaluation and proposed road safety interventions have the objective of savings lives. Traffic accidents are currently among the leading causes of death in Nicaragua and, as such, have come under the public policy spotlight. The proposed interventions attempt to decrease speeds at high-risk road sections with the objective of reducing accidents, as well as accident-related injuries and fatalities. The interventions under evaluation are largely scalable and might be implemented to additional high-risk road sections after the study is completed. Study results might also be leveraged by other countries where excessive speeding is common. In fact, speed is a critical road safety issue globally and identifying behaviorally-motivated interventions that reduce speeding are of particular relevance for the World Bank’s road safety strategy. There are strong policy relevant co-benefits with inclusion and with ambient air quality as well as greenhouse gas emissions in having lower speeds on roads.

In addition, the design and implementation of this IE entails substantial capacity building potential and an opportunity to foster evidence-based policy in Nicaragua. This is largely because the Ministry of Transport and Infrastructure (MTI) increasingly strives to base policies on evidence obtained from rigorous evaluations.

For more information email dimetransport@worldbank.org or visit www.worldbank.org/en/research/dime/brief/transport

The ieConnect for Impact program links project teams with researchers to develop rigorous and innovative impact evaluations that both substantially improve the evidence-base for policy making and induce global shifts in transport policy. The ieConnect program is a collaboration between the World Bank’s Development Impact Evaluation (DIME) group and the Transport Global Practice. This program is part of the Impact Evaluation to Development Impact (i2i) multi-donor trust fund and is funded with UK aid from the UK government and by the European Union.