Thematic Fact Sheets on Road Safety Risk Factors in Africa – A Knowledge and Management Tool

George Yannis[1], Stergios Mavromatis[2], Alexandra Laiou[3], Katerina Folla[4], Dimitris Nikolaou[5]
National Technical University of Athens
e-mail[1]: geyannis@central.ntua.gr
e-mail[2]: stemavro@central.ntua.gr
e-mail[3]: alaiou@central.ntua.gr
e-mail[4]: katfolla@central.ntua.gr
e-mail[5]: dnikolaou@mail.ntua.gr

Περίληψη

Η εργασία παρουσιάζει τα αποτελέσματα της ανάλυσης δεδομένων οδικής ασφάλειας που συλλέχθηκαν στο πλαίσιο του ερευνητικού έργου "SaferAfrica – Innovating dialogue and problems appraisal for a safer Africa", με στόχο να υποστηρίξει τους υπεύθυνους χάραξης πολιτικής οδικής ασφάλειας και τους εμπλεκόμενους φορείς με στοιχεία αναφορικά με κρίσιμους παράγοντες κινδύνου, σχετικές δράσεις καθώς και ορθές πρακτικές. Το έργο χρηματοδοτείται από το πρόγραμμα έρευνας και καινοτομίας της Ευρωπαϊκής Ένωσης Horizon 2020. Για τα δεδομένα που συλλέχθηκαν, ανάπτυχθηκε ένα σύστημα οργάνωσης και ανάλυσης προκειμένου να παραχθούν δείκτες και να προσδιοριστούν κρίσιμοι τομείς και προκλήσεις ανά εξεταζόμενο θέμα και περιφέρεια της Αφρικής. Η ανάλυση των δεδομένων, που συλλέχθηκαν είτε από διεθνείς βάσεις δεδομένων είτε μέσω ερωτηματολογίων σε εκπροσώπους των χωρών της Αφρικής, οδήγησε στην ανάδειξη ορισμένων θεματικών πεδίων, τα οποία παρουσιάζονται μέσω ενημερωτικών δελτίων, προκειμένου να προσδιοριστούν οι προτεραιότητες για δράσεις και παρεμβάσεις ενίσχυσης της οδικής ασφάλειας. Η παρούσα εργασία περιγράφει τα βασικά αποτελέσματα της ανάλυσης δεδομένων οδικής ασφάλειας ανά ενημερωτικό δελτίο.

Λέξεις κλειδιά: *οδική ασφάλεια, SaferAfrica, παράγοντες κινδύνου, τομείς προτεραιότητας*

Abstract

The paper presents the results of the road safety data analysis, collected within the research project "SaferAfrica - Innovating dialogue and problems appraisal for a safer Africa", aiming to support policy makers and stakeholders with evidence on critical risk factors, related actions and good practices drawn from high quality data and knowledge. The project is funded by the European Union's Horizon 2020 research and innovation programme. A data organisation and analysis system was developed for the data gathered in order to produce indicators and define critical areas and challenges per assessed topic and region of Africa. The analysis of the data, collected either from international databases or via questionnaires in Africa, delivered certain thematic topics, in the form of fact sheets, for identifying priority areas for road safety actions and interventions. The paper outlines, per fact sheet, the basic results of the road safety data analysis.

Keywords: *road safety; SaferAfrica; risk factors; priority areas*

1. Introduction

In the European Union, during the past two decades, a substantial progress has been achieved in improving road safety and reducing traffic fatalities. This is not the case for Africa, where the number of road fatalities represents 31% of the relevant global figure. However, the most

disturbing concern in Africa, is that road trauma is expected to worsen further, with fatalities per capita projected to double from 2015 to 2030.

In order to improve road safety performance in African countries, many barriers need to be overcome. Among them stands the substantial lack of detailed knowledge on road casualties in terms of their number as well as associated factors leading to road accidents or affecting their consequences.

Europe could play an important role in supporting African countries to improve their road safety and traffic management performance. These considerations are addressed through the Horizon2020 research project "SaferAfrica-Innovating dialogue and problems appraisal for a safer Africa" aiming to create favorable conditions and opportunities for the effective implementation of road safety and traffic management actions in the African countries, by setting up a Dialogue Platform between Africa and Europe.

In many African countries road safety data are significantly missing or are not directly comparable due to under-reporting, different definitions of the variables, collection methodologies etc. Under this scope, road safety data, collected within the SaferAfrica project, were analysed in order to identify key risk factors affecting road safety in African countries.

More specifically, a data organisation and analysis system was developed for the data gathered in order to produce indicators and define critical areas and challenges per topic and region of Africa. On that purpose, data were mainly collected either from international databases (e.g. WHO, 2015; IRF - World Road Statistics, 2016; etc.) or via questionnaires distributed to national experts within the context of the SaferAfrica project, the input of which was found to be very useful. Moreover, in certain cases, preliminary results from the analysis of the data being conducted within other tasks of the SaferAfrica project were also exploited, in order to identify main road safety problems and particularities for specific countries and regions.

The analysis of the data in the African region based on the established literature related to road safety risk factors delivered the following thematic topics for developing knowledge and management tools in the form of fact sheets:

- Gender;
- Road user behaviour;
- Infrastructure;
- Vehicle;
- Post-crash care;
- Road Safety Management;

The current paper presents the results of the road safety data analysis in Africa, as highlighted through the above-mentioned thematic fact sheets, aiming to identify the priority areas for road safety actions and interventions.

2. Identification of Priority Areas for Road Safety Actions and Interventions

2.1 Gender Fact Sheet

A key aspect that should be taken into account in road safety analyses is road users' gender. Globally, it has been proven that males are more likely to be involved in road crashes than

females (WHO, 2015). This is based not only on higher exposure of male road users, but also on a riskier driving behaviour developed too often.

About three quarters (73%) of all road traffic deaths occur among young males under the age of 25 years who are almost 3 times as likely to be killed in a road traffic crash compared to young females (Figure 1). Unfortunately, Africa bears the biggest burden of them all (Remacle et al., 2018).

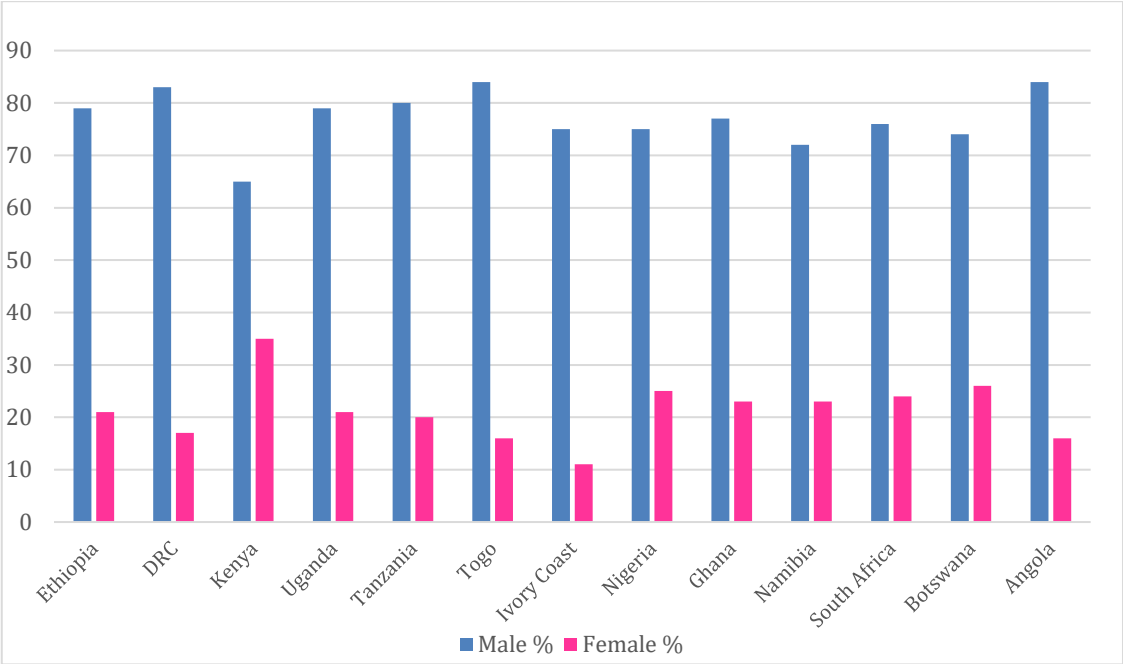

Figure 1: *Fatalities by gender according to national authorities of African countries (WHO, 2015).*

Women on the other hand, have been found to spend a greater share of their disposable income on public transport than men do, while if public transport is not accessible, walking is the most common mode of transport. A study in Uganda showed that women spend as much as 29% of their income on public transport. (Kamuhanda and Schmidt, 2009).

This concern is further evidenced by documentation on the percentage of females that die in road crashes as passengers and pedestrians. In South Africa for example, according to the RTMC data (2015), 77% of pedestrian fatalities were females, while only 23% of them were males. On the contrary, the percentage of female drivers killed in road accidents was much lower than 10% (Figure 2).

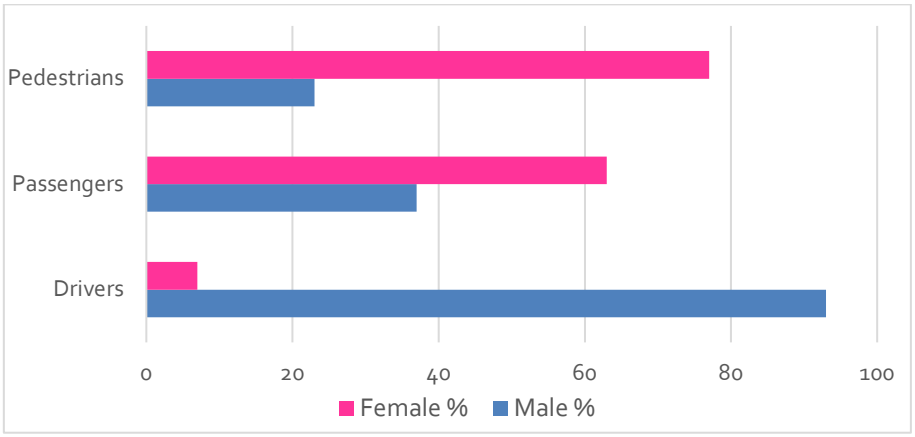

Figure 2: *Fatalities by gender and road user type in South Africa (South Africa RTMC, 2015).*

2.2 Road User Behaviour

The key risk factors identified in this topic, concerned speed, alcohol, helmet use, seatbelt use and child restraint use, which were explored by using available data on Safety Performance Indicators (SPIs), as well as legislative and traffic law enforcement information (Talbot and Welsh, 2018).

Although road safety concerns all road user groups, the risk of injury in a crash is greater for the more vulnerable ones: pedestrians, cyclists and powered 2- or 3-wheelers. The distribution of road fatalities among the different road user types varies among the African countries, with some of them differing greatly from the average, especially when considering specific road user types. As shown in Figure 3, the highest percentage of 4-wheelers' fatalities were recorded in Libya and the Democratic Republic of Congo (71%), while the highest percentages of pedestrian fatalities were recorded in Seychelles (75%) and Egypt (59%).

Most available data on safety devices use concerned seatbelt and helmet wearing rates, which vary greatly among the countries. Data on the drivers exceeding the BAC limits while driving were not available, while data on the percentage of alcohol related road fatalities were available only for eight African countries. Three of these countries have shown high percentages of alcohol related road deaths, however, the low percentages for the remaining countries may be attributed either to general low alcohol consumption because of law prohibitions and/or religious practices or to under-reporting. Furthermore, only three countries had available data on speeding, in which more than 50% of drivers were found to drive above the legal speed limits. No related data for the use of child restraint systems were available.

Except for child restraints systems, a large proportion of countries have established legislation concerning the aforementioned key risk factors. Since the existence of traffic legislation cannot by itself deter road traffic violations and contribute to an overall better road user behaviour, the assessment of traffic law enforcement was also considered in the examination of the impact of the risk factors in Africa. In general, the enforcement is assessed as low in most African countries, with enforcement of seatbelt use being highest, followed by the respective for helmet wearing, speeding and lastly drink-driving.

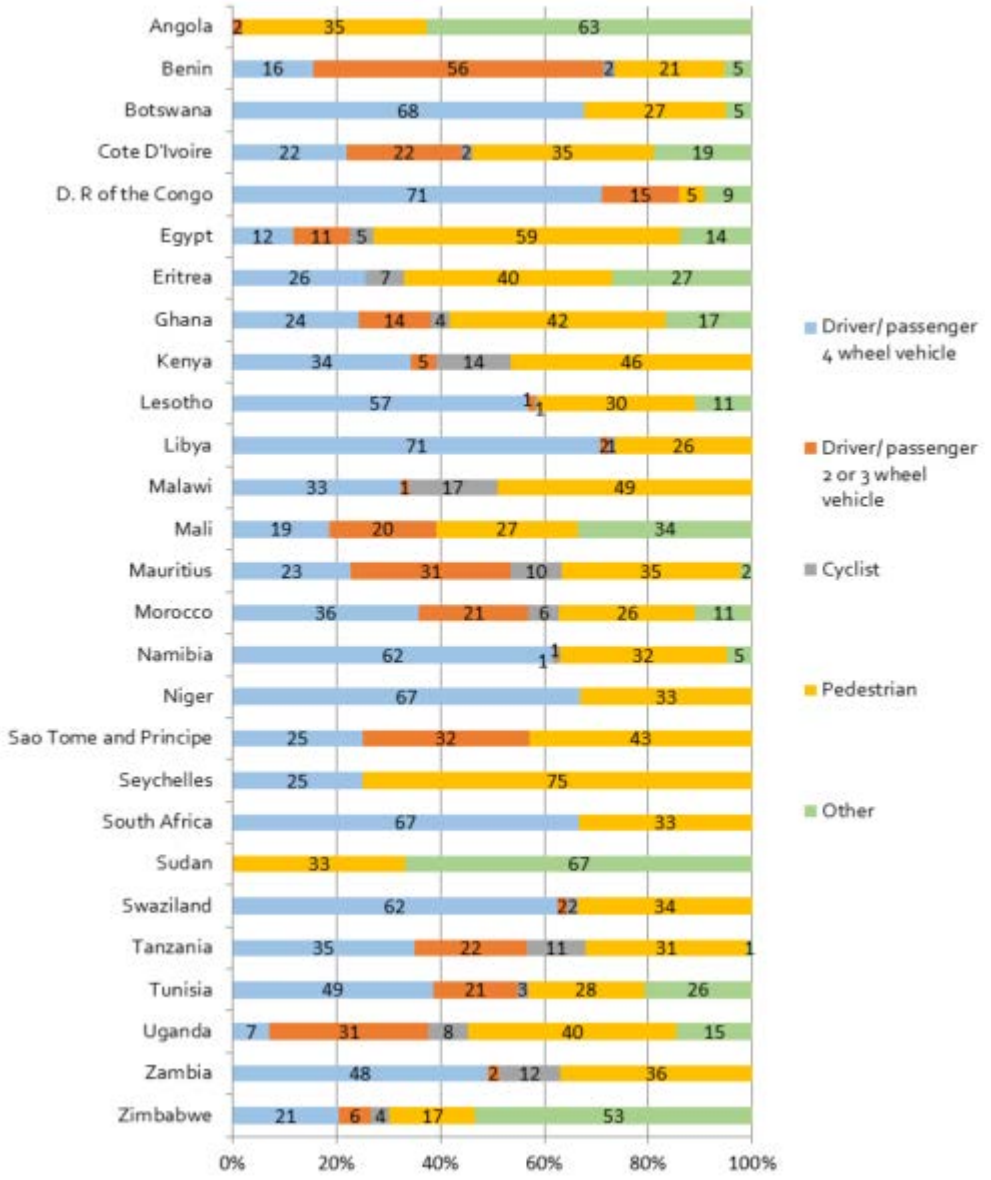

Figure 3: *Fatalities by road user type and transport mode for 27 African countries (WHO, 2015).*

2.3 Infrastructure

The identification of the related to infrastructure risk factors was pursued through both macroscopic (country level) and microscopic (infrastructure element level) analyses (Yannis et al. 2018). Macroscopic analysis was conducted by exploiting data from the WHO report (2018) and IRF-WRS report (2016), while the microscopic analysis was based on technical reports and concerned examples for specific countries.

Figure 4 presents the road network density as well as the percentage of paved roads in total road network in the African regions. Northern African countries have the highest percentage of paved roads, while Eastern Africa has the densest road network.

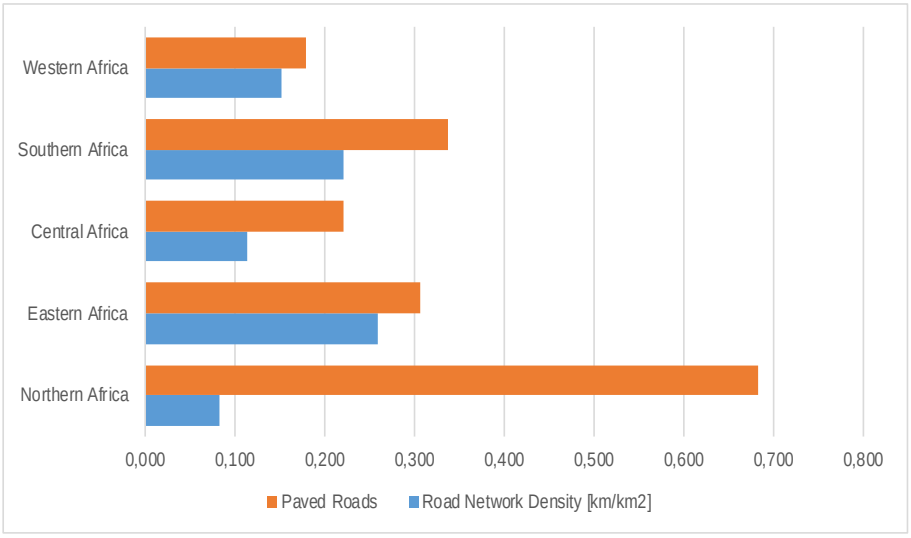

Figure 4: *Road network density and percentage of paved roads in African regions (IRF-WRS, 2016).*

Regarding road type, there is some inconsistency, as some studies suggest that highways are associated with more injuries, whilst other studies show that rural roads are more dangerous. Moreover, when the WHO mortality data were exploited, a strong declining trend was present when examining the relationship between fatality rates and percentage of paved roads. It should be noted, however, that the vast majority of African countries have less than 40% of their roads paved. A weak but existent relationship between road network density and fatality rates in Africa was also found.

Although some research has been carried out on infrastructure risk factors and road safety, the major issue identified is the absence of appropriate data. This is observed mainly by the fact that many technical reports propose guidelines based on international studies, without having previously evaluated the suggested risk factors and countermeasures in the African context. Additionally, no specific infrastructure risk factors for vulnerable road users could be identified, since no related data or published studies were available.

2.4 Vehicle

In order to identify risk factors related to vehicle in Africa, the indicator used was the Vehicle Killing Potential (VKP) or traffic fatalities per 1000 vehicles (Fernandez et al., 2018). The span of its values is particularly high, from 0.34 fatalities/1,000 vehicles in Mauritius to 65.3 fatalities/1,000 vehicles in Somalia, reflecting the great variability both in motorization level and vehicle safety among African countries. In order to compare the results, the respective values of the VKP indicator for several European countries are also presented in Table 1.

Table 1: *VKP (fatalities per 1,000 vehicles) in European countries (WHO, 2015)*

Country	VKP
Switzerland	0.047
Sweden	0.047
United Kingdom	0.051
Norway	0.052

Both vehicles per 1,000 inhabitants and VKP show a great variability among the African countries. Figure 5 shows graphically the relationship between the two indicators. At regional level, the VKP is lower in the countries of Northern and Southern Africa compared to those in the Western, Central and Eastern African regions.

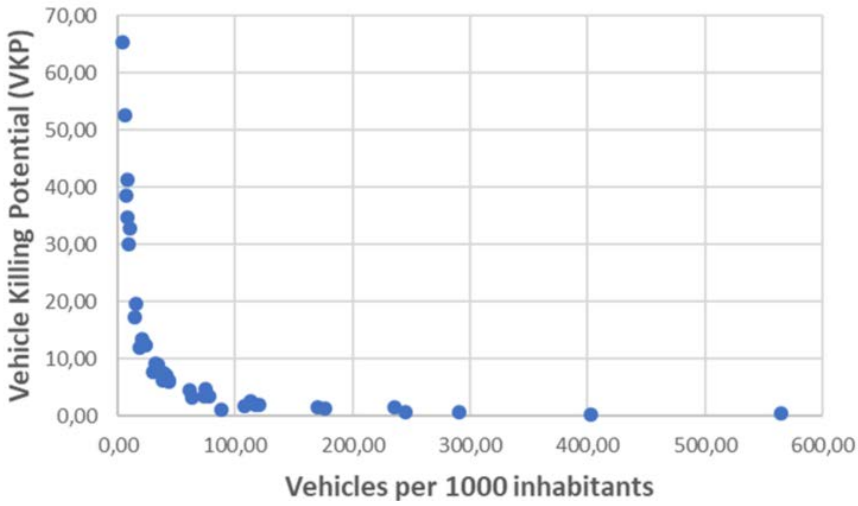

Figure 5: *Vehicle's Killing Potential versus vehicle rate per population (WHO, 2018).*

It was also found that the VKP has a relationship with the GNI, with the countries with GNI higher than 2,000 USD presenting lower VKP. However, relationship was not identified between VKP and the structure of the fleet in terms of type of vehicles. Possible relationships are also recommended to be examined between VKP and fleet age, when data are available. Furthermore, data concerning the suitability of the vehicles in the different stages of their life would be useful to be gathered and further analysed.

2.5 Post-crash care

Concerning the identification of risk factors related to post-crash care, key performance indicators within the four domains of post-crash care management (i.e. emergency care management, incident management, cost management and rehabilitation) were explored by exploiting data form international databases (e.g. WHO, 2018) and literature findings (Kluppels and Delhaye 2018).

Although most African countries are gradually developing or have already developed medical health infrastructure (from sanatoria, over small local or regional hospitals to university

hospitals) the post-crash care is still poor, with ambulance services being available only in cities, most caretakers not being specialized and having access to limited resources only. Additionally, in rural areas, the road infrastructure and the more isolated situation makes it almost impossible in some cases to develop a well-organized emergency system.

In almost half of the countries the percentage of traffic victims being transported by ambulance is lower than 11%, while in most African countries injured persons may be transported to hospitals by either volunteer drivers or police. Transport of injured victims to medical institutions and professional care is in some cases achieved with the use of motorbikes. On that purpose, in some countries first-aid courses are mandatory in schools or are a prerequisite to get a drivers' license. This type of training could be improved for specific professionals, like truck and bus drivers as well as police officers, who are more frequently confronted with accidents.

While bystanders could give the necessary first aid care, it is also important to improve professional care. Therefore, based on data availability per country, the number of medical specialists per 10,000 inhabitants was exploited, split in three kind of specialists: surgical workforce, physiotherapists and occupational therapists. Figure 6 shows the surgical workforce per country.

Moreover, one national number to get the right services (that also coordinates the different emergency services, such as police, ambulances and fire departments, is a necessity and could improve the current situation.

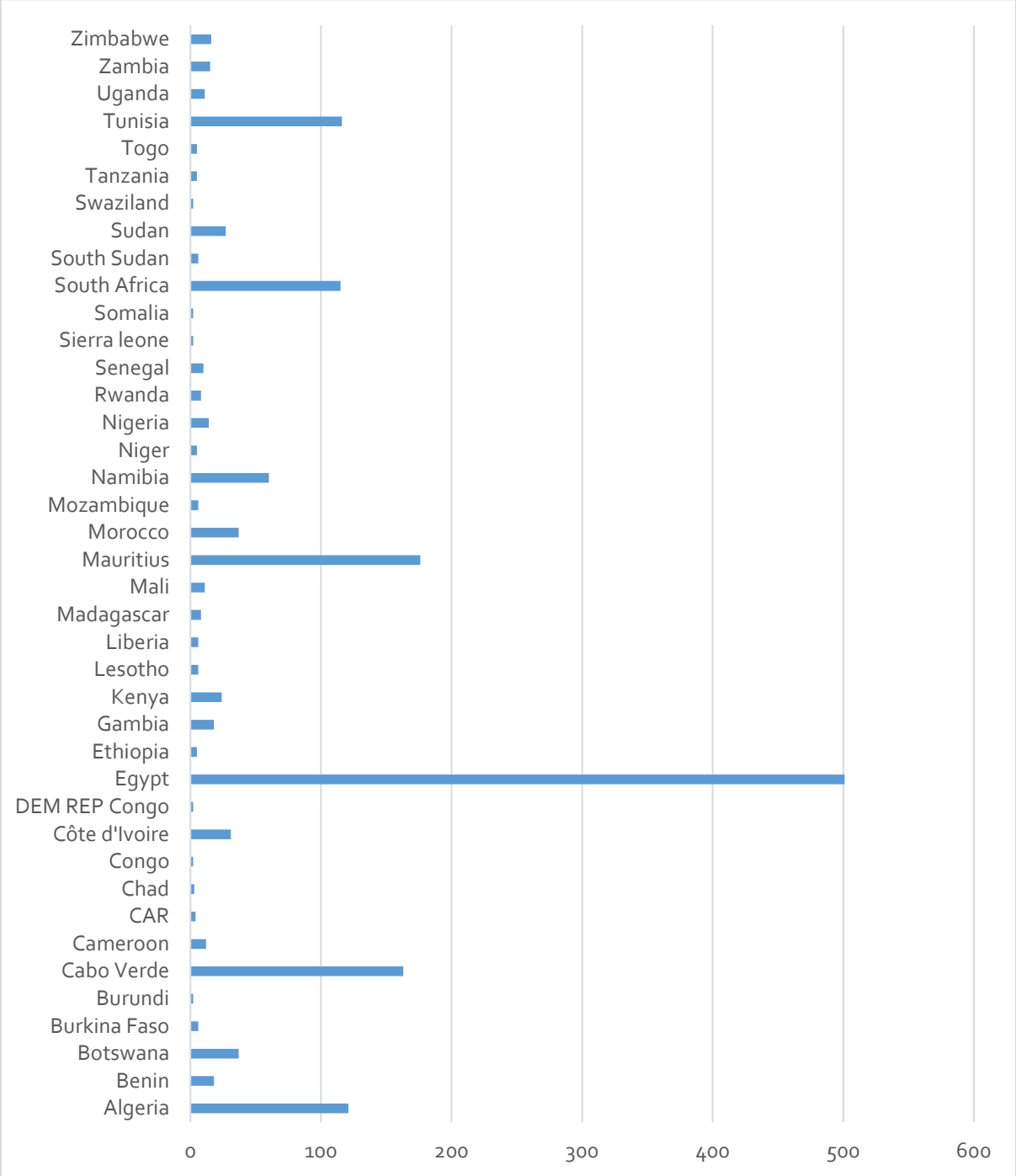

Figure 6: *Surgical workforce by country in Africa (WHO, 2015).*

2.6 Road Safety Management

The existence of a lead agency, the mobilization of resources, the access to good data and information recording are considered crucial issues for achieving better results on road safety performance. The assessed road safety management indicators can be seen through Figure 7.

From the data gathered and the analysis that followed (WHO, 2015; WHO, 2013; Economic Commission for Africa, 2017; Small and Runji, 2014), it was shown that the African countries have good performance concerning the establishment and the strengthening of a lead agency and some management and evaluation tools exist already (Carnis and Mignot, 2018). However, some weaknesses were identified, such as the partial or the lack of a dedicated funding for the implementation of road safety strategies and a poor system for data registration and monitoring road safety performance.

Consequently, the improvement of the road safety situation requires a true political commitment coming from the top of government, the implementation and the intervention of a leader agency and a national road strategy resting upon accurate data as far as possible.

Road Safety Management	Established or strengthening of lead agency					Improved Management of Data	
	A lead agency is present	The lead agency is funded	National Road Stratégy (NRS) present	Funding available to implement NRS Strategy	Fatality reduction target	Registration of total number of vehicles	Good death registration data
Algeria							
Angola							
Benin							
Botswana							
Burkina faso							
Burundi							
Cameroon							
Cabo Verde							
Centr. Afric. Rep.							
Chad							
Comoros							
Congo							
Côte d'Ivoire							
D.R. of the Congo							
Djibouti							
Egypt							
Equatorial Guinea							
Eritrea							
Ethiopia							
Gabon							
Gambia							
Ghana							
Guinea							
Guinea-Bissau							
Kenya							
Lesotho							
Liberia							
Lybia							
Madagascar							
Malawi							
Mali							
Mauritania							
Mauritius							
Morocco							
Mozambique							
Namibia							
Niger							
Nigeria							
Rwanda							
Sao Tome and Principe							
Senegal							
Seychelles							
Sierra Leone							
Somalia							
South Africa							
Sudan							
South Sudan							
Swaziland							
Tanzania							
Togo							
Tunisia							
Uganda							
Zambia							
Zimbabwe							

Note: Green: yes (data 2015); Light green: yes (data 2013); Red: no; Orange: partially; no colour: no information.

Figure 7: *Road Safety Management indicators in African countries (WHO, 2015; WHO, 2013; Economic Commission for Africa, 2017).*

3. Discussion

Road safety in Africa is poor and is expected to worsen further. Besides lack of knowledge on road casualties in terms of their number as well as on associated factors leading to road accidents, a serious deficiency of road safety data is also perceived. Even when data are available, data are not always comparable among the countries due to different definitions of the variables, collection methodologies etc.

In every case, safety data should be enhanced through additional data and indicators, which may be available at the individual country level but are not currently published (e.g. exposure data, road safety performance indicators, road safety management, etc.). Finally, data should be analysed to provide a factual appraisal of road safety levels in Africa, to reveal critical issues and to indicate priority areas with high potential for road safety improvements. Reliable and accurate data are a fundamental prerequisite to understand the magnitude of road safety problems in Africa and convince stakeholders to take proper actions. Data are also needed to identify problems, priority areas and mostly risk factors in order to formulate strategies, set targets and monitor performance.

The present research aimed to analyse all available road safety data, coming from either international databases or dedicated questionnaires distributed within the context of the SaferAfrica project, in order to identify the key risk factors. These risk factors concerned the following topics: Gender, Road user behavior, Infrastructure, Vehicle, Post-crash care and Road Safety Management.

The data analysis allowed for the identification of priority areas for road safety action and intervention in each region, with emphasis being given on those with high road safety improvement potential. On that purpose for those risk factors that sufficient data were available, further analyses were performed for the African regions.

The results of the analyses were published in the form of thematic fact sheets. The thematic fact sheets can serve as a tool for the comparative assessment of the road safety level in African countries. Moreover, their systematic update in the future is expected to contribute to the monitoring of the evolution of road safety performance in these countries and fulfil the needs of the various users of the SaferAfrica Dialogue Platform.

Acknowledgements

The present research was carried out within the research project “SAFERAFRICA - Innovating Dialogue and Problems Appraisal for a Safer Africa”, which has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 724029.

4. References

International Road Federation, IRF (2016). World Road Statistics 2016.

World Health Organisation, WHO (2018). Global status report on road safety.

World Health Organisation, WHO (2015). Global status report on road safety.

Remacle E., Sanon C., Aketch S. (2018). Thematic Fact Sheet on Gender, European Commission.

Kamuhanda R. and O. Schmidt (2009). A Case Study of the Core Segment of the Public Transport Market of Kampala, Uganda. Transport Reviews, Vol. 29, No. 1, pp. 129-142.

Road Traffic Management Corporation, RTMC (2017). Road Fatality Report for 2017. Arrive Alive, South Africa.

Talbot. R. and R. Welsh (2018). Thematic Fact Sheet on Road User Behaviour, European Commission.

Yannis G., S. Mavromatis, A. Laiou, A. Theofilatos, K. Folla (2018). Thematic Fact Sheet on Infrastructure, European Commission.

Fernandez E., V. Sogodel, J. Wismans (2018). Thematic Fact Sheet on Vehicles, European Commission.

Kluppels L. and A. Delhaye (2018). Thematic Fact Sheet on Post Crash Care, European Commission.

Economic Commission for Africa, African Development Bank Group, African Union Commission (2017). African Statistical Yearbok / Annuaire Statistique pour l'Afrique, 357 p.

Road safety in the WHO African Region – The Facts (2013).

Small M. and J. Runji (2014). Managing Road Safety in Africa. A Framework for National Lead Agencies, SSATP Africa Transport Policy Program working paper n° 101.

Carnis, L. and D. Mignot (2018). Thematic Fact Sheet on Road Safety Management, European Commission.

Folla K., Theofilatos A., Laiou A., Mavromatis S., Yannis G., Zammataro S., Gonzalez C., Welsh R., Talbot R. K., Fernandez E., Sogodel V., Wismans J., Kluppels L., Carnis L., Mignot D., (2018). Data analysis and identification of risk factors, Deliverable, European project "SaferAfrica", WP4 " Pan-African Road safety knowledge and data centre", Deliverable 4.3.