Traffic Safety Diagnostic and Application of Countermeasures for Rural Roads in Burkina Faso

By

Dominique Lord*  
Center for Transportation Safety  
Texas Transportation Institute  
Texas A&M University System  
3135 TAMU, College Station, TX, 77843-3135  
d-lord@tamu.edu  

Hamidou Mamadou Abdou  
CIMA International  
3400, boul. du Souvenir, bureau 600  
Laval (Québec), H7V 3Z2  
hamidou.mamadou@cima.ca  

Antoine N’Zué  
Ministère de l’Éducation du Québec  
Direction des Statistiques et des Études Quantitatives  
1035 de la Chevrotière, 26e étage, Québec (Québec), G1R 5A5  
kouadio-antoine.n'zue@meq.gouv.qc.ca  

Georges Dionne  
HEC Montreal  
3000 Cote Ste Catherine  
Montréal (Québec), H3T 2A7  
georges.dionne@hec.ca  

Claire Laberge-Nadeau  
Laboratoire sur la sécurité des transports  
Centre de recherche sur les transports, Université de Montréal  
C.P. 6128, succ. Centre-Ville, Montréal (Québec), H3C 3J7  
claire@crt.umontreal.ca  

March 5th 2003  

Accepted for publication in Transportation Research Record  

Word count: 1,977 word + 2 figures + 2 tables = 2,990 words  

* Corresponding Author
ABSTRACT

The Government of Burkina Faso has recently been conducting important macro-
economic changes, aiming at encouraging the economic growth of the country. In order
to maintain this growth, the Government has put in place a transportation program to
improve the efficiency and safety of the road network. This paper documents the study
carried out in 2000 on the safety improvement of rural roads in Burkina Faso. The
primary objectives of the study were to prepare an assessment of traffic safety problems
and to propose several countermeasures to reduce the number and severity of collisions
on rural roads. To accomplish these objectives, a large sample of rural roads were visited
and evaluated; all accident data and important socio-economic variables were collected;
and key staff members from various governmental and private agencies were
interviewed. The results of the study have shown that traffic safety problems in Burkina
Faso are multidimensional, involving inefficient traffic safety management and policy,
inadequate road networks, untrained drivers and defective vehicles. Several traffic safety
countermeasures have been proposed for immediate, short- and long-term application.
The most important countermeasures consist of creating a new institutional framework
with which to improve the management of traffic safety and to train the key personnel
who will be responsible for implementing traffic safety countermeasures. In the short
term, the proposed countermeasures are mainly related to roadway infrastructure
improvements and better enforcement tools. In the long term, the proposed
countermeasures include the review of current highway traffic laws, their application, the
evaluation of countermeasures already in place and the improvement of driver training.
INTRODUCTION

The Government of Burkina Faso has been conducting important macro-economic changes aiming at encouraging the economic growth of the country. In order to maintain this growth, the Government has put in place a transportation plan to improve the efficiency of the transportation network. This plan has mainly focused on the construction and rehabilitation of the network without putting a strong emphasis on safety. Since road accidents have important adverse economic and social effects, the Government of Burkina Faso, in 1999, solicited the help of the Canadian International Development Agency (CIDA) to prepare a traffic safety study aimed at reducing crashes on rural roads.

The primary objective of this study was to conduct a diagnosis of traffic safety problems and propose a series of countermeasures that would allow a substantial reduction in the number and severity of crashes. A multidisciplinary team performed the study in 2000. The team collected all available data such as accident statistics and important socio-economic and demographic variables; visited a large sample of rural roads; and interviewed key personnel from different governmental and private agencies.

This paper documents the results of the study aiming at improving the safety of rural roads in Burkina Faso. The first section summarizes important characteristics on socio-economic variables, the rural road network, and crashes. The second section describes the results of the diagnosis of traffic safety problems. The third section presents the proposed countermeasures. Additional information about this project can also be found in two other publications (1, 2).

CHARACTERISTICS

Burkina Faso is a country located right at the heart of Western Africa, near the southern border of the Sahara Desert. Burkina Faso’s economy is primarily driven by the agricultural industry. The Gross Domestic Product (GDP) was about $796 (US) per person in 1996, which makes Burkina Faso one of the poorest countries in the world (3, 4). In fact, based on the Human Development Index, the United Nations ranked Burkina Faso at no. 172 out of the 175 countries (3).

The total length of the rural road network is approximately 58,450 km, with about 12,450 km of which is maintained by the General Directorate of Roads (GDR) (2). Based on recent vehicle surveys, passenger cars and heavy vehicles account for about 54% and 45% of the vehicular traffic respectively (2).

The exploratory analysis of the crash data has shown the following characteristics: about 250 reported crashes occur each year on the rural network (Table 1); 70% of crashes are injury collisions, which can be partly explained by the non-use of seatbelts and inappropriately seat-equipped vehicles; trucks and two-wheel vehicles are involved in more than 60% of all crashes; passenger cars are involved in 31% of crashes; two-wheel
vehicles are most often hit by passenger cars and sport utility vehicles; more than 50% of all crashes involve only one vehicle; passenger cars hit more than half of the pedestrians involved in a collision; and, collisions involving two or more vehicles occur most often near urban centers (55%).

Table 1 here

It is very important to warn the reader about underreported crashes. A substantial portion of crashes is not reported to governmental authorities. The magnitude of the problem in Burkina Faso is currently unknown. This problem is attributed to crashes that are settled between the parties involved in the collision without official interventions and an inefficient data collection process.

DIAGNOSIS OF TRAFFIC SAFETY PROBLEMS

The diagnosis of traffic safety problems in Burkina Faso has been accomplished by simultaneously evaluating all the components that have a direct effect on safety. The analysis included a critical review of all relevant traffic laws; the appraisal of existing institutional framework; interviews with key personnel in the Government and the private sector, and private citizens; the collection of all important socio-economic and demographic variables; a review of all relevant scientific literature (5, 6, 7, 8, 9, 10, 11, 12, 13, 14); on-site visits of a rural road segments; and the evaluation of the data collection process.

The entire study has been performed with the excellent collaboration of the government officials. This collaboration enabled the consulting team to fully understand all the important issues related to the diagnosis of safety problems and the application of countermeasures tailored for Burkina Faso. This collaboration is greatly appreciated.

MANAGEMENT OF TRAFFIC SAFETY

One of the most important factors that affect traffic safety is the lack of collaboration between different agencies and ministries within the Government. For instance, the Ministry of Infrastructure, Habitat and Urbanism (MIHU), which is responsible for the maintenance of the roadway infrastructure, and the Ministry of Transportation and Tourism (MTT), which is the entity responsible for developing traffic laws, training drivers, and collecting crash data, do not collaborate efficiently with each other. The collaboration problems result in the inefficient use of available resources to properly manage the transportation network.

The critical review of existing traffic laws has shown that they are inadequate to properly regulate the transportation network (e.g., no regulation for the mandatory use of seatbelts or helmets, licensing process, etc.) and are poorly applied by the Traffic Safety Brigade.
(TSB) due to the lack of proper equipment to carry out the job properly (e.g., radar guns, breathalyzers) and proper training.

The National Committee on Traffic Safety (NCTS) is unfortunately plagued by serious limitations. While the General Directorate of Terrestrial and Maritime Transportation (GDTMT), a directorate of the MTT, is responsible for the day-to-day activity related to traffic safety, the NCTS responsibilities are associated with the development of the National Traffic Safety Policy program. The agency is basically a consulting organization to the Government. The problems include: lack of communication between the various committee members; the budget allocated by the government to allow the committee to initiate traffic safety activities is too low (less than $5,000 US per year); and, no properly trained staff.

The data collection process currently has many shortcomings and needs to be completely overhauled. Important limitations include important variables not collected at the crash site; the lack of a unique identification number for accident reports; the fields in the electronic database do not exactly match the ones used in the accident report; and the staff are not properly trained to use the database program and perform good data quality control.

HIGHWAY INFRASTRUCTURE

Two teams of traffic safety experts surveyed several highway segments located in rural areas and found many critical deficiencies. First, the roadway infrastructure and highway signs were found to be problematic on many highway segments: no pavement marking on paved roads, missing highway signs, traveling lanes and shoulders plagued by dangerous potholes, and roadside hazards not protected by guardrails.

Second, there exist many restrictions that impede the flow of traffic near the entrance of cities and villages. Typically, these locations are used for commercial activities, where people set shops on each side of the road. This activity creates serious safety problems since many vehicles enter villages at high speeds. As a matter of fact, many of these sites were identified as “black spots.”

Third, the sharing of the limited highway space by different transportation modes has a direct influence on safety. In rural areas, passenger cars, bicyclists, pedestrians, and animal-powered vehicles all share the same space, which increases the likelihood of a collision (15, 16).

DRIVER BEHAVIOR

The behavior of drivers traveling on rural roads is very disturbing. The survey teams noticed many drivers taking unnecessary risks, given the deficiencies related to the road and the vehicle. Many vehicles were caught traveling in excess of 80 km/h on roads (85th
percentile) where the surface conditions would warrant a driving speed below 40 km/h. It has been noted that, in many instances, drivers “play chicken” with one another. According to the TSB, alcohol related crashes are also a major problem in Burkina Faso.

MECHANICAL CONDITION OF VEHICLES

The mechanical inspection of vehicles is mandatory in Burkina Faso. Based on the visual surveys and interviews with CVC officials, it is evident that many badly maintained vehicles are able to pass the mechanical inspection without difficulty such as tractor-trailers with twisted frames and trucks built from unrelated vehicle parts. It was brought to the team's attention that many drivers borrow vehicle parts before going for the vehicle inspection at the CVC. Unfortunately, the Government of Burkina Faso is currently unable to prevent this problem.

Almost all commercial vehicles travel with loads far exceeding the physical capacity of the vehicle. The survey teams witnessed many trucks carrying loads at least as high as the truck itself. These vehicles have a center-of-gravity so high that any emergency maneuver will automatically lead to a severe crash.

COUNTERMEASURES

Several traffic safety countermeasures were proposed to the Government for immediate, short- or long-term applications (Table 2). The most important and critical countermeasure was the introduction of a new national transportation safety policy. The aim was to create a new institutional framework that would allow the Government to properly manage traffic safety. Without this framework, most other countermeasures will be difficult to implement.

Table 2 here

Two alternative institutional frameworks have been proposed to the Government. The first alternative proposes the creation of a new traffic safety agency that will be managed by the MTT (Figure 1). The new agency will be merged with the current CVC into one common entity and will be governed by a board of directors. This institutional framework is currently being exploited in other developing countries, such as the Ivory Coast. This framework has been shown to work well, though an important governmental restructuring will be required before it can be implemented.

Figure 1 here

The second alternative proposes the creation of a traffic safety directorate within the CVC (Figure 2). The new directorate will contain two technical services: one for crash analyses and another for safety planning and marketing respectively. This directorate will greatly benefit from the latest technological support available at the CVC. However, the
collaboration between the new directorate and other agencies may be problematic. This framework will be less flexible than the one proposed for the first alternative, since the directorate will not be as independent.

In order to effectively manage traffic safety, new sources of financing must be established (e.g., new taxes, fines, etc.); a new training program outside of Burkina Faso must be put in place to educate traffic safety managers; and the data collection process must be completely overhauled, including the development of a new accident report.

As detailed in Table 2, several countermeasures are proposed to improve the safety on rural roads. The ones that should have immediate positive effects on the number of crashes are related highway infrastructure improvements. In the mid- to long-term period, the proposed countermeasures focus on the reevaluation of the role and financing of the TSB; the re-examination of all the technical criteria currently being applied to evaluate the mechanical condition of vehicles by the CVC; the development of a plan to minimize the borrowing of legitimate vehicle parts for the mechanical inspection; the complete review of the Highway Traffic Act, including the broad dissemination of the Act and the harmonization of transportation-related laws with other countries in West Africa, as well as the introduction of new traffic laws; and the promotion of traffic safety through media campaigns aimed at both the political establishment and the population at large.

**SUMMARY AND CONCLUSION**

Vehicular crashes have become one of the most important problems in developing countries since they cause important economic and social costs. The Government of Burkina Faso, understanding the importance of this problem, has solicited outside partners to perform a diagnosis of traffic safety problems and develop a series of countermeasures aimed at reducing vehicular crashes on rural roads. The traffic safety problems in Burkina Faso are multidimensional. Several traffic safety countermeasures have been proposed for immediate, short- and long-term applications. In the end, the success of the project and the implementation of its recommendations rely exclusively on the political will of the Government of Burkina Faso. Government officials now have the opportunity to become leaders in West Africa for the application of a well-managed traffic safety policy.

**ACKNOWLEDGEMENTS**

The authors would like to express their gratitude to all the other team members who participated in this study, particularly Léonce Adico, Marc-André Tousignant and Mathieu Maurice, Mr. Issiaka Sigué, former head of The Burkina Faso Transportation Board, as well as all the managers who collaborated with us from the Government of Burkina Faso. The input from Leah Silverman is greatly appreciated. Finally, the authors
would also like to thank one of the reviewers for the useful comments aimed at improving this paper.

REFERENCES


Table 1. Number of Reported Crashes (1995-1999)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Crashes</th>
<th>Fatal and Non-Fatal Injury Crashes</th>
<th>Percent Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>72</td>
<td>50</td>
<td>69.4%</td>
</tr>
<tr>
<td>1996</td>
<td>117</td>
<td>63</td>
<td>53.9%</td>
</tr>
<tr>
<td>1997</td>
<td>244</td>
<td>193</td>
<td>79.1%</td>
</tr>
<tr>
<td>1998</td>
<td>265</td>
<td>190</td>
<td>71.7%</td>
</tr>
<tr>
<td>1999</td>
<td>258</td>
<td>171</td>
<td>66.3%</td>
</tr>
<tr>
<td>Total</td>
<td>956</td>
<td>667</td>
<td>(avg.) 69.7%</td>
</tr>
</tbody>
</table>

(Data provided by GDTMT)
### Table 2. Summary of Countermeasures

<table>
<thead>
<tr>
<th>Countermeasure</th>
<th>Category</th>
<th>Action</th>
<th>Anticipated Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Immediate to Short-Term</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institutional Framework</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Financing</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Training for Current Managers</td>
<td>Institutional</td>
<td>Implementation</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Data Collection Process (accident report, database system, training)</td>
<td>Institutional</td>
<td>Implementation</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Treatment of Hazardous Sections</td>
<td>Infrastructure</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Physical Enhancements: Villages</td>
<td>Infrastructure</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Physical Enhancements: Rural Network</td>
<td>Infrastructure</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Traffic Signs Program</td>
<td>Infrastructure</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Pavement Markings</td>
<td>Infrastructure</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Repairs of Potholes</td>
<td>Infrastructure</td>
<td>Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Treatment of Unpaved Roads (oil-based products)</td>
<td>Infrastructure</td>
<td>Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Program to Increase the Night-Visibility of Road Users</td>
<td>Road Users</td>
<td>Study/Implementation</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Promotion and Education(^1)</td>
<td>Road Users</td>
<td>Study/Implementation</td>
<td>Improving Driver Behavior</td>
</tr>
<tr>
<td>Safety Campaigns(^1)</td>
<td>Road Users</td>
<td>Study/Implementation</td>
<td>Improving Driver Behavior</td>
</tr>
<tr>
<td><strong>Mid- to Long-Term</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety Audits System</td>
<td>Infrastructure</td>
<td>Study</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>“Positive Guidance” Study</td>
<td>Infrastructure</td>
<td>Study</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>New Highway Section Identification System</td>
<td>Infrastructure</td>
<td>Study</td>
<td>Improving Road Conditions</td>
</tr>
<tr>
<td>Enforcement (role, equipment, training, financing)</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Driver Behavior</td>
</tr>
<tr>
<td>Improved Mechanical Inspections (CVC)</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Vehicle Conditions</td>
</tr>
<tr>
<td>Program to Reduce the Borrowing of Legitimate Vehicle Parts</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Vehicle Conditions</td>
</tr>
<tr>
<td>Training of Traffic Safety Specialists (doctoral studies)</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Review of Current Highway Act</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Evaluation of New Traffic Laws</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Government Response</td>
</tr>
<tr>
<td>Improved Driver Training Program</td>
<td>Institutional</td>
<td>Study</td>
<td>Improving Driver Behavior</td>
</tr>
<tr>
<td>Promotion and Education(^1)</td>
<td>Road Users</td>
<td>Study</td>
<td>Improving Driver Behavior</td>
</tr>
<tr>
<td>Safety Campaigns(^1)</td>
<td>Road Users</td>
<td>Study</td>
<td>Improving Driver Behavior</td>
</tr>
</tbody>
</table>

\(^1\) Different programs are implemented in the short-term and in the long-term
Acronyms (translated):

Safety Agency:
- SPESR: Traffic Safety Planning Services
- SM: Maintenance Directorate
- SAF: Administration Department
- SEA: Department of Special Studies and Analysis
- SFE: Personnel Training Services
- AR: Regional Offices
- SCT: Vehicle Inspection Services

Other existing agencies, departments or directorates:
- DTH: Directorate of Tourism and Hotels
- DEP: Planning and Studies Directorate
- DRH: Department of Human Resources
- DGTTM: General Directorate of Terrestrial and Maritime Transportation
- DGACM: General Directorate of Air Transportation and Weather
- DRTT, etc.: Regional Antennas (East, West, North)
Acronyms (translated):

Safety directorate:
   SEA: Department of Special Studies and Analysis  
   SPESR: Planning, Evaluation and Promotion of Traffic Safety Services

Other existing agencies, departments or directorates:
   DT: Technical Directorate  
   DAF: Financial and Administrative Directorate  
   AR: Regional Offices

Figure 2. 2\textsuperscript{nd} Proposed Alternative