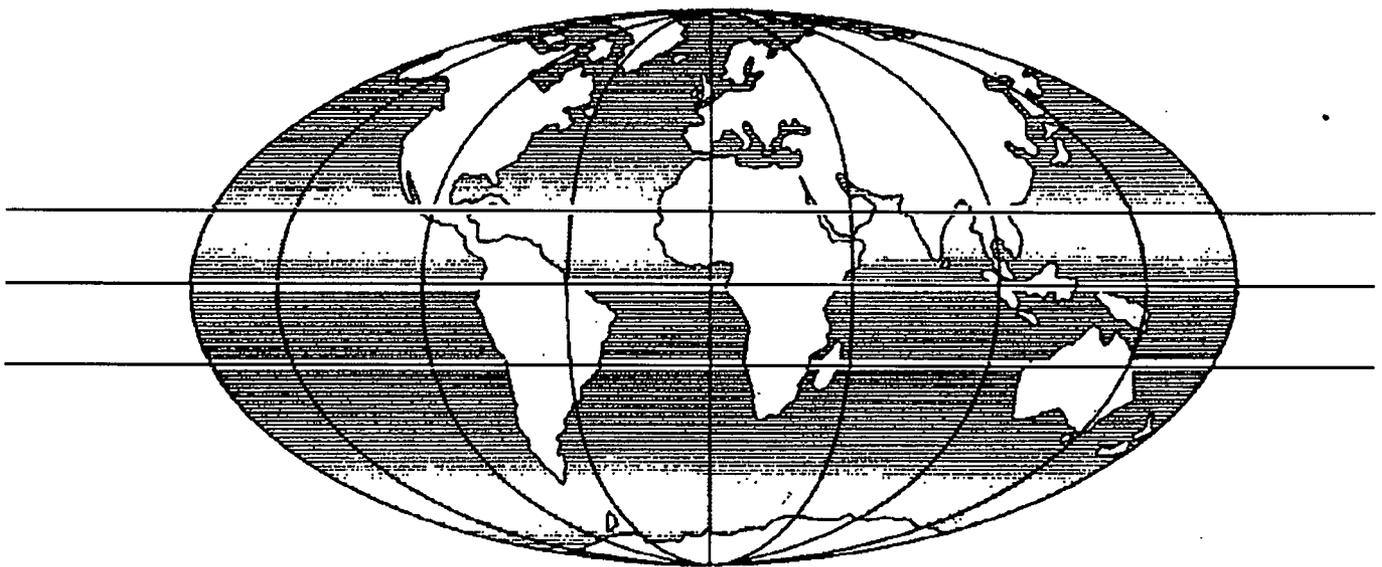




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**TITLE Accident data collection and analysis: the
use of MAAP in the Sub-Saharan region of
Africa**

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PA3230/97 GORELL, R S J (1997). **Accident collection and analysis: the use of MAAP in the Sub-Saharan region of Africa.** *3rd African Road Safety Congress, Pretoria , 14 - 17 April 1997.*

**ACCIDENT DATA COLLECTION AND ANALYSIS: THE USE OF MAAP IN
THE SUB-SAHARAN REGION OF AFRICA.**

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Summary

An efficient accident data collection and analysis system is a basic requirement for any country determined to tackle its road safety problem. At the beginning of the 1980's the Overseas Centre at the Transport Research Laboratory began development of the Micro-computer Accident Analysis Package (MAAP). The first trials of MAAP took place in 1983, and in 1987 Botswana became the second country to adopt MAAP nationwide as part of a National Road Safety Programme. Following a successful introduction, MAAP was then installed in Ghana (1989) and Zimbabwe (1991). During the mid 1990's full scale trials of MAAP were established in Malawi, Swaziland and Tanzania. In all six countries, MAAP has been in continuous use since its introduction. This paper describes the use of MAAP within these six countries and describes their procedures for collecting, processing and analysing road accident data. A brief comparison of accident statistics for Botswana, Ghana and Zimbabwe derived from MAAP is also presented.

INTRODUCTION

The Micro-computer Accident Analysis Package (MAAP) is a personal computer-based accident data collection and analysis system developed by the Overseas Centre of the Transport Research Laboratory through a research programme funded by the Overseas Development Administration. Since its introduction in 1983 (Hills and Kassabgi, 1984; Hills and Elliott, 1986), MAAP has been installed in over 25 developing countries. In Sub-Saharan Africa it has been installed in Botswana, Ghana, Zimbabwe, Malawi, Tanzania and Swaziland. Each installation has presented its own unique challenges including agreeing modifications to the accident report forms, the adoption of new office procedures and training local personnel in the use of the package. The MAAP package has been used to analysis road accident trends on both a national and regional level. From this analysis a number of national road traffic accident reports have been produced most notably in Botswana (Department of National Transport and Communications, 1994) where the increasing number of road accident (8.5% per annum between 1989 and 1994) has been clearly documented. Comparison of accident data from Botswana, Ghana and Zimbabwe reveals close similarities for a number of the accident categories analysed. However, the analysis also shows marked differences, particularly in the risk associated with different road users and the types of collision leading to casualties.

A BRIEF DESCRIPTION OF THE MAAP PROGRAM

The purpose of the Micro-computer Accident Analysis Package (MAAP) is to enable developing countries to collect and analyse road accident data in a systematic manner with easy-to-use software. The program is specifically designed for use on a personal-computer which enables users to work interactively with ready accessible data (something which was not always possible on a mainframe computer).

The package has two distinct sections. The first deals with the input of accident data from police road traffic accident report forms while the second deals with the analysis of the accident database.

The package allows accidents with common features to be identified and, if required,

written to a separate database. Accident, casualty and vehicle cross-tabulations can be produced using a number of standard cross-tabulations which can be set-up within the package. In addition, users have complete facilities to define their own cross-tabulations. A major feature of the package is its 'Stick Diagram Analysis' facility, a technique designed to help investigators identify patterns in groups of accidents.

There are currently two released versions of the package; MAAP4.10 and MAAP*five* for DOS. Although similar in many ways, these packages have significant differences which are highlighted below.

MAAP4.10 is a ASCII character based package and, as a result, it can only plot the location of accidents on so called 'text maps' which are constructed using the ASCII character set. Since no true graphics are employed, MAAP4.10 can be installed and run successfully on any of the '286' family of personal-computers. ('286' computers have been subsequently superseded by '386', '486' and 'pentium' computers.)

MAAP*five* for DOS uses standard Windows-style lay-out offering a variety of accident mapping facilities in which the location and severity of accidents can be plotted on raster scanned, vector or text maps. A useful feature of the scanned and vector mapping modules is that a selected area of the map can be isolated for separate analysis using the 'polygon analysis' facility.

In MAAP*five* for DOS the 'Stick Diagram Analysis' is enhanced by the use of icons for selected items which can improve the interpretation of stick diagrams. The program also features a new module called 'WORST'. This facility identifies the worst accident group or site within the accident database according to criteria defined by the user. As MAAP*five* is significantly more sophisticated than MAAP4.10, it requires at least a '386' computer.

It should be noted that a new Windows version of MAAP is about to be released which incorporates the features of MAAP*five* for DOS. However, accident data are now stored

in a relational (ACCESS MDB Format) database. Therefore, Standard Query Language (SQL) can be used permitting more in depth analysis. In addition, a Geographical Information System module will be included.

ESTABLISHED MAAP INSTALLATIONS

Botswana

MAAP was introduced to Botswana in 1987 as part of a National Road Safety Program undertaken by SWEROAD, a part of the Swedish National Roads Administration. To enable its introduction, a police Road Accident Report Form compatible with MAAP was developed and, following training in 1987, was adopted nationally by the Botswana Traffic Police. In March 1996, MAAP*five* was installed at the traffic police headquarters. At the same time training on the use of the MAAP*five* package was provided for the relevant officers in the accident statistics section.

The data collected on each accident report form is checked and verified before being entered into a temporary data file within the MAAP package. When this temporary data file contains around 100 accidents, the data are transferred to the main accident data file. At the end of each working day, the main data file is inspected and a floppy disk back-up is made of its contents. Up to 5000 accidents can be held in a single main data file.

Once completed, a copy of each accident data file is sent to the Accident Analysis and Statistics section of the Department of National Transport and Communications where the data are analysed. (The traffic police also carry out some analysis.) The main result of this analysis is the production of the Road Traffic Accident Annual Report. It should be noted that MAAP has contributed to all the reports produced since 1987.

In general, MAAP is used for the analysis of overall trends and the identification of accident clusters in the area of the capital Gaborone. A list of these accident clusters is forwarded to the Roads Department and City Council for consideration. In 1990, a number of modifications were carried out at the accident cluster sites identified by the MAAP program. Evaluations carried out between 1991 and 1993 have shown reduced

accident frequencies at the modified sites (Gorell, 1995).

In recent years, the MAAP installation in Botswana has required an above average level of support by TRL, largely caused by ageing computer hardware which has now been replaced. To improve the support given by TRL, a fax-modem has been connected to one of the computers. This allows the hard disc of the computer to be accessed remotely. Problems can now be diagnosed on-line at TRL. With new computers and MAAP*five* installed, it is anticipated that a much lower level of support will now be required.

Ghana

MAAP was introduced in Ghana as part of National Road Safety Program in 1989. The package was installed at the National Road Safety Committee in Accra and the Building and Road Research Institute (BRRI) in Kumasi. At the time of installation, extensive training was provided for police officers to enable them to complete the accident report form designed for use with the package. In March 1996, MAAP*five* was introduced and further training on the package was provided for BRRI staff.

The procedure adopted in Ghana for entering accidents into the MAAP package is complex. Unlike Botswana, accident records are not forwarded to a central location for entering into the MAAP package. Instead, BRRI staff collect data from each of the 10 regions.

Although this procedure worked well during 1990 and 1991, when accident forms from all 10 regions of Ghana were collected, the collection of data by BRRI in recent years has been problematical. The limited data collection in recent years is mainly due to funding problems at the BRRI which are hopefully now resolved. The collection of accident data has now resumed.

Despite these problems with the collection of data for the MAAP system, some accident analysis has been carried out by the BRRI. A number of reports have been produced which include published reports on accident trends in the Northern, Volta, Upper Western

regions based on data collected during the 1989-1991 period. Reports on the Greater Accra and Eastern region are prepared and ready for publication. Disk copies of the accident data are forwarded to the NRSC for analysis.

In May 1995 a support visit was undertaken by TRL which revealed a number of minor problems with the software. These were corrected at the time. A major problem with accessing data on the now obsolete computers installed at the BRRI has now been resolved by the installation of new IBM-compatible computers.

Zimbabwe

The MAAP package was introduced to Zimbabwe in 1991 where it was installed at the Zimbabwe Traffic Safety Board (ZTSB) in Harare and the Ministry of Transport and Energy also based in Harare. However, MAAP has not been adopted by the Zimbabwe Traffic Police. Therefore, MAAP cannot be described as a nationally adopted data collection and analysis system.

Unlike Botswana and Ghana, road accident data are not directly entered into the MAAP database. Instead, accident report forms completed by the traffic police are sent to the Zimbabwe Government Central Computing Services where the accident data are entered onto a mainframe computer.

Until March 1996, the accident data recorded by Central Computing Services was periodically forwarded on magnetic tape to the Ministry of Transport and Energy where the data are copied onto floppy disks. These floppy disks were then forwarded to the ZTSB where a specially written computer program converted the data from the format used on the mainframe to the format used by MAAP.

However in March 1996, a simplified procedure was established where the Central Computing Services convert the data directly onto floppy disks provided by and returned to the ZTSB. Analysis carried out by the ZTSB is presented in their annual report. This consists of a number of cross-tabulations of general trends which are considered on a

national, road authority, provincial and municipal level. The location of specific accident sites is not considered. During 1995 and 1996, the MAAP package was reinstalled at the Ministry of Transport and Energy (MoTE). In March 1997, Zimbabwe became the last of the six countries covered in this paper to have MAAP*five* installed.

RECENTLY INITIATED TRIALS OF MAAP*FIVE*

Malawi

The MAAP package was introduced to Malawi in early 1994 as part of a National Road Safety program funded by the African Development Bank and carried out by Deleuw Cather International. In order to facilitate the introduction of the package a revised accident report booklet was developed and adopted by the Malawi Police. Training in the use of the booklet was provided for all traffic police officers.

A training course in the use of MAAP*five* was attended by staff from the Department of Transport, National Road Safety Council and Traffic Police. Immediately following the course the package was installed at all three institutions.

In the trial, completed and checked accident report forms are sent to the traffic police headquarters in Zomba where the accident data are entered into the package. It was envisaged that at regular intervals, the data would be forwarded to the Department of Transport and National Road Safety Council both based in Blantyre.

The Traffic Police started to enter accidents from the Lilongwe area into the MAAP package in February 1995. The entry of accidents from the rest of the Central region soon followed. However, the national introduction of MAAP has been delayed by problems linked to the production of sufficient copies of the revised accident report booklet.

Tanzania

In Tanzania, MAAP was introduced in 1994 as part of a National Road Safety Program funded by the Norwegian aid agency NORAD and carried out by the Norwegian Public

Roads Administration (NPRA). In order to facilitate the introduction of MAAP, the Tanzania Traffic Police adopted a new accident report form. An introductory course on MAAP was attended by representatives of the Traffic Police, Ministry of Works, Transport and Communication and National Institute of Transport.

The MAAP package was introduced on a trial basis in the Dar-es-Salaam region. It was originally envisaged that this trial would be initially extended to the Mbeya region, and then extended country wide. However, the extension of the trial beyond the Mbeya region has been slower than anticipated.

As with Malawi, the Tanzania installation of MAAP has experienced few technical difficulties. This is probably due to the use of new computers purchased for the task and there has not been a requirement to adapt MAAP to an existing system of data storage.

Swaziland

Swaziland is the most recent installation of MAAP in the Sub-Saharan region of Africa. Funded as part of a World Bank project the installation was carried out in October 1995. In conjunction with TRL, an accident report form compatible with MAAP was designed and introduced to the Royal Swaziland Police by staff from the Ross Silcock Partnership.

MAAP was installed at the Royal Swaziland Police headquarters in Mbabane and at the Swaziland Road Safety Council. Since November 1995, MAAP has been used to shadow the existing paper based system of accident recording. Due to its recent introduction, no significant data analysis has taken place. As with Malawi and Tanzania, this installation has encountered no significant technical problems.

COMPARISON OF ACCIDENT DATA SETS

The accident databases of Botswana, Ghana and Zimbabwe have been compared using the cross-tabulation facility incorporated into the MAAP package. Only these databases have been compared since these are the only countries where a full year's data are available. In each case the most recent full year's data for the whole country has been analysed.

Figure 1: Casualties by class of road user

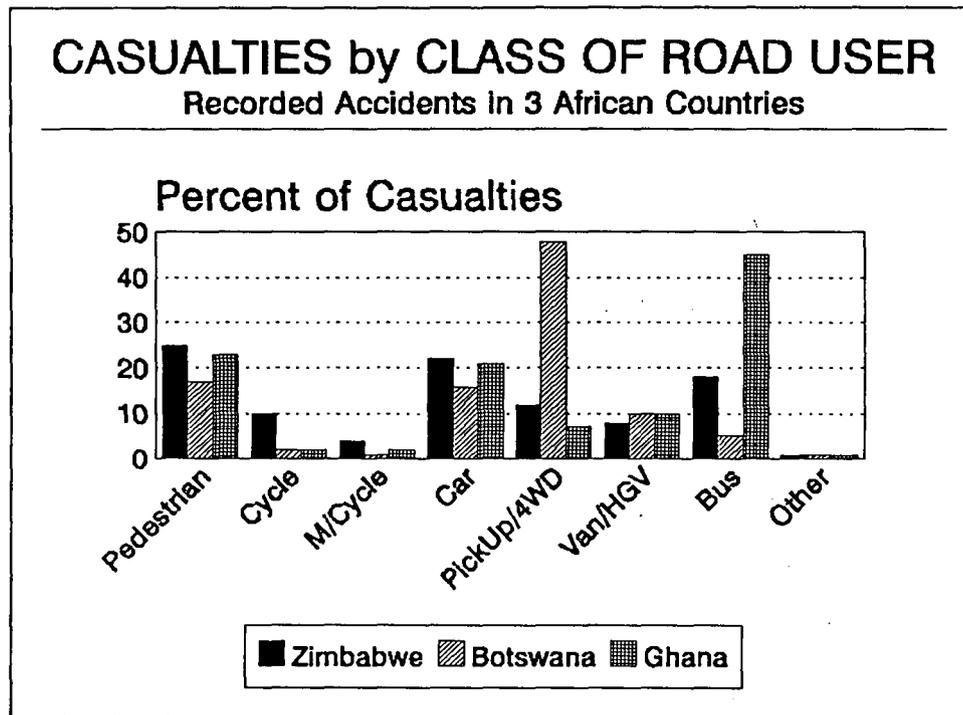
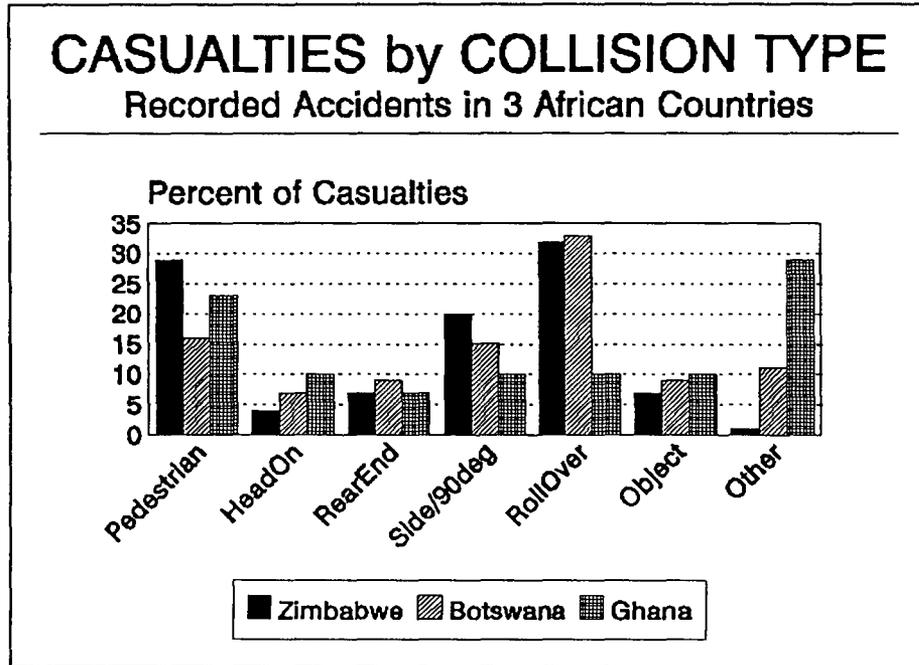


Figure 1 shows marked differences between countries in the road users most at risk. 48% of casualties in Botswana were using either pickups (37%) or four-wheel-drive (11%) vehicles. This reflects the fact that these types vehicles are often used as substitutes for buses and taxis with passengers sitting in the unprotected rear section. If the vehicle is involved in a roll-over, a large number of serious injuries can result.

In Ghana a completely different picture emerges. Here the most vulnerable road users are bus passengers accounting for 45% of casualties. Pedestrians are a major class of casualty common to all countries, being either the largest or second largest class.

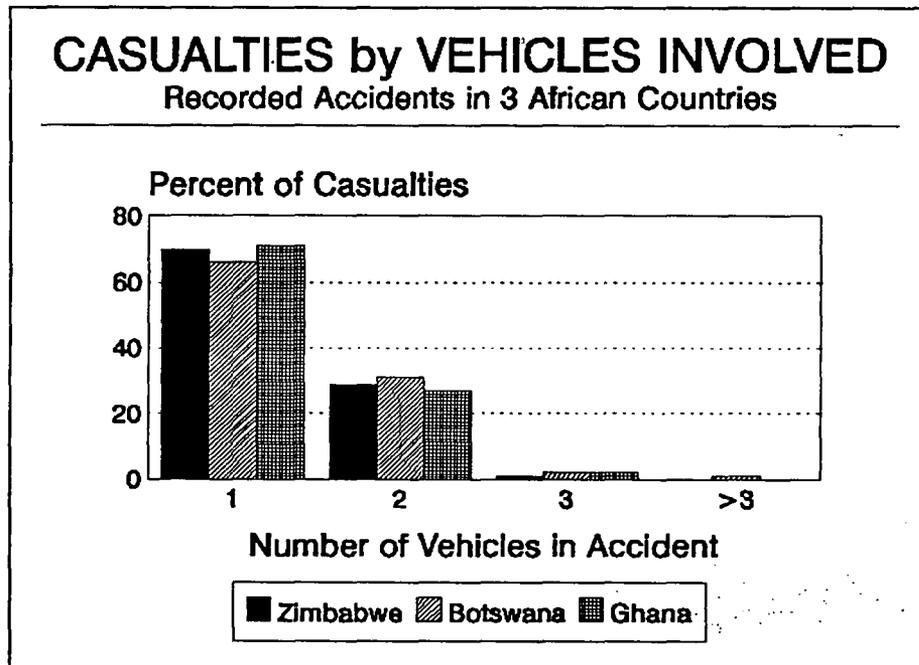
Figure 2 confirms that both Botswana and Zimbabwe have a high percentage of casualties resulting from roll-over accidents. This helps explain the high proportion of pickup and four-wheel-drive casualties recorded in Botswana, due to large numbers of passengers travel in the unprotected rear section.

Figure 2: Casualties by collision type



Further analysis of the data revealed that single vehicle accidents were most common accounting for over 65% of accidents in each country as shown in Figure 3.

Figure 3: Casualties by Vehicles involved



The most vulnerable age is between twenty and thirty for all casualties. For pedestrian casualties the most vulnerable age is between six and ten years old.

DISCUSSION

Since being installed in Botswana almost 10 years ago, the Micro-computer Accident Analysis Package has become the leading accident data collection and analysis system in Sub-Saharan Africa. Its wide use, flexibility and sustainability enables in-depth comparison to be carried out between countries where it has been implemented.

As no two MAAP installations are the same, a step-by-step procedure for introducing the MAAP system has generally been adopted in each country, starting with a demonstration project, and then selected regional trials, before any national changes are enacted. This gradual approach enables potential problems to be rectified at an early stage. Experience of MAAP in Sub-Saharan Africa has also revealed that installation problems are minimised when a 'clean-slate' approach is adopted. That is, new computers dedicated to MAAP are acquired and accident report forms specifically designed for use with MAAP are developed and adopted by the local traffic police. The local presence of staff familiar with MAAP following the introduction stage is also beneficial.

The analysis presented in this paper shows that there can be differences between countries particularly in the risk to different road users and the collision types leading to casualties. It also reveals, once again, the vulnerability of pedestrians and the need to pay particular attention to this road user group. The high percentage of single vehicle accidents has also been revealed.

Although not directly analysed here, it has been found that there can be large differences between different regions of a country, usually with the major cities showing very different characteristics to rural areas. Thus, it is important to analyse accidents and evaluate countermeasures at both regional and local authority levels. However it should be noted that, with few exceptions, most notably Botswana, the investigation of accident sites within Sub-Saharan Africa has been limited. As each country has its own characteristics, the

benefits of countermeasures will not always be the same. It therefore becomes important for each country to evaluate its own schemes. It will be necessary to develop expertise in this area, by providing further training to local personnel to develop accident investigation techniques and to introduce the concepts of "safety conscious" design and planning.

ACKNOWLEDGEMENTS

The provision of technical support for the MAAP installations described in this paper was funded by the Overseas Development Administration UK. The author acknowledges the provision of accident data from the Botswana Traffic Police, Building and Road Research Institute in Ghana, Zimbabwe Traffic Safety Board, Malawi Traffic Police, Tanzania Traffic Police and Royal Swaziland Police Force. The author also wishes to thank counterpart colleagues for their co-operation and assistance.

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