Urban transport safety assessment in Akure based on corresponding performance indicators

Adedamola Oye¹, Olufikayo Aderinlewo¹, Silvana Croope²*

¹ Civil Engineering Department, Federal University of Technology, Akure, Nigeria
² Delaware Department of Transportation, Delaware, USA

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Abstract: The level of safety of the transportation system in Akure, Nigeria was assessed by identifying the associated road safety problems and developing the corresponding safety performance indicators. These indicators were analysed with respect to accidents that occurred within the city from the year 2005 to 2009 based on the corresponding attributable risk measures. The results of the analysis showed the state of existing safety programs in Akure town. Six safety performance indicators were identified namely alcohol and drug use, excessive speeds, protection system (use of seat belts and helmets), use of day time running lights, state of vehicles (passive safety) and road condition. These indicators were used to determine the percentage of injury accidents as follows: 83.33% and 86.36% for years 2005 and 2006 respectively, 81.46% for year 2007 while years 2008 and 2009 had 82.86% and 78.12% injury accidents respectively.

Keywords: Vulnerability • Safety performance indicators • Attributable risk • Protection system • Injury accidents

1. Introduction

Transport safety has been assessed till date mainly based on crash data. However, transport crashes are relatively rare events. There is a need to establish and specify safety performance indicators which are causally related to crash frequency and severity. Increasingly, behavioral measures such as percentage usage of seat belts, crash helmets, proportion of drivers being drunk, exceeding the speed limits or running light cameras are used. Such measures can give direction to policy instruments, making it possible to assess limited areas of transport safety within specified problem areas. Because of the high information density available, they allow quicker and more local analysis and monitoring than crashes.

Transportation in urban areas is highly complex because of the modes involved, the multitude of origins and destinations as well as the amount and variety of traffic. Traditionally, the focus of urban transportation has been on passengers as cities were viewed as locations of utmost human interactions with intricate traffic patterns linked to commuting, commercial transactions and leisure/cultural activities. However, cities are also locations of production, consumption and distribution. Urban transit is an important dimension of mobility, notably in high density areas. Urban transport safety refers to a state where the transportation system is devoid of all forms of vulnerable deaths, injuries and consequent trauma resulting from accidents and injuries.

*E-mail: Silvana.Croope@state.de.us
Hence, this study assesses the level of safety of urban transport in Akure, the capital of Ondo state based on the corresponding performance indicators. This involves identifying the existing safety performance indicators for urban transport, developing safety performance indicators for urban transport in the city and assessing the corresponding level of safety based on its performance indicators. This study is important because it develops effective measures to reduce the number of accidents and the corresponding number of killed or injured people. Various data related directly and remotely to accidents are analyzed to assess the quality of safety of road transportation in Akure.

2. Background literature

Safety performance indicators are defined as any measurement that is used in addition to a count of crashes or injuries to understand the process that leads to accidents. They are observable and measurable features of road transport systems which, if present, identify the level of road traffic risks [1].

A large number of potential safety performance indicators exist even though they are not all of equal importance. The importance of a safety performance indicator can be assessed in terms of its strength in relation to accident or injury occurrence. This can be achieved by measuring the change in accident or injury risk attributable to a change in the value of the indicator. The concept of attributable risk is frequently employed in epidemiological research [2]. It denotes the size of the change in the number of accidents or injuries expected to occur if a risk factor is removed. While there is a longer tradition of use of performance indicators in the non-road transport modes and particularly in aviation, it is easier to correlate them with road transportation crash data. Therefore, no attempt has been made in this paper to make a case for the standardization of safety performance indicators across transport modes since they vary from one mode of transport to the next [3].

The greatest transport safety problem in Nigeria is related to road transport with about 90% of all transport accident fatalities occurring therein [4]. Therefore, emphasis has been laid on road transport in this study.

2.1. Road safety performance indicators

Among the road safety performance indicators most commonly used are those that relate to behavioral characteristics such as speed levels, the rate of drink-driving and the use of seat belts [5]. In addition, a number of infrastructure, vehicle or trauma related indicators are relevant. They allow for a more detailed understanding of the reasons for safety problems than is possible by looking at crash frequency alone [6].

2.1.1. Importance of safety performance indicators

Transport safety can be assessed in terms of the frequency and socio-economic cost of accidents and injuries. Yet, it is clear that simply counting crashes or injuries is often an imperfect indicator of the level of transport safety because this process is subject to random fluctuations [7]. A safety performance indicator is any variable that is used in addition to accidents or injuries to measure changes in safety performance. It should be amenable to reliable measurement and should have a causal relationship to accidents or injuries. It should also be easy to understand.

2.2. Principal road safety problems in Akure

A survey carried out in Akure indicates the key road safety problems as follows: excessive and inappropriate speeds, driving under the influence of alcohol, accident risks of pedestrians and motorcyclists and non-use of protective equipment such as seat belts and crash helmets. A large number of factors contribute to road accidents and injuries. Road user behavior and their physical vulnerabilities figure prominently among these factors. There are many aspects of road user behavior that influence the number of accidents. Some aspects of road user behavior that could function as safety performance indicators include excessive speeding, use of seat belts, use of crash helmets, incidence of drinking and driving, failure to stop or yield at junctions or at pedestrian crossings, use of daytime running lights and use of reflective devices. In addition to behavioral safety performance indicators, there are engineering indicators such as pavement friction, percentage of technically defective vehicles, percentage of road network not fulfilling safety design standards and indicators of the quality of emergency medical services. The most commonly used safety performance indicators for road transport in Nigeria are speed measurements, surveys of the use of seat belts and crash helmets and surveys of the incidence of drinking and driving.

2.2.1. Development of safety performance indicators (SPI)

An overview of the theory behind road safety performance indicators (SPIs) and the way they were developed for the different road safety related areas, alcohol and drugs, speed, protective systems, daytime running lights, vehicles (passive safety), roads and trauma management have been reported in recent research works [8].

Seven problem areas were selected in this study for development of the SPI’s namely alcohol and drug-use, speeds, protection systems, daytime running lights (DRL), vehicles,