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An Evaluation of the "Road Accident Injury Report" System in the Kingdom of Bahrain: Health System & Policy Implications

A Thesis Submitted in Partial Fulfillment of the Requirements for the Master's Degree in Health Policy and Population Studies

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Abstract

Road Traffic Injuries are one of the ten leading contributors to the global burden of disease and injury. Road safety is of prime concern to many individuals, groups and organizations, all of whom require data and evidence. While different users have different data needs, reliable, valid data & evidence are essential for describing the burden of road traffic injuries, assessing risk factors, developing and evaluating interventions, providing information for policy-makers and decision-makers, and raising awareness. Without reliable information, the priorities for road traffic injury prevention cannot be rationally or satisfactorily determined.

It was in this context that this study was undertaken. Its hypotheses and objectives were related to the performance, design and utilization of one component of the RTI data collection system Road Accident Injury Report (RAIR) in the Kingdom of Bahrain.

A cross sectional descriptive study design, including both qualitative (direct observation techniques, and semi-structured interviews of relevant physicians) and quantitative components, was used to examine the validity and reliability of RAIR and its utilization practices. Together, the study methods revealed problems in both validity and reliability of the form, as well as confusion among stakeholders about its purpose; frustration with its limitations, and lack of clarity for "injury severity" classification. The observation revealed issues for further inquiry; under reporting, problem with storage and retrieval, and problems of urgency in classification & quality compliance of key stakeholders.

In conclusion the RAIR is lacking in validity and reliability as a source of data, because of that, there are limitations to what it can offer to the development of injury prevention and mitigation initiatives.

Glossary of Terms

ABBREVIATION	MEANING
CARE	Community Database on Accidents on the Roads in Europe
CPR	Central Population Register
ESR	Emergency Service Report
IRTAD	International Road Traffic Accident Database
MOH	Ministry of Health
MOI	Ministry of Interior
OECD	Organization for Economic Cooperation and Development
RAIR	Road Accident Injury Report
RTI	Road Traffic Injury
STRADA	Swedish Traffic Accident Data Acquisition system
WHO	Word Health Organization

1 Introduction

Historically, motor vehicle "accidents" have been viewed as random unfavorable events that happen to others, and as an inevitable outcome of road transport, (Loimer, 1996). The term "accident" can give the impression of inevitability and unpredictability – an event that cannot be managed, or prevented. They are better described as "crashes", to denote something that is an event or series of events, amenable to rational analysis and remedial action. While the risk of a crash is relatively low for most individual journeys, people travel many times each day, every week and every year. The sum of these small risks is considerable. Many countries, however, put far less effort into understanding and preventing road traffic injuries than they do into understanding and preventing disease that do less harm.

1.1 Background of the Problem

A road traffic injury (RTI) is any injury due to crashes originating, terminating or involving a vehicle, partially or fully, on a public highway, (WHO, 1992). Worldwide, 1.2 million people are known to die in road accidents every year, and more than 3000 people die from road traffic injury every day, while the number injured, may be as high as 50 million, with some 5 million suffering permanent disabilities. Such figures regularly attract less media attention than other, less frequent but more unusual, types of tragedy.

In terms of the World Health Organization's list of leading contributors to the global burden of disease and injury; road traffic injuries ranked "ninth" in 1990, but by 2020, will rank "third", as seen in Appendix 1. It is estimated that at that time, such a contribution will account for about 2.3 million deaths per year, almost double the current mortality burden of 1.2 million deaths. Ninety per cent of these deaths are expected in "less motorized countries", as seen in Appendix 2.

1.1.1 Global Trends in morbidity and mortality

In 2002, the overall global road traffic injury mortality rate was 19.0 per 100 000 population. The rate was lower, at 12.6, in high-income countries and higher, at 20.2, in low and middle- income countries. Rates were lowest in the high- income countries of Europe, averaging 11.0, falling to 4.5 in the United Kingdom. The rates were highest in the low and middle -income countries of the Africa and Eastern Mediterranean Regions, averaging 28.3 and 26.3 per 100 000 people respectively, (WHO, 1992). The vast majority – 90% – of road traffic deaths were in low-income and middle-income countries.

Although the number of road traffic injuries has continued to rise in the world as a whole, time series analysis reveals that road traffic fatalities and mortality rates show clear differences in the pattern of growth between high-income countries on the one hand, and low-income and middle-income countries on the other, (Murray CJI et al, 1996). In general, since the 1960s and 1970s, there has been a decrease in the numbers and rates of fatalities in high-income countries such as Australia, Canada, Germany, the Netherlands, Sweden, the United Kingdom and the United States of America. At the same time, there has been a pronounced rise in numbers and rates in many low and middle-income countries. Furthermore, during the one-year period between 1999 and 2000, the burden due to injuries globally increased from about 12% to 15%, and is expected to rise even further. By the year 2020, and if current trends continue, the annual numbers of road traffic deaths and disabilities in high-income countries, may have *decreased* by as much as 30%. This will be due largely to their continuing efforts to improve road safety. At the same time, the annual numbers of road traffic deaths and disabilities may have *increased* globally by 60%. That is, the annual numbers of deaths and disabilities will have *increased* in low and middle-income countries enough to account for the entire 60% increase globally and, also, to cancel out the global impact of the decrease in high-income countries. Moreover, the majority of such deaths is likely to occur among "vulnerable road users" – pedestrians, pedal cyclists and motorcyclists, whereas in high-income countries, deaths among car occupants will continue to be predominant.

1.1.2 Trends in morbidity and mortality, Eastern Mediterranean Region

According to the World Health Report 2003, a total of 132 000 deaths occurred in 2002 in the Eastern Mediterranean Region because of road traffic accidents alone. In these countries of the Eastern Mediterranean Region, the risk of death and disability due to road traffic accidents generally increases with increasing per capita income. According to the available data, the risk of death due to road accidents in the Eastern Mediterranean Region ranges from about 8 deaths per 100 000 population in Yemen to 24 deaths per 100 000 population in Oman. Death rates per 10 000 vehicles are highest in the Syrian Arab Republic with 36 deaths per 10 000 vehicles and lowest in Bahrain with 3 deaths per 10 000 vehicles, (WHO, 1992). However, if these figures are compared with those of a developed country like the United Kingdom, which has 1.5 deaths per 10 000 vehicles, people in our region are more likely to die because of road traffic accidents.

1.1.3 Trends in morbidity and mortality, the Kingdom of Bahrain

In developing countries such as the Kingdom of Bahrain, motor-vehicle-related mortalities frequently exceed those of the industrialized nations of North America and Europe. Bahrain has a population of 0.7 million. (Appendix 3)

- In 2000, there were 7.70 deaths from road traffic injuries per 100 000 population (rates based on an estimated population, derived from 1991 census).
- In 2001, this death rate had increased to 11.53 deaths per 100 000 population. This translated into 53 deaths in that year (rates based on 2001 census).
- Drivers comprised the major fatality group (21), compared to 15 passengers and 17 pedestrians. Furthermore, 52% of driver injuries were in the age group, 15 to 30 years. A third of pedestrian casualties were under 10 years of age, (MOI, 2001).
- In 2002, a total of 1651 persons were injured or died in 42,089 accidents, (MOI, 2002).
- Of those, 65 persons died, 1173 persons had slight injuries and another 413 had serious injuries.

- In 2003, the corresponding figures were 71 deaths, 1596 suffering slight injuries, and 448 receiving serious injuries, (MOI, 2003).
- In 2004, the corresponding figures were 70 deaths, the slight injuries had increased to 3016, and 538 suffering serious injuries, (MOI, 2005).
- In 2005, the corresponding figures were increased to 83 deaths, 2912 suffering slight injuries, and 623 receiving serious injuries, (MOI, 2005).
- In 2006, the corresponding figures were increased to 87 deaths, 2919 suffering slight injuries, and 533 receiving serious injuries, (MOI, 2006).

1.1.4 Current and predicted burdens in developing and developed countries

While a decrease in deaths has been recorded in high-income countries, current and projected trends in low-income and middle-income countries foreshadow a large escalation in global road traffic mortality over the next 20 years and possibly beyond. Currently, there are two main models for predicting future trends in road traffic fatalities. These two models are:

1. The WHO Global Burden of Disease (GBD) project, (WHO, 1992) using health data;
2. The World Bank's Traffic Fatalities and Economic Growth (TFEG) project, (Kopits E, 2003) using transport, population and economic data.

Both predict a substantial increase in road traffic deaths if present policies and actions in road safety continue and no additional road safety countermeasures are put into place. The GBD model predicts the following scenario for 2020 compared with 1990 (WHO, 1992).

1. Road traffic injuries will rise in rank to sixth place as a major cause of death worldwide.
2. Road traffic injuries will rise to become the third leading cause of DALYs (disability-adjusted life years) lost.

3. Road traffic injuries will become the second leading cause of DALYs lost for low-income and middle-income countries.
4. Road traffic deaths will increase worldwide, from 0.99 million to 2.34 million (representing 3.4% of all deaths).
5. Road traffic deaths will increase on average by over 80% in low-income and middle-income countries and decline by almost 30% in high-income countries.
6. DALYs lost will increase worldwide from 34.3 million to 71.2 million (representing 5.1% of the global burden of disease).

According to the TFEG model predictions (Appendix 4), between 2000 and 2020, South Asia will record the largest growth in road traffic deaths, with a dramatic increase of 144%. If the low-income and middle-income countries follow the general trend of the high-income countries, their fatality rates will begin to decline in the future, but not before costing many lives. The model anticipates that India's rate will not decline until 2042. Other low-income and middle-income country rates may begin to decline earlier, but their fatality rates will still be higher than those experienced by high-income countries.

The predicted percentage decrease in deaths from 2000 to 2020 for high-income countries of 27% and the global increase of 67% in the TFEG model are similar to those of the GBD model. However, the models differ on the total number of deaths each predicts for 2020. The TFEG model suggests that there will be 1.2 million deaths, as against 2.4 million for the GBD model. To some extent, this difference is explained by a much higher starting estimate for 1990 in the GBD model, which is based on data from health facilities.

The international data presented show that at each country income level, there are significant differences among countries in the number of vehicles per capita and in fatalities per capita. A higher number of vehicles per capita need not imply an increase in fatality, and it is possible for people to live with fewer vehicles per capita and fewer fatalities per capita than the average rates seen at present. Projected trends are based on the averages of past trends. While existing scientific knowledge has not always been easily accessible for most countries, efforts are now being made to

collate and disseminate this information so that it can be fed into predictive models. It is feasible, therefore, to assume that low-income and middle-income countries will not follow the trends of the past and even that they could improve upon them. As a result, the projections of the World Bank and WHO may prove too high and low-income and middle-income countries may see much lower death rates in the future.

It has to be noted that both models have made a number of assumptions about the future and are based on scarce and imperfect data. Moreover, neither model can be expected to predict future reality precisely, as unforeseen factors will almost inevitably emerge.

Nevertheless, the underlying message from the projections is clear: should current trends continue and no intensified real efforts and new interventions be implemented, then many more deaths and injuries will be experienced from road traffic crashes in the future. Helping low-income and middle-income countries tackle the problem of road traffic injuries must be a priority, as these are the countries where the greatest increases will occur in the next 20 years.

1.2 Regional and International Initiatives.

1.2.1 The Eastern Mediterranean Region.

In recent years there has been growing realization of the escalating problem of road traffic injuries among countries of the region. A number of efforts and interventions are being undertaken by countries to tackle the issue at different levels. The involvement of leaders and politicians at key points, cannot be underestimated. For example, countries of the Eastern Mediterranean Region have been instrumental in putting forward road traffic injury prevention for discussion in the United Nations, His Majesty Sultan Qaboos of Oman assumed a leading role in this regard. Led by Oman, a number of countries took the opportunity of World Health Day to address the issue of road safety in the United Nations General Assembly, which passed resolution 57/309 on 22 May 2003. The resolution welcomed the WHO's decision to select *"Road Safety"* as the theme for World Health Day 2004, called for further discussions in the months ahead and requested the United Nations Secretary General to prepare a report, which was submitted in August 2003. (WHO, 2004).

At a national level, countries of the region are implementing a range of interventions in response to the growing number of accidents and resulting deaths and disabilities. High-level multi-sectoral committees and supreme councils for road safety have been formed in some countries. Policies and strategies are being reformulated in the light of increased focus on the problem. As a result many traffic laws are being reviewed and strengthened. However, surveillance and data remain insufficient.

In Egypt, in 1997, a national campaign for the prevention of road traffic accidents was organized by the Ministry of Health and Population, under the auspices of Her Excellency Mrs. Suzanne Mubarak, First Lady of Egypt. The campaign brought together the ministries concerned in an effort to raise public awareness on the importance of road safety. To ensure wider accessibility to emergency care, the Ministry of Health and Population issued a decree in the late 1990s that "Private and investment hospitals have to provide medical care, free of charge, to all emergency cases for the first 24 hours". Emergency Medical centers have been established along

Egypt's highways and side roads, with a maximum separating distance of 50 kilometers and some of these centers are equipped with operating theatres for minor surgery. A new traffic law has been introduced in the country, putting in place more stringent measures for road safety. The use of seat belts and helmets has become mandatory. Recently, a National Council for Traffic Safety was formed, comprising representatives from different ministries for optimal collaboration and coordination of efforts.

In the Islamic Republic of Iran, growing awareness of the seriousness of the problem has been reflected in a strengthening of the existing traffic related legislation. Fines have been increased up to tenfold. Law enforcement has been asserted by an increase in the number of trained traffic officers. Different sectors such as health, education, urban development and the municipalities are increasingly incorporating related areas of road traffic injury prevention into their programs. A close monitoring and surveillance system for mortality and morbidity due to road traffic injuries has facilitated program management and the development of effective interventions.

In Jordan, targeted interventions include: improving the training of traffic officers, strengthening legislation and enforcement, and the introduction of an active surveillance system. The Jordan Traffic Institute, affiliated with the Ministry of the Interior, recently published a comprehensive study on the magnitude of traffic accidents in the country.

Innovative traffic control measures have been introduced by the Government of Pakistan. A new cadre of traffic police called the Pakistan Motorway Policy (PMP) has been created. Better training and a higher rate of remunerations to PMP officers are contributing factors to the success of this venture. The PMP force is responsible for supervising the traffic on more than 2000 kilometers of highway. Its mandate also includes imparting education to drivers, pedestrians and commuters about road safety through various means.

In Saudi Arabia, King Faisal Specialist Hospital has taken the lead in road safety efforts with the formation of a special high level committee for road safety under the patronage of the Minister of the Interior. The committee brings together the

representatives of the supreme Authority for Developing Riyadh City, traffic authorities, King Faisal Hospital and Research Center and the WHO Regional Office for the Eastern Mediterranean.

In the United Arab Emirates, enforcement is strongly emphasized. In addition, the Department of Traffic Engineering and Road Safety in Dubai is developing a detailed strategy for road safety. Issues of legislation and regulations, enforcement, road engineering, awareness programs and ambulance and medical care are being addressed to help prevent avoidable deaths.

Despite these important achievements, there is a growing need to focus on more proactive, multi-sectoral efforts for effective and sustained prevention. But to preserve such a goal, good RTI data is necessary. As one of the major challenges related to the issue of road traffic injuries in the Eastern Mediterranean Region is the scarcity and poor quality of data. There is a great need for the establishment of a sound database and information system.

"Most countries still lack reliable, regularly updated, population based data on the major causes of morbidity and mortality. Cardiovascular disease, cancer, and injuries are still not covered by regular surveillance in the Eastern Mediterranean Region. Where data exist, poor reporting regulations and practices affect their quality and reduce the usefulness of national registries. Without such data, it is impossible to define health priorities accurately or design effective health systems, let alone assess their impact" (Wasim Maziak, 2006).

1.2.2 South-East Asia

1.2.2.1 Thailand

For decades road safety was a low priority issue in Thailand. There were sporadic law enforcement campaigns and public education. Then the alarming road casualties around the Thai New Year (13-15 April) and *Song Kran* festivals, achieved national experience through newspaper report.. This raised public awareness on road accidents and put pressure on politicians and bureaucrats for action. A 'New Year's resolution'

to bring down the toll of road accidents by 20% during the seven-day festivities, was taken by politicians..

A war room was set up, chaired by the Minister of the Interior and co-chaired by deputy ministers from other ministries. This was, by far, the strongest political initiative on road safety, leading to several laws enforcement activities throughout the country. Over 160 000 motorists were checked during the seven-day period for helmet use, seat belts and driving under the influence of alcohol.

Though the target of 20% reduction in casualties was not met, it clearly marked a new beginning. Immediately after the New Year festivities, a war room meeting was held, led by the Deputy Prime Minister who declared a long-term policy commitment for road traffic injury prevention. A series of war room meetings followed to formulate strategies and action plans. Seven months later, a cabinet resolution was issued endorsing the strategies and action plans covering law enforcement and other road safety issues.

All this did not happen overnight. It was the culmination of efforts by various partners over the previous decade. Back in 1992, a civic group of physicians, media persons and businessmen had formed a coalition against drunken driving. It first lobbied for amendment of the law to objectively define drunken driving. These small efforts over two decades highlighted road accidents and casualties. Although it was not strong enough to effect policy changes, it kept public attention focused on road safety. It also helped mobilize a critical mass of bureaucrats, academics and civic groups to promote safe roads. Gradually, a network of stakeholders was formed.

From 1997, the mass media was mobilized to highlight law enforcement and public education. Outdoor road safety campaigns became visible throughout the country, mobilizing public support for law enforcement against drunken driving.

In 1994, sobriety checkpoints were first set up on some Bangkok streets. Finally in 1999, sobriety checkpoints were set up on a larger scale. In 2001, the Ministry of Public Health mobilized public opinion using health statistics to highlight the number of casualties around the New Year and *Song Kran* festivals. The figures, presented on

a daily basis, succeeded in drawing media attention. Newspaper headlines, articles and editorials during and after the festivals did the rest. The media reports around the Thai New Year became an established practice and a warning for the government and the authorities concerned. (Ramaboot et al, 2004).

1.2.2.2 Malaysia

Malaysia has reduced its numbers of crashes and injuries by building highways specifically designed and reserved for motorcycles and mopeds and by requiring that they use daytime running lights.

1.2.3 Other Jurisdictions

Many countries have also been implementing road safety measures that address their own particular traffic problems.

Ghana has prevented many road traffic injuries by introducing rumble strips, speed bumps and other traffic calming measures on roads where pedestrians are common. Bogotá, Colombia, has reduced bus crash rates by providing dedicated bus lanes and convenient crossings for pedestrians at bus stops.

Injuries, and in particular those related to road crashes, are among the major causes of potential life years lost in Australia and other developed countries, and cost many billions of dollars each year. Prevention of traffic injury is thus a major priority for Public Health in Australia and requires a comprehensive approach involving a combination of environmental, legislative and educational strategies along with law enforcement.

Until recently, a substantial proportion of road safety measures in Australia have been developed by government and non-government agencies with relatively little active involvement of the community. There has been, however, increasing recognition that community participation is desirable as part of a comprehensive approach.

1.3 Research problem

Given the trends in morbidity and mortality, the need for national health and health care policies that address this specific health burden, is clear, as is the need for on-going assessment and evaluation of such policies. A first step in this process is to assess the quality of current instruments, through an appraisal of the data produced by their application, and an assessment of their authenticity. RTI data in the Kingdom of Bahrain is derived from two main sources (Appendix 5):

1- Ministry of Interior (MOI).
2- Ministry of Health (MOH).

1- MOI provides both general and specific data about road traffic incidents, fatalities and injuries, type of road users involved, age, sex and nationality of casualties, type of vehicles involved, police assessment of causes of crashes, environmental data, location and sites of crashes, prosecutions, and legal issues.

2- MOH provides specific data re fatal and non-fatal injuries, diagnosis, seriousness of injury and disposal, prognosis, age, sex and nationality of casualties, type of road users involved, length of stay at hospital, operation data, and costs of treatment. It is of interest, that MOI is the source of all the published road accident injury data in the annual health statistic book; as seen in Appendix 6.

The Road Accident Injury Report (RAIR) was designed to be the operational and central instrument of road traffic injury (RTI) data management in the Kingdom of Bahrain; used by both police officer on one hand, and ER physicians on the other, that is used to summarize the more specific data collected individually by these professionals. Its performance, in terms of validity, reliability, and relevance, has not been assessed.

1.4 Aim of the Study

To highlight the need for an enhanced quality of data on RTI's in the Kingdom of Bahrain, so as to better inform preventive and mitigation policies.

1.5 Research Questions

- Is the Road Accident Injury Report (RAIR), a valid and reliable instrument?
- Are the data compiled from the RAIR relevant, helpful, and appropriate for injury prevention and/or mitigation?

1.6 Research Objective

- To assess the validity and reliability of the composite RAIR instrument.

1.7 Research Hypothesis

- It is hypothesized that the RAIR is not a valid source of data for health policy development and assessment in accident injury.
- It is hypothesized that the RAIR is not a reliable source of data for health policy development and assessment in accident injury.
- It is hypothesized that the data compiled from RAIR can help in development of victim profile characteristics that are relevant to injury prevention and mitigation.

2 Literature review

The literature review consists of three principal components;

1- Review of current road traffic injury data-base systems.
2- Review of effective data linkage system.
3- Data issues and concerns.

2.1 Road Traffic Injury Database Systems

There are a number of approaches to collecting and collating data and evidence on road traffic injuries, (Holder Y et al, 2001). These approaches are organized as follows: injury surveillance systems, community surveys, and surveys on selected themes, (Department of Transport, 1998).

2.1.1 Injury surveillance systems

Most countries have some form of national system for aggregating injury data on road crashes using police records or hospital records, or both. However, the quality and reliability of data vary between surveillance systems in different countries and also between systems within the same country. Many developments have been undertaken to address the needs of standardization and reliability, for example, for road traffic injuries, certain key variables need to be collected. WHO, in its recently published *Injury surveillance guidelines*, makes recommendations for a minimum data set for surveillance of road traffic injuries in emergency rooms, (Holder Y et al, 2001) that include:

1- something to identify the person injured (probably not their name but a unique number);
2- age of the injured person;
3- sex of the injured person;
4- intent (e.g. whether the injury was unintentional or resulted from violence or self-harm);
5- place where the injury occurred;
6- nature of the activity or event being undertaken when the injury happened (e.g. swimming, driving),
7- mechanism or cause (e.g. traffic injury, drowning) and
8- nature of the injury.

This data set, comprising eight variables, is the recommended basic international standard data set for comparison among countries. There is also a core optional data set a surveillance system need not necessarily collect but may collect, if it is deemed useful and the system has the resources to collect and process it. Optional data may include such things as information on:

1- race or ethnicity of the person injured;
2- external cause of injury;
3- date of injury;
4- time of injury;
5- residence of injured person;
6- whether alcohol was a factor;
7- whether another substance was a factor;
8- severity of the injury and
9- disposition of injured person (e.g. was the injured person treated in hospital and then discharged or admitted to hospital)

It is advisable to include also an "incident summary" variable, which can be used to record what happened to the patient verbatim. This type of free-form variable is useful when validating the information collected.

Most high-income countries have well established injury surveillance systems. Recently, a number of low-income and middle-income countries have set up systems to monitor injuries, including road traffic injuries. Examples include Colombia (C. Clavel-Arcas, unpublished observations, 2003), El Salvador (C. Clavel-Arcas, unpublished observations, 2003), Ethiopia (Bartolomeos et al, 2003), Ghana (London et al, 2002), Jamaica,(Ashley et al, 2002), Mozambique, Nicaragua (C. Clavel-Arcas, unpublished observations, 2003), South Africa, (Butchart A et al, 2001) Thailand, (Santikam et al, 1999), and Uganda, (Kobusingye OC et al, 2000).

In addition to country-specific information systems, a number of regional systems exist. Countries belonging to the Organization for Economic Cooperation and Development (OECD), see Appendix 16, support and make use of the International Road Traffic Accident Database (IRTAD), see Appendix 17 to which they submit crash and injury data, together with some basic transport statistics and other safety-related information. (Gutoskie, 2003).

One of the principal mandates of the International Road Traffic and Accident Database (IRTAD) Operational Committee, when it first became operational in 1990, was to gather standardized traffic collision and exposure data among OECD member countries. This information was and continues to be used by program and policy makers to identify existing and emerging road safety problems and, if necessary, to help develop programs to curtail these problems, (Gutoskie, 2003).

In 1990, more than 154,000 road users were killed in traffic collisions in IRTAD member countries. Since that time, the level of safety has improved considerably. Road user fatalities have decreased by approximately 46% despite substantial increases in both vehicles in use (+25%) and population (+8%). The fatality rates in member countries have been more than halved on both a per registered vehicle and a per population basis. These changes were, in large part, the result of the development and implementation of road safety policies and programs in IRTAD member countries as well as improvements in vehicle design and roads infrastructure. Notwithstanding these positive trends, the rate of road safety improvements in many member countries has plateau in recent years. Efforts to resume the pace of road safety improvements require enhanced knowledge of road safety problems. More complete or

comprehensive traffic collision and exposure data are often prime sources of this expanded road safety knowledge.

The United Nations Economic and Social Commission for Asia and the Pacific has developed a regional road crash database known as the Asia-Pacific Road Accident Database, which, like IRTAD, requires countries in the region to submit data in a standard format. The Caribbean Epidemiology Centre has introduced an injury surveillance system in the Bahamas, Barbados, and Trinidad and Tobago.

Europe has its own regional system, known as CARE – Community Database on Accidents on the Roads in Europe – which differs from the other systems in that country data returns are mandatory. However, the system allows countries to make returns in their own national formats and it includes disaggregated data on individual crashes. After being received, the data are adjusted for variations in definitions. To this end, a number of correction factors have been developed (Brussels, 2003).

2.1.2 Community-based surveys

- A second approach to gathering data on road traffic injuries is to conduct community-based surveys. Some injured patients fail to reach hospital for a variety of reasons, in which case they will not be captured by hospital-based injury surveillance systems. Community-based surveys not only pick up these otherwise unreported cases, but also provide useful information on injuries and may be of particular relevance in countries where basic population and mortality data are not available, (Mock CN et al, 1999). Community surveys have been recently conducted in Ghana, (Sethi D et al, 2004). India, Pakistan, South Africa, Uganda and Viet Nam. These surveys, though, require methodological expertise which may not be widely available. Recognizing this reality, the WHO is currently developing *Guidelines for conducting community surveys on injuries and violence*, which will provide a standardized methodology for carrying out such studies, (Sethi D et al, 2004).

2.1.3 Surveys on selected themes

A third approach is to conduct surveys on particular themes related to road traffic injuries and transport. Examples include road-user surveys, road-side surveys, origin–destination surveys, pedestrian surveys, cyclist surveys and speed surveys – as well as studies on such issues as alcohol use and the cost of crashes. These surveys may arise from the need for specific data that are not available from hospital-based surveillance systems or community surveys.

For example, there is good evidence that the use of cycle helmets and child car seat restraints, provision of road crossing guards, and measures to redistribute traffic can reduce the rate and severity of childhood injuries due to RTA's. Educational programs by themselves appear to have little effect, (NHS, 1996).

- The most successful of Helmet promotion programs- the Seattle Children's Bicycle Helmet Campaign organized by Harborview Injury Prevention and Research Center- used multiple strategies and increased helmet wearing rates among children to more than 40%. These strategies included classroom education, discount purchase program, bike rodeos, distribution of printed material through a variety of venues, and intensive promotional efforts by sports leaders, bicycle clubs, and the media to increase children's helmet use, (IUHP, 1993).
- The experience of the state of Victoria, Australia, is of note. Prior to the introduction of legislation on the mandatory use of helmets, only 5% of cyclists reported usage. Two years after legislation, usage had reached 83% of cyclist, with a decreased in head injury incidence of 70%, (Cameron H M et al, 1994).
- Ekman R et al 1997 using community approaches, reported a 48% decrease in injuries during 1978-93 (head injuries 59%), in children under 15, for some intervention areas of Sweden, and Sweden as a whole, starting a program in 1987, showed a reduction of 32% in bicycle-related injuries (head injuries 43%).

- Use of child safety seats in the United States reduced the likelihood of fatal injury over the period 1983-1990 by an estimated 69% for infants and 47% for toddlers, (Agran P et al, 1987).

Finally, in response to studies that demonstrate the positive impact on injuries of traffic calming strategies, many countries have introduced such measures. Traffic calming is intended to reduce vehicle speed to about 20 miles per hour, which has been shown to reduce the number and severity of casualties to children crossing the road. In Sweden all traffic is banned in some neighbourhoods. There is no reason to think that a low death rate for children in the Netherlands and Sweden is due to some difference in national character. Rather it is due to the introduction of physical safety measures, (Preston B, 1995).

2.2 Effective data linkage systems

Road traffic injury data and evidence is collected and stored by a range of agencies. As seen in Appendix 7. This is in itself a positive feature, as it reflects the multi-sectoral nature of the phenomenon. However, it also raises important issues to do with harmonization, linkages, and access, between different data sources and users. Ideally, where there are a number of data sources available, it is important that the data should be linked, to obtain maximum value from the information. An example of the in-depth multidisciplinary crash investigation approach has been taken in Finland, where a center has been established.

Steered and supervised by the Ministry of Transport and Communications and maintained by the Motor Insurers' Centre and the Motor Traffic Insurers Committee (VALT), (Margie Peden et al, 2004). The Centre started in-depth crash investigation in 1968 and its 21 law-based investigation teams investigate about 500 mainly fatal crashes, at the scene of the crash, annually. Each team consists of police, a road safety engineer, a vehicle inspector, a medical doctor and sometimes a psychologist. Specific information is collected by each person and a combined report is produced on each case. In each case, more than 500 variables are collected on standardized forms. The

emphasis is placed on data that will contribute to crash avoidance and injury prevention. In addition, the teams have legal rights to access information from official and private records and health care systems to obtain human, vehicle and road information.

Coordinated data management systems do exist elsewhere, in a handful of countries. One such example is the United States of America. The National Automotive Sampling System combines information from four data systems:

1. the Fatality Analysis Reporting System,
2. the General Estimates System,
3. the Crashworthiness Data System and
4. the Crash Injury Research and Engineering Network.

All combine to provide an overall picture for policy-makers and decision-makers at the national level, (National Highway Transport Safety Administration, 1996).

The Swedish Traffic Accident Data Acquisition system STRADA was developed to integrate the registration of all traffic injury accidents into one database. The project was started in 1997 by the National Roads Agency in co-operation with the police, the health sector, Swedish Statistics and the local government association. By 2003 all police districts in Sweden used STRADA; however, the compliance of hospitals is less than desirable, due to priorities and costs. Many hospital owners want the road-sector to pay for traffic injury data from the hospitals. STRADA offers increased efficiency, and claims to protect the personal identity of traffic victims, an issue that has proven to be a significant challenge to its application, (Anders Langeland, 2004).

2.3 Data issues and concerns

2.3.1 Indicators

Indicators are important tools not just for measuring the magnitude of a problem but also for setting targets and assessing performance. Two very common indicators that attempt to address the issue of exposure to RTI's, are the number of deaths per 100 000 population, and the number of deaths per 10 000 vehicles. Both of these indicators have limitations regarding their reliability and validity that place restrictions on how they can be used and interpreted. For example, the number of deaths per 100 000 population is widely used with reasonable confidence to monitor changes over time in "personal risk" levels and to make comparisons between countries. Errors in population statistics are assumed to have little impact on the observed changes or comparisons, (Hilman M et al, 1990).

With "motorization risk" as an indicator in mind, the use of vehicle registrations is problematical, as there can be errors in country databases due to delays in adding or removing records of vehicles. Furthermore, changes in vehicle numbers do not generally provide a good estimate of changes in exposure to, and travel on, the road network, especially when making comparisons between countries. A better indicator of traffic safety risk is deaths per vehicle-kilometers, but this also fails to allow for non-motorized travel.

The measurement of exposure to the risk of road traffic injuries presents conceptual and methodological difficulties. That is illustrated by the experience in Malaysia. Since 1975 Malaysia has experienced a continuous decline in deaths per 10 000 vehicles, whereas the rate of deaths per 100 000 population has shown a slight increase. Over the same period, there has been a rapid growth in motorization and increased mobility among Malaysia's population. The opposing trends in the two indicators reflect the fact that road traffic fatalities have increased more slowly in Malaysia than the growth in the vehicle fleet, but that they have increased a little faster in recent years than the growth in the population.

More information is needed to understand how changes in mobility and safety standards have contributed to such trends.

Though road traffic injury statistics are used as measures of road safety, they are often inadequate and may even be misleading. This highlights the need for existing measures to be refined and new ones to be explored.

2.3.2 Definitions and standardization of data

There are a number of potential problems within the area of "definitions" relating to a road traffic death or injury, (Margie Peden et al, 2004). For example,

1- There may be a lack of precision, in terms of the criteria used in describing the nature of injuries, and their severity classification;
2- There may be variable compliance on the part of health professionals, in applying established criteria to clinical situations
3- There may be variable compliance on the part health professionals with regard to injury reporting;
4- There may be variable provision in terms of how criteria and guidelines are translated into reporting mechanism and systems;
5- There may be sub optimal use of quality management systems, (Holder Y et al, 2001)
6- There may be variability in not only nature and severity of injuries, but in ascribing causality.

For example, the most commonly cited definition of a road traffic fatality is: "any person killed immediately or dying within 30 days as a result of an injury accident", (Brussels, 2003). A recent study has revealed considerable variations in working definitions, however, within the European Union, Greece, Portugal and Spain use a time period of 24 hours, whereas France, uses 6 days, Italy, 7 days, and other countries use 30 days. To adjust for this variation, various correction factors are applied to arrive at a "30-day equivalent". Such factors, though, themselves introduce uncertainty as to what the real numbers would be at 30 days, (Mackay M, 2003)

There are a number of other definitional issues relating to the classification of an injury death as one caused by a road traffic crash, including:

1. the method of assessment;
2. the location of a fatal crash (i.e. whether on a public or private road);
3. the mode of transport (some classifications stipulate the presence of at least one moving vehicle);
4. the source reporting the data (i.e. whether police or a self-report);
5. whether or not to include confirmed suicides;
6. whether or not post-mortem examinations are routinely conducted on road traffic deaths.

Definitional issues also arise with regard to survivors of road traffic crashes, including:

- The actual definition and interpretation of a "SERIOUS" injury in different countries;
- Whether the police, who record most of the information, are sufficiently trained to ascertain and correctly assign injury severity.

In Finland, for example, a serious road traffic injury is considered to involve hospital admission or three days off work; in Sweden, it involves hospital admission as well as fractures, whether or not the patient is admitted; while in France, it involves a hospital stay of at least six days, (Mackay M, 2003). See Appendix 11, 12, and 13.

2.3.3 Underreporting

Underreporting of both deaths and injuries is a major global problem affecting not only low-income and middle-income countries but also high-income ones, (Leonard PA et al, 1999). For example, the United Kingdom, studies comparing hospital and police records suggest that some 36% of road traffic injury casualties are not reported to the police, (Mackay M, 2003). In addition, around 20% of incidents reported to the police remain unrecorded. In some low-income and middle-income countries, on the other hand, levels of underreporting can be as high as 50%, (Gururaj G et al, 2000). Underreporting can arise out of:

1. a failure on the part of the public to report;
2. the police not recording cases reported to them;
3. hospitals not reporting cases presenting to them;
4. an exemption for certain institutions, such as the military, from reporting directly to the police.

In some low-income and middle-income countries, underreporting may stem from the basic fact that some victims cannot afford to attend hospital. The problem of underreporting highlights a number of structural, methodological and practical issues affecting the quality of data collected on road traffic injuries, including:

- the coordination and reconciliation of data between sources;
- the harmonization and application of agreed definitions, especially the definition of a road crash fatality;
- the actual process of classification and the completion of data forms.

These problems make it difficult to obtain reliable estimates on road traffic fatalities and injuries world-wide.

3 Methodology

In addressing the issue of the validity and reliability of RAIR (see Appendix 18), it is necessary first to describe that instrument in details:-

3.1 Road Accident Injury Report RAIR:

This report as seen in Appendix 8 represents an intermediate instrument that transfers the doctor's diagnosis, opinion and medical information about an injured person, from an Emergency Service Report (ESR) to the General Directorate of Traffic report system. The RAIR consists of two sections:

Section One, This section is the responsibility of the police officer; and consists of two components;

- Component (1) deals with demographic data of the injured person involved in the accident such as name, personal identification number i.e. Central Population Register (CPR), age, gender, nationality, and address, and
- Component (2) deals with the details of the accident, such as seat belt usage, the role of the person involved in the accident (driver, passenger, or pedestrian), the location, date, time of the accident, the name of the reporting police officer and his identification number.

Section Two: This section is the responsibility of the Accident & Emergency Physicians and consists of five components;

- Component (1) : Severity of injury;

  1. MINOR or
  2. SERIOUS;

- Component (2) : Nature of injuries;

    1. wounds & contusions,
    2. fractures,
    3. joints & ligaments,
    4. "pose contusion" (Concussion),
    5. internal injuries,
    6. burns, and
    7. others.

- Component (3): Anatomical Site of Injury:

    1. head,
    2. spine,
    3. pelvis,
    4. neck,
    5. left hand,
    6. left leg,
    7. right hand,
    8. right leg,
    9. chest, and
    10. others.

- Component (4): deals with the management and outcome results of the accident, and includes the following three categories or choices:

    1. released from hospital after treatment;
    2. kept in Day Care Unit (DCU) under observation;
    3. admitted to hospital (specific ward number).

- Component (5): deals with information resulting to a fatal injury, and includes two categories:

    1. died before reaching hospital, and
    2. died in hospital.

3.2 Study Design

A cross sectional descriptive study design, including both qualitative and quantitative components, was used to examine the validity and reliability of RAIR, and its utility/ relevance to injury prevention and mitigation.

A strong case can be made for using such an approach, for when investigating human behaviors and attitudes, a variety of data collection methods has proven to be very fruitful, (Patton, M.Q. 1990). and can increase both the validity and reliability of data. Data collected through quantitative methods are often believed to yield more reliable, objective and accurate information because they are collected through standardized methods that can be replicated. Further, the data can be analyzed using sophisticated statistical techniques, (Joy Frechtling et al, 1997). Quantitative researchers, however, and especially in the use of surveys, are becoming increasingly aware that some of their data may not be accurate and/or valid, because for example, some survey respondents may not understand the meaning of questions to which they respond, and because people's recall of even recent events is often faulty. On the other hand, qualitative researchers have developed better techniques for classifying and analyzing large bodies of descriptive data. It is also increasingly recognized that all data collection - quantitative and qualitative - operates within a cultural context and is affected to some extent by the perceptions and beliefs of investigators and data collectors.

3.3 Data Collection

3.3.1 Qualitative Component of the study:

Two kinds of qualitative studies were undertaken.

- First, the context in which MOI and MOH professionals recorded and used traffic injury data, was explored through direct observation techniques.
- Second, the face and construct validity was explored through semi-structured interviews of relevant physicians.

- **The Context**

- Direct Observation;

Victims of road traffic accidents were observed as follows;

- One victim was involved in a Fatal Accident.

Attention was paid to the reporting methods used by the police officer in recording the nature and outcome of the accident, as well as details of context e.g. conditions under which reports were being written, time outlines, etc.

- A second road traffic victim was observed in the emergency treatment room at Salmaniya Medical Complex (SMC).

Specific note was taken of how police officers and physicians recorded accident data (Appendix 9);

- by observing the police officer and physicians in action, including their description of the nature of the accident and the seriousness of injury;
- by observing how this data was transferred into the Police and Hospital reporting systems;
- by taking note on areas of registration weakness if any, and opportunities for improvement.

- **Face and Construct Validity**

Semi-structured interviews were conducted with emergency room (ER) physicians, with specific emphases on the purpose, structure and function of the RAIR.
A template of key questions and probes was designed (Appendix 15). The main components were as follows:

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1- Demographics of the Respondents.
2- Purpose of Road Accident Injuries Police Report.
3- Structure of the Report.
4- Physician's Comments, Concerns, and Suggestions.

The template was first tested with five physicians in April 2005, and minor adjustments were made. The model was then implemented over a period of one month with 15 physicians, selected because of their raised experience in using the RAIR, and including, the Chief of Accident and Emergency Services.

Each interview lasted some 10 minutes, and detailed field notes were made of the physician responses, as well as interactions that occurred between physicians and police officers regarding the completion of reports.

3.3.2 Quantitative Component of the Study:

All data from RAIR during the 17 month period in the Kingdom of Bahrain from 1st of January 2004 till 31st May 2005, for all injuries treated at Salmaniya Medical Complex (SMC), were entered directly using statistical package of social science SPSS . Also the corresponding information derived directly from the Emergency Service Report ESR (see Appendix 10) was entered separately using SPSS.

3.3.2.1 Study Population

The study population of interest consists of those suffering road traffic accident injuries in the Kingdom of Bahrain during the period 1st January 2004 to 31st May 2005 managed at SMC. Victims managed at other hospital in the kingdom were not included.

3.3.2.2 Sampling Method

A systematic random sampling method was used to withdraw a random sample from the sampling frame given in table 1. The sampling frame was derived from Health Information Directorate (HID) data. A systematic random sample of size 263 was taken from the total population of 7812 (total number of road traffic injuries reaching SMC from1st January 2004 to 31st May 2005), representing 3% of the study population.

Table 1: The total Number of road traffic injuries reaching SMC as they appeared in the Health Information Directorate computer system, Ministry of Health

Year	Month	Number
2004	January	423
	February	475
	March	441
	April	351
	May	434
	June	453
	July	452
	August	434
	September	450
	October	462
	November	512
	December	498
2005	January	527
	February	393
	March	456
	April	480
	May	571
Total		**7812**

3.4 Data Analysis

3.4.1 Qualitative Data

Data from all qualitative study components were processed in a similar manner, using three elements of analysis;

1- Data Reduction: Data from both observation and interviews were repeatedly examined and reviewed, resulting in increasinlly clear and focused concepts and illustrations.

2- Data Display: The templates used in designing the interviews were used as an intermediate means of representing and transforming data.

3- Conclusion Drawing and Verification, (Miles et al, 1994)

3.4.2 Quantitative Data

The collected data were entered and analysed using the Statistical Package for Social Sciences SPSS version 14.0. Relevant descriptive statistics including means, standard deviation and frequency tables were obtained. The Reliability Coefficient Cronbach Alpha; was used to measure the reliability of RAIR. A series of Chi-square tests were used to test the association between injury severity and selected items of the RAIR. A test with P-value < 0.05 was considered statistically significant.

4 Results

4.1 Qualitative Data Results

4.1.1 Observation Logs

LOG 1: OBSERVATION OF A FATAL ACCIDENT

Monday 21st November 2005.
8:40am

I received a call that an accident had occurred at 8:30 am in the Diplomatic area near the Islamic Bank of Bahrain, specifying that a Death Accident had occurred at that location, this was in agreement with previously arrangement that was made to clear purpose and role of my presence at the scene of the accident with Ministry of Interior. I asked the Operations Room Officer for the name of the contact officer at the scene of the accident and was given his name. When asked if he would be notified of my arrival, I was advised to ask for the officer, at the location.

9:05am

Fortunately, I was at work in Manama; I left a meeting and rushed to the accident area. Roads were crowded and I had to call my Secretary, enlisting her assistance on directions on the best and quickest way to reach the site of the accident. I managed to park on a footpath. A traffic police officer was issuing tickets to people who were disobeying the law. I requested him not to give me a ticket as I had come to attend to the accident in that area.

From a little distance, I could observe a number of details; at the scene of the accident, two policemen were putting sand on the road near the traffic light, markers had been placed on the road, (one arrow indicating the site and direction of movement of the car, and a further arrow at a right angle to the first arrow, with a cross with

writing on it (area of falling down in Arabic); sand and blood marks were seen at an angle of 45 degrees, to that cross; a photographer was recording site details.

At the accident location, five police officers were in attendance – three from the traffic department, and two from public security. A young female driver and two female passengers were seated inside a red Cressida car (they were asking the police officer for permission to leave the scene, to sit college examinations).

I recorded the following notes, having first reassured both the police officer, and those involved in the accident, as to my role and purpose.

The driver's account of the accident, as given to the officer, was as follows; "the traffic lights were green while I approached the area, so I continued. But while nearing the traffic light I felt something hit the car. I did not know that it was a body. As I moved forward across the road I realized something was wrong as I saw people crowding in my ear-view mirror. I called 999, and was told to go back to my seat and that an ambulance would soon be there".

The police officer then proceeded to record his assessment of prevailing weather conditions and the type of road. He also made note of the fact the crossing was not equipped with a road crossing sign. He questioned the driver about her use of the seat belt. The police officer had in his possession, two dossiers for recording accident details; the first dealing with SERIOUS accident and death, and the second, MINOR injury.

A supervisory police officer then arrived and questioned my presence and purpose. He was given my business card, but was not satisfied and stated that there were no orders that permitted me to be at the site. He questioned me whether I had informed the driver that the person she had struck, was dead. I told him that I was there as an observer and had not spoken to anyone. Despite that there were a previous arrangement and agreement that permit my presence at the scene of the accident. He then called his superior officer or someone at a higher level at the Accident Section and was told that they too were unaware of my presence. At my request, the MOI contact person interceded, and resolved the issue.

10.15am

I returned to my car, to find a parking ticket under the windscreen wiper.

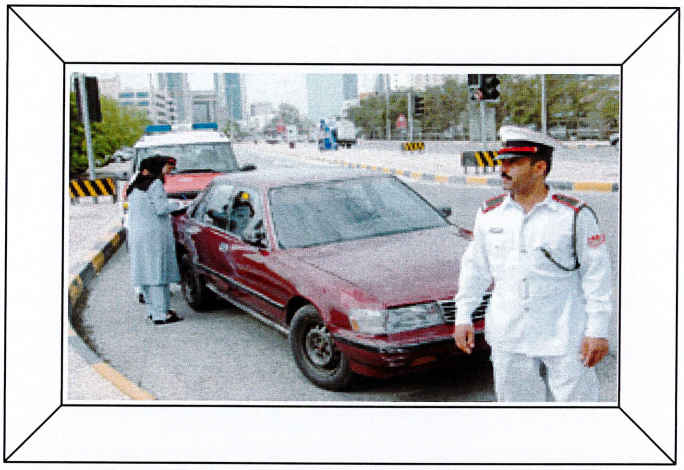


Figure 1: This Photograph was taking and published by Alayam Newspaper

LOG 2: OBSERVATION OF A SERIOUS ACCIDENT

20th November 2005
08:13 am

The emergency room received a 19 year old male involved in a car accident. He has reported that he had been driver and hit the wall of his home. The airbag of the car had released. He had been transported by ambulance. The injured was brought with cervical collar in situ and a splint on his left leg. He was conscious, alert and screaming on and off from pain. The paramedic briefed the doctor in charge about the case, and it was decided that as the patient appeared stable, he should be transferred to room A in the ER. The senior physician in room A examined the injured patient and ordered x-Ray of; C-spine, Chest, Pelvis, and Left Leg; In addition ordered an Intravenous line, and arrange Zenacif antibiotic 1.5 gram I.V. He arranged for suturing of forehead laceration, and diagnosed him as a combined fracture of tibia and fibula and referred him to the orthopedic resident on call.

9:00 am

A police officer approached the patient and questioned him about his accident details. Since another police officer usually will attend the accident scene. Upon completion of his report (RAIR) the police officer approached the senior physician about the classification of injury (SERIOUS and MINOR). The physician replied that it seemed that it was a SERIOUS injury but wanted to wait until he had seen the X-ray result at least in order to document this officially in the report. He went on to explain, it and seemed that he had done so previously, that in multiple injury cases there might be internal injury that need time to declare itself. He further stated that the patient should be under observation for some time. In addition to this RAIR, the ER physician had to fill in the Emergency Service Report (ESR) too.

09:15 am

The police officer explained that the seriousness of injury was a very important consideration from his point of view, because future actions depended on that decision for example; taking legal action, arranging future investigation on accident site.

10:15 am

The hospital Clerk entered the ER seeking a specific physician to complete a RAIR. Having successfully obtained what he wanted, he returned to the file office, located in a different area in the old hospital- the journey took about 7 minutes. In the office, all road traffic reports, either the RAIR or ESR, were seen to be arranged by month, and each monthly file contained ESR or RAIR without sequence, or systematic organization, or relationship ESR and RAIR files.

10:35 am

A patient entered the office and ask about his RAI report, the clerk requested his Identification Number and requested information about the date of the accident, then he automatically with easy step collect for him from 2 different file with the same month the requested ESR and the RAIR he the give the patient a copy of each.

10:50 am

The injured patient was seen by the orthopedic resident and was ready to be transferred to the operation theater.

4.1.2 Interviews with ER physicians

Semi-Structured Interviews with ER Physicians focused on the purpose and function of the RAIR. A total of 15 ER physicians were interviewed, including 2 Consultant Emergency Physicians, 2 Chief Residents, and 11 Senior Residents. In general, their working experience ranged from one to 10 years and with one exception where one physician had accumulated more than 15 years experience.

4.1.2.1 Face Validity- Purpose

In response to probes that focused on the overall purpose of the RAIR, its clarity and ease of interpretation, physicians offered a range of opinions and sentiments. There was no clear consensus about the purpose(s) of the report. Most physicians thought that the form was to meet medical-legal purposes, and to identify the nature of injury-specifically the Severity of Injury. Some stated clearly that this report was designed only to meet MOI purposes of diagnosing injuries to SERIOUS and MINOR categories. Some stated more clearly their ideas about medical-legal accountability. They were of the opinion that the purpose of the report was to identify the person involved in the accident with regards to their role and responsibility (Driver-Passenger-Pedestrian), to identify any modifiable risk factors attributable to the person involved in the accident.(Seat Belt- Alcohol - Mobile Phone Usage), and to document the outcome of the accident (Disposal of patients, follow up, & Death). Physicians reached these conclusions through practical experiences, and felt under pressure by police officers to complete their assessments, and classification decisions.

"As a matter of fact, the first question the police officer asks the physician, is the injury SERIOUS or not. And what is so important about the rest of this report if the police officer wants us to answer only this one question of SERIOUS or MINOR. Why do they waste our time to fill the whole report for one question?"

As for clarity and interpretation, one doctor mentioned that his colleagues used different criteria for differentiating between SERIOUS and MINOR injury, and he was not sure how that was dealt with. All agreed that if the report's purpose was to

categorize injury severity, then at least criteria should be laid down, and agreed to by all parties.

Patients seemed to be aware of the importance and ambiguity of the system, and were known to try to negotiate the decision, depending on their particular interest in the outcome. In general, physicians were unhappy with the limited options for severity classification, and the data entry opportunities offered by the form's design.

4.1.2.2 Construct Validity- Function.

In response to probes that addressed the structure / function of the RAI report, many comments were obtained, and collated. For example, most ER physicians thought that the RAI report was superficial, and did not reflect properly the significance of the injury. The ER physician found the report easy to complete, however, and took little time, but in agreeing to that, acknowledged that criteria for severity classification were missing. The doctors gave an example of GCS (Glascow Coma Scale) which makes all physicians around the world speak the same language when injury is involved. They felt that the list of diagnostic categories was a limited one. Further, they had found that there were some categories of the RAIR explained in Arabic but when translated into English, failed to capture the precise meaning. For example "Post Concussion" in Arabic was translated as "Pose Contusion" in English.

Further, categories such as "HEAD", or "HAND" did not do justice to the need to be precise. For example, injuries to (EAR, NOSE, FOREHEAD, EYE, CHEEK, MANDIBLE, CHIN, SKULL, etc) would all be classified as HEAD INJURY. *"Hand; is that forearm, arm, hand, fingers...it can cause many problems."*

Most physicians agreed that in order to be satisfied with this report; there was a need to get a complete report with anatomical categories or body picture to illustrate. *Many preferred to record their complete findings in the "Other" category, to decrease the levels of imprecision and potential misunderstanding.*

At the same time, it was recognized by several senior physicians, that an opportunity for injury surveillance and prevention, was being lost. A majority felt that a better report was needed, to include detailed clinical data, and removed from unreasonable time pressures.

In this context of prevention, it is of note that only 5 cases out of 263 did a police officer record seat belt usage.

4.1.2.3 Comments and Suggestions.

Because the physician interviews were only partly structured, the opportunity was given to them to speak freely on the specific task of accident injury recording. Their comments were grouped under a number of headings.

- Report interpretation and application.

Physicians wondered how the MOI will use their information, in terms of interpretation for planning and later decisions, when there is no agreement between physicians themselves and between MOI and MOH, on classification criteria.

- Allegiances.

Most of the ER Physicians that were interviewed think that they should not fill this report, as they are working for MOH. Where their responsibilities lay, was not clear. Some of the ER Physicians that were interviewed think that one report should be combined between MOH and MOI, as most of the questions that were stated in RAIR are also found in ESR. Few of the ER Physicians that were interviewed think that defect were due to lack of guidelines and standards in the MOH.

- Improvements.

Some of the ER Physicians that were interviewed thought that there should be clear definitions and clear criteria and an introduction (orientation) shared session between MOI and MOH on how to complete this report.

- Convenience as a factor.

ER physicians complained that despite the fact that some patients will be seen by other than ER physicians, they are not obliged to complete this report.

"At the end we have to fill this report, no matter how many physicians had seen this patient, no matter that they had much to contribute."

- Under-reporting.

Physicians stated that not all road traffic injuries attending A&E get their RAIR completed. For example, if a patient attended A&E during the night, when no police officer was on duty, an ESR only would be processed. That patient would be asked to attend the traffic department next morning if they needed such a report. Such injuries would normally be in the "MINOR" category. Only those patients with SERIOUS injury will be accompanied by police officer from the traffic department at night time.

Again, it was stated by ER physicians that on a few occasions, patients involved in a RTA and attending A&E, do not want to complain or report their accident to the traffic department. They asked only for medical treatment.

Further contributing to under-reporting was the observation that the emergency clerks do not issue for processing, ESR forms for patients attending A&E more than 24 hours after an accident. In such a situation, a RAIR is not issued at all.

One ER physician stated that one father accidentally injured his son in front of his house and upon attending A&E refused to describe his son's injury, as due to a RTA. A further case, told the story of a patient dragged by a moving vehicle, and suffering bruises and fracture. The injury was classified as "assault", as the vehicle passenger was attempting to steal the victim's purse.

4.2 Quantitative Data Results

4.2.1 Demographic Data

Table 2 shows the frequencies and percentages of the demographic variables of the study subjects. The majority of the study sample were males (71%) and Bahrainis (75%). Over 50% of the subjects involved were in the age group 30 to 50 years.

Table 2: Demographic Data of the Study Sample

Category	Type	Frequency	%
Gender	Male	187	71
	Female	76	29
	Total	263	100
Nationality	Bahraini	198	75
	Non-Bahraini	65	25
	Total	263	100
Age Group	Less than 18	6	2
	18 to < 30	99	38
	30 to < 50	155	59
	50 & above	3	1
	Total	263	100

4.2.2 Description of Some Major Items of RAIR

207 victims (79%) were drivers and almost two thirds of the accidents happen on weekdays. Also, 207 drivers (79%) were involved in accident with MINOR injuries. Table 3.

Table 3: Description of Some Major Items of RAIR

Category	Type	Frequency	%
Severity of Injury	MINOR	207	79
	SERIOUS	56	21
	Total	263	100
Injured Type (Victim)	Driver	207	79
	Passenger	30	11
	Pedestrian	23	9
	Not Indicated	3	1
	Total	263	100
Accident Day	Weekdays	168	64
	Weekend	95	36
	Total	263	100

4.2.3 Severity of Injury by selected items of the RAIR.

Table 4 presents the results of the Chi- square test of association between injury severity and selected items of the RAIR. There were statistically significant associations between injury severity and gender (P - value = 0.02); in that males have more SERIOUS injury (25%) than females (12%), victim type and severity of injury of (P- value = 0.00). Pedestrians were more likely to suffer SERIOUS injuries than drivers and passengers, and treatment outcome (P- value = 0.00). All MINOR injuries were released from the hospital after treatment (as one would

expect). On the other hand, around 66% of the SERIOUS injuries were similarly released.

No significant associations were found between Injury Severity and Age Group, Nationality and Accident Day.

Table 4: Cross Tabulation of Injury Severity by selected Items of the RAIR

ITEM		MINOR	SERIOUS	P-Value
Gender	Male	140 (75%)	47 (25%)	0.02
	Female	67 (88%)	9 (12%)	
Nationality	Bahraini	159 (80%)	39 (20%)	0.296
	Non-Bahraini	48 (74%)	17 (26%)	
Age Group	Less than 18	5 (83%)	1 (17%)	0.43
	18 to < 30	73 (74%)	26 (26%)	
	30 to < 50	127 (82%)	28 (18%)	
	50 & above	2 (67%)	1 (33%)	
Injured Type (Victim)	Driver	172 (83%)	35 (17%)	0.00
	Passenger	28 (93%)	2 (7%)	
	Pedestrian	4 (17%)	19 (83%)	
	Not Indicated	3 (100%)	0 -	
Accident Day	Weekdays	131 (78%)	37 (22%)	0.76
	Weekend	76 (80%)	19 (20%)	
Treatment Outcome (RAIR)	Released from Hospital after Management	207 (85%)	37 (15%)	0.00
	Admitted to the ward	0 -	19 (100%)	

4.2.4 Severity of Injury by Diagnosis Impression of the ESR

As seen in table 5 that there is a significant association between severity of injury and Diagnosis Impression in Emergency Service Report (ESR). The majority of the MINOR injuries were soft tissues and the majority of the SERIOUS injuries were fractures. Multiple trauma was assessed as a SERIOUS injury only.

On conducting cross tabulation for the two categories (excluding the multiple trauma impression as it only represents around 3% of the population), the p value was found to be 0.00 i.e. there was a significant association between severity of injury and Diagnosis Impression (ESR).

Table 5: Cross Tabulation of Injury Severity by Diagnosis Impression of the ESR

ITEM		MINOR	SERIOUS	P-Value
Diagnosis Impression (ESR)	Soft Tissue Injury	153 (87%)	23 (13%)	0.00
	Fracture	54 (67%)	27 (33%)	
	Multiple Trauma	0 -	6 (100%)	

4.2.5 Utilization of RAIR by ER Physicians

The number of the documented diagnosis by ER Physicians of the "type of injury" and the "part of the body injured", were given in table 6. It can be seen that other injury type and other part of the body injured were documented most by the ER Physicians.

Wound and contusions were documented in 114 cases, fractures documented in 56 cases, and joints and ligaments were documented in 21 cases. Also, left leg was documented in 49 cases, followed by neck 35, right hand 34, head 14, and left hand 14.

Table 6: Utilization of RAIR by ER Physicians

	Diagnosis	Documented (%)	Not Documented (%)
Diagnosis of Injury (RAIR)	Burns	0 (0%)	263 (100%)
	Pose Contusion	0 (0%)	263 (100%)
	Internal Injuries	0 (0%)	263 (100%)
	Joints & Ligaments	21 (8.0%)	242 (92%)
	Fractures	56 (21.3%)	207 (78.7%)
	Wound & Contusions	114 (43.3%)	149 (56.7%)
	Other Injury Type	142 (54.0%)	121(46%)
Part of the Body Injured	Pelvis	1 (0.4%)	262 (99.6%)
	Chest	7 (2.7%)	256 (97.3%)
	Spine	11 (4.2%)	252 (95.8%)
	Head	14 (5.3%)	249 (94.7%)
	Left Hand	14 (5.3%)	249 (94.7%)
	Right Leg	21(8.0%)	242 (92%)
	Neck	35 (13.3%)	228 (86.7%)
	Right Hand	34 (12.9%)	229 (87.1%)
	Left Leg	49 (18.6%)	214 (81.4%)
	Other Injured Part	142 (54.0%)	121 (46.0%)

4.2.6 Reliability

The Reliability Coefficient Cronbach Alpha was used to measure the reliability of the RAIR.

Table 7 gives the overall reliability of the RAIR, with 21 items, which included "Injured person type", "Injury Severity", "Injury Diagnosis", "Part of the body injured", "Treatment Outcome", and "Death Place". The Cronbach Alpha= 0.158; indicating that the RAIR has poor reliability.

The reliability of the factor "Part of the Body Injured" (which has 10 items) was also measured by calculating Cronbach Alpha. It was very low = 0.132. When finding the item "Other" was excluded, the Cronbach Alpha = 0.511.

The significance of this finding is very important, for it means that the item "Other" is affecting the internal consistency of the RAIR.

In an effort to provide an opportunity for clinicians to record their findings accurately, the designs of the form have inadvertently negatively affected the reliability of the form.

Table 7: Reliability of the RAIR		
Variables in RAIR	**No of Items Included**	**Cronbach Alpha**
Overall Reliability **(Injured Person Type, Injury Severity, Diagnosis, and Part of Body Injured, Treatment Outcome, Fatality Result)** **see Appendix 19**	21 Items	0.158
Part of Body Injured	10 items With Other	0.132
	9 items Without Other	0.511

5 Discussion

Road safety is of prime concern to many individuals, groups and organizations, all of whom require data and evidence. While different users have different data needs, reliable, valid data and evidence are essential for describing the burden of road traffic injuries, assessing risk factors, developing and evaluating interventions, providing information for policy-makers and decision-makers, and raising awareness. Without reliable information, the priorities for road traffic injury prevention cannot be rationally or satisfactorily determined. It was in this context that this study was undertaken. Its hypotheses and objectives, related to the performance, design and utilization of the RAIR have been examined.

The hypotheses were as follows;

- It was hypothesized that the RAIR is a valid source of data for health policy development and assessment in accident injury.
- It was hypothesized that the RAIR is a reliable source of data for health policy development and assessment in accident injury.
- It was hypothesized that the data compiled from RAIR can help in development of victim profile characteristics that are relevant to injury prevention and mitigation.

The objectives, as follows;

- To study the validity and reliability of the composite RAIR instrument.
- To examine the data provided by the RAIR, in terms of its relevance to injury prevention and mitigation.

Prior to the presentation of the summarized findings, however, it is important to place the RAIR in the "injury information context", in the Kingdom of Bahrain, and it is important to acknowledge that the RAIR represents an attempt to provide for the tasks of collating and summarizing of RAI data. It addresses these tasks through the functions of description and classification.

- First, the RAIR exists in parallel with other MOI and MOH reports, which demand more specific and detailed *descriptions*, e.g. " modifiable risk factors", (MOI) and "clinical description and outcome" (MOH). It is not surprising to find that the RAIR, a summary report, does not perform well in the task of description.

  For example, in terms of "part of the body injured" and "overall", reliability was low; it was 0.132 and 0.158 respectively.

  Furthermore, the reliability of the "part of the body injured" was relatively increased from 0.132 to 0.511 when the category "other" was removed, to 0.511. Most of the physicians were utilizing the "other" category to describe the part of the body injured that were not mentioned in the rest of the categories, i.e. the inadequacy of the descriptors encouraged physicians to use the "other" category, with negative effects on the internal consistency of the form. In the quest for authenticity and validity, reliability was compromised.

- Second, with regards to the task of *classification*, the performance of the RAIR instrument was problematical. For example, out of 56 injuries classified as SERIOUS, two thirds of affected patients were released from the emergency room after management. Interviews with physicians revealed that this classification task was of concern, as they described a lack of clarity and consensus concerning the criteria for deciding on the severity of an injury is differentiating between MINOR and SERIOUS injury.

When the treatment outcome (released from hospital after management or admitted) and injury severity (MINOR and SERIOUS) are focused on, it was shown that all the cases that were admitted to the hospital were seriously injured. No minor cases were admitted to the hospital. However, some cases that were released from the hospital were labeled as SERIOUSLY injured. On one hand, this can mean that serious cases were managed effectively in the ER Room, then discharged after management, and given an outpatient clinic appointment if needed. On the other hand, it can mean that there is no clear distinction between SERIOUS and MINOR injury and that the issue of hospitalization as a means of classifying severity, is not utilized in this context. There is an urgent need to develop guidelines and standards for criteria that classify injury severity in the kingdom of Bahrain.

Moreover, when diagnosis impression and injury severity, all multiple trauma cases were categorized as SERIOUS injury, whereas the majority of soft tissue injury and fracture cases, were categorized as MINOR injury. Within that sub-group of soft tissue and fractures, however, physicians were more likely to label fractures (of any kind) as SERIOUS. This particular classification pattern is of concern. It would appear that physicians are using diagnostic impression for the classification of injury severity.

It is difficult to know whether or not the injury-victim profiles and other conclusions that have been characterized in the study's cross tabulations, can be the basis for actions or decisions.

However, from further cross tabulations it appeared that there is a significant difference between pedestrian on one hand and drivers and passengers on the other hand. There is a clear pattern, as pedestrians are more susceptible to serious injuries than drivers and passengers. This is expected as a vehicle hitting a pedestrian can lead to a serious injury. In fact, studies showed that if the speed of a vehicle hitting a pedestrian exceeds 40 km/hour, can kill a pedestrian (WHO, 2004) and (UNICEF, 2001). Therefore, it appears that there is a need for actions to be taken for enforcement of speed limits especially in areas where pedestrians are walking; with better control on high speed traffic

that often passes through residential areas or close to schools; with better provision for safe pedestrian crossings, bike lanes, and sidewalks or protected play areas. Furthermore, most injuries can be prevented by a handful of measures: better road design especially in areas of high pedestrian traffic, and the mandatory use of seatbelts and helmets. Even measures as simple as clothing that makes pedestrians and cyclists more visible, can be effective.

Of course, Bahrain is not alone in facing such problems. Disagreement in injury severity classification (appendices 11, 12, and 13) exists in the international community. Where some define severity by hospital stay "hospitalization", others define seriousness as "not minor", "inability to work", "disabling of normal activity", "severe visible injury", or with "specific medical diagnosis". Even within the group using "Hospitalization" as their criterion, there was a difference of opinion, from stays of 24 hours, to 7 days.

Incomplete data constitute another area of concern for all. The qualitative component of the study was especially valuable in identifying under reporting of road traffic accident injury data as an issue. This took two forms:

- failure to open files in certain circumstance. For example *it was stated by ER physicians that on a few occasions, patients involved in a RTA and attending A&E, do not want to complain or report their accident to the traffic department. They asked only for medical treatment.*

  Further contributing to under-reporting was *the observation that the emergency clerks do not issue for processing ESR forms for patients attending A&E more than 24 hours after an accident. "In such a situation, a RAIR is not issued at all".*

- failure to classify injury as road accident injury. For example *an ER physician stated that one father accidentally injured his son in front of his house and upon attending A&E refused to describe his son's injury, as due to a RTA. A further case, told the story of a patient dragged by a moving vehicle, and suffering bruises and fracture. The injury was classified as "assault", as the vehicle passenger was attempting to steal the victim's purse.*

The relevance of the data collated from the RAIR to injury prevention and mitigation, was an issue. Examination of the sample showed that seat belt use documentation was missing in 235 out of 240 of appropriate cases.

It is in this context of problems and challenges that the experience of Thailand, can be of help. Thailand's provincial injury surveillance system started in 1993. Its objectives were to establish a database to evaluate, at a provincial level, the quality of acute trauma care and the referral services provided to the injured, and to improve injury prevention and control at both local and national levels. Previously, data providers in hospitals had not been responsible for information on road traffic crashes at a provincial level. Existing information systems were poorly designed and managed, not computerized, and not standardized as regards definitions, sources of data and methods of data collection. Consequently, regional or national comparisons were impossible.

A trauma registry system had been developed in the large provincial hospital in Khon Kaen. This system was chosen as the prototype for the new surveillance system, because of its achievements over eight years in injury prevention and improving the quality of acute care. The Non-communicable Diseases Epidemiology Section of the Ministry of Public Health revised the hospital's trauma registry form and set up appropriate reporting criteria, definitions of terms and methods of coding. Appropriate computer software for processing the data was developed. The hospital produced manuals and ran training courses to help personnel operate the surveillance system effectively.

In January 1995, a provincial injury surveillance system was established in five sentinel hospitals, one in Bangkok and four in other regions of Thailand. Each was a large general hospital with a sufficient number of injuries and mix of cases, receiving referrals from other local hospitals.

All those acutely injured within seven days before admittance, including those who had died, were included in the surveillance system. Data were forwarded every six months by the local authorities to the central coordinating unit in the Epidemiology Division of the Ministry of Public Health.

Within six months, it had become clear that traffic injuries were the most important cause of injury in each sentinel hospital. The epidemiology of other major causes of injuries was also investigated, and the quality of pre-hospital service and of inter-hospital transfers was monitored. Information obtained was fed into the eighth five-year National Health Development Plan.

Data on alcohol-related traffic injuries were instrumental in the introduction of obligatory warnings on the labels of alcoholic beverages and of other interventions against drink-driving. The surveillance reports were sent to policy-makers in a range of sectors, including parliamentarians and governors of the provinces in which the sentinel hospitals were located – as well as to police departments and the mass media (Santikarn C et al, 2002)

Although the extra workload arising from the surveillance activities created problems in the sentinel hospitals, the advantages of the scheme were such that 20 more hospitals voluntarily joined the surveillance network. Simplifications to the system were subsequently made, though, to reduce the workload on medical records departments, so that the sentinel hospitals were required to report only cases of severe injury, including:

- deaths before arrival;
- deaths in the emergency department;
- observed or admitted injury cases.

These changes had little effect on ranking among the top five leading causes of injury.

In January 2001, Thailand's National Injury Surveillance was officially launched. By 2003, the national network had grown to include 28 large hospitals, as well as almost 60 general hospitals and one university hospital.

The system in Thailand is one of only a few injury surveillance systems in low-income and middle-income countries that operates nationally and involves a model that WHO recognizes and encourages for technology transfer between countries.

Thailand has successfully addressed the challenges now faced by the Kingdom of Bahrain through;

- revision of injury registration system including definitions and coding;
- introduction of computer system and appropriate software;
- an injury surveillance and research program;
- provision of a central collating agency;

The introduction of such initiatives could be expected to result in similar data outcomes for Bahrain.

6 Recommendations

The Recommendations therefore are:

1. The continued use of the RAIR as a data management tool needs to be reconsidered.

2. In the case that RAIR continues to be used; then several actions need to be taken:

    - The "other" category currently used in the form should be deleted.
    - A consensus on injury diagnosis descriptors needs to be reached, with relevant stakeholders.
    - A consensus on injury severity classification needs to be reached, with relevant stakeholders.
    - In this regard, hospitalization as the criterion, and as employed internationally, offers advantages of clarity, and practicality (time pressures for data completion are removed).
    - The issue of under- reporting needs to be addressed through further quantitative research.

These recommendations, however, would be at best temporary and less than satisfactory. It would be preferable for;

3. an agency or program to be established, to design data collection and collation tools, to collect and collate road accident injury data, to conduct further validity and reliability research on data sources as part of ongoing injury surveillance.

4. that agency or program to be supported with appropriate staffing, i.e. epidemiologist and program assistant.

Of course, such initiatives would only make sense if they were taken in the context of an overall road accident injury prevention and mitigation strategy. That strategy would have to be developed by appropriate government and non government agencies representatives, working together in harmony, and within internationally accepted parameters, such as those developed by the World Health Organization, that could serve as the template for data collection and interpretation. (Peden MM, et al, 2001).

Such an agency or program would be encouraged to collaborate with the International Road Traffic and Accident Database (IRTAD), for the purpose of comparing and validating Kingdom of Bahrain Road Traffic and Accident Data.

7 Conclusion

This research shows that although the kingdom of Bahrain has implemented a road traffic accident injury data system, the component that deals with the collation and summarization of data, is lacking in terms of validity and reliability. More initiatives in data collection and processing need to be undertaken to provide a data base for the development of rational health policies that would lead to progressive injury mitigation and prevention.

8 Appendices

Appendix 1: Top 10 leading contributors to the global burden of diseases			
1990		**2020**	
Disease or injury		**Disease or injury**	
1	Lower respiratory infections	1	Ischaemic heart disease
2	Diarrhoeal diseases	2	Unipolar major depression
3	Perinatal conditions	3	Road traffic injuries
4	Unipolar major depression	4	Cerebrovascular disease
5	Ischaemic heart disease	5	Chronic obstructive pulmonary disease
6	Cerebrovascular disease	6	Lower respiratory infections
7	Tuberculosis	7	Tuberculosis
8	Measles	8	War
9	Road traffic injuries	9	Diarrhoeal diseases
10	Congenital abnormalities	10	HIV

Epidemiologists use estimated DALYs (disability-adjusted life years) lost as the measure of the burden of disease.

Source: Murray CJL, Lopez AD, Eds. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Boston, Harvard University Press, 1996.

Appendix 2 : Estimated Global Road Traffic Injury - related deaths

	Number	Rate per 100000 Population	Proportion of total (%)
Low- income and middle-income countries	1 065 988	20.2	90
High-income countries	117 504	12.6	10
Total	1 183 492	19.0	100

Source: WHO Global Burden of Disease project, 2002, Version 1

Appendix 3: Traffic Accident Facts in Bahrain 2000-2004

Years	Total registered vehicles	Total traffic violations	Total traffic accidents	Total traffic accidents with personal Injury	Total traffic accidents with damage to property	Deaths Rate per 100000 population
2000	216,679	113,039	35,179	1656	33,523	7.70
2001	229,780	126,562	38,153	1722	36,431	11.53
2002	250,978	149,704	42,089	1651	40,438	12.05
2003	273,230	114,920	45,996	2115	43,881	11.2
2004	295,484	111,382	50,991	2064	48,927	9.9

Source: Public Security, General Directorate of Traffic, Ministry of Interior, Kingdom of Bahrain

Appendix 4: Predicted road traffic fatalities by region (in thousands), adjusted for underreporting, 1990–2020

Region	Number of Countries	1990	2000	2010	2020	Change (%) 2000-2020	Fatality rate (deaths/100 000 persons)	
							2000	2020
East Asia & Pacific	15	112	188	278	337	79	10.9	16.8
East Europe & Central Asia	9	30	32	36	38	19	19.0	21.2
Latin America & Caribbean	31	90	122	154	180	48	26.1	31.0
Middle East & North Africa	13	41	56	73	94	68	19.2	22.3
South Asia	7	87	135	212	330	144	10.2	18.9
Sub-Saharan Africa	46	59	80	109	144	80	12.3	14.9
Sub-Total	**121**	**419**	**613**	**862**	**1124**	**83**	**13.3**	**19.0**
High-Income countries	35	123	110	95	80	-27	11.8	7.8
Total	**156**	**542**	**723**	**957**	**1204**	**67**	**13.0**	**17.4**

Data are displayed according to the regional classifications of the World Bank

Appendix 5: Key Sources of Road Traffic Injury Data in the Kingdom of Bahrain

Source	Type of Instrument	Type of Data
Police *Represented by Ministry of Interior*	1- Road Traffic Injury Report (RAIR) 2- Blue & Green Investigation Book	Number of road traffic incidents, fatalities and injuries Type of road users involved Age, sex and nationality of casualties Type of vehicles involved Police assessment of causes of crashes Environmental data Location and sites of crashes Prosecutions Legal Issues
Hospital *Represented by Ministry of Health*	Traffic injuries registration at hospital by: 1-Accident & Emergency Department Data - Emergency Service Report (ESR) 2- Ambulance Data Form 3- Admission Data Form 4- Hospital Inpatient Records 5-Insurance Data	Fatal and non-fatal injuries Diagnosis, seriousness of injury and disposal, prognosis Age, sex and nationality of casualties Type of road users involved Length of stay at hospital Operation data Costs of treatment, i.e. investigation
Insurance Companies	Claim Forms	Fatal and non-fatal injuries Damage to vehicles Costs of claims
Centre for Transport & Road Studies (CTRS) - University of Bahrain	1- Research & Studies 2- Projects & Courses	Traffic safety studies Injury accident studies Public transport studies Traffic safety awareness assessment General Database of global researches and personnel interested in field of transportation environmental & Health Impact of transport

Appendix 6: Health Statistic Book – HID – Ministry of Health

PUBLIC HEALTH

Road and Traffic Related Accidents by Seriousness of Injuries and Sex 1999-2003

Table 6.14, page 6-18

Seriousness of Injury	Rate	Total			Pedestrians		Passengers		Drivers		درجة خطورة الإصابة
	المعدل	الجملة Total			المشاة Pedestrians		الركاب Passengers		السواق Drivers		
		الجملة Total	انثى Female	ذكر Male	انثى Female	ذكر Male	انثى Female	ذكر Male	انثى Female	ذكر Male	
1999											1999
Death	0.09	63	13	50	4	14	9	12	3	24	وفاة
Serious injury	0.71	476	94	382	35	138	39	52	20	162	اصابة بليغة
Slight injury	3.46	2,303	705	1,598	110	276	373	495	222	827	اصابة بسيطة
2000											2000
Death	0.08	53	5	48	2	15	2	13	1	20	وفاة
Serious injury	0.63	436	79	357	22	116	28	71	29	170	اصابة بليغة
Slight injury	3.35	2,312	678	1,634	99	257	407	535	182	842	اصابة بسيطة
2001											2001
Death	0.11	75	10	65	4	22	4	17	2	26	وفاة
Serious injury	0.79	513	97	416	33	125	47	122	17	169	اصابة بليغة
Slight injury	3.47	2,269	695	1,574	95	292	384	489	216	793	اصابة بسيطة
2002											2002
Death	0.12	81	22	59	6	22	10	17	6	20	وفاة
Serious injury	0.75	503	103	400	28	126	50	99	25	185	اصابة بليغة
Slight injury	3.45	2,318	752	1,566	96	258	417	536	239	802	اصابة بسيطة
2003											2003
Death	0.11	77	8	69	4	21	4	10	-	38	وفاة
Serious injury	0.73	501	102	399	43	110	39	73	20	216	اصابة بليغة
Slight injury	4.27	2,945	953	1,992	78	273	535	631	340	1,118	اصابة بسيطة

Source: Ministry of Interior - Traffic Directorate.
Rates are per 1000 population.

المصدر: وزارة الداخلية – ادارة المرور.
المعدلات لكل 1000 من السكان.

جدول 6.14، صفحة 6-18

عدد السواق والركاب والمشاة المصابين حسب درجة خطورة الاصابة والنوع 1999-2003

الصحة العامة

Appendix 7: Key sources of road traffic injury data worldwide

Source	Type of data	Comments
Police	Number of road traffic incidents, fatalities and injuries Type of road users involved Age and sex of casualties Type of vehicles involved Police assessment of causes of crashes Location and sites of crashes Prosecutions	Level of detail varies from one country to another. Police records can be inaccessible. Underreporting is a common problem, particularly in low-income and middle-income countries.
Health settings (e.g. hospital inpatient records, emergency room records, trauma registries, ambulance or emergency technician records, health clinic records, family doctor records)	Fatal and non-fatal injuries Age and sex of casualties Costs of treatment	Level of detail varies from one health care facility to another. Injury data may be recorded under "other causes", making it difficult to extract for analysis
Insurance firms	Fatal and non-fatal injuries Damage to vehicles Costs of claims	Access to these data may be difficult.
Other private and public institutions, including transport companies	Number of fatal and non-fatal injuries occurring among employees Damage and losses Insurance claims Legal issues Operational data	These data may be specific to the planning and operation of the firms.
Government departments and specialized agencies collecting data for national planning and development	Population denominators Income and expenditure data Health indicators Exposure data Pollution data Energy consumption Literacy levels	These data are complementary and important for analysis of road traffic injuries. The data are collected by different ministries and organizations, though there may be one central agency that compiles and produces reports, such as statistical abstracts, economic surveys and development plans.
Special interest groups (e.g. research institutes, advocacy nongovernmental organizations, victim support organizations, transport unions, consulting firms, institutions involved in road safety activities)	Number of road traffic incidents, fatal and non-fatal injuries Type of road users involved Age and sex of casualties Type of vehicles involved Causes Location and sites of crashes Social and psychological impacts Interventions	The various organizations have different interests.

Appendix 8: Road Accident Injuries Reports (RAIR)

Ministry of Interior



KINGDOM OF BAHRAIN
MINISTRY OF THE INTERIOR
GENERAL DIRECTORATE OF TRAFFIC

مملكة البحرين
وزارة الداخلية
الإدارة العامة للمرور

تقرير لاصابات حوادث الطرق
ROAD ACCIDENT INJURIES REPORT

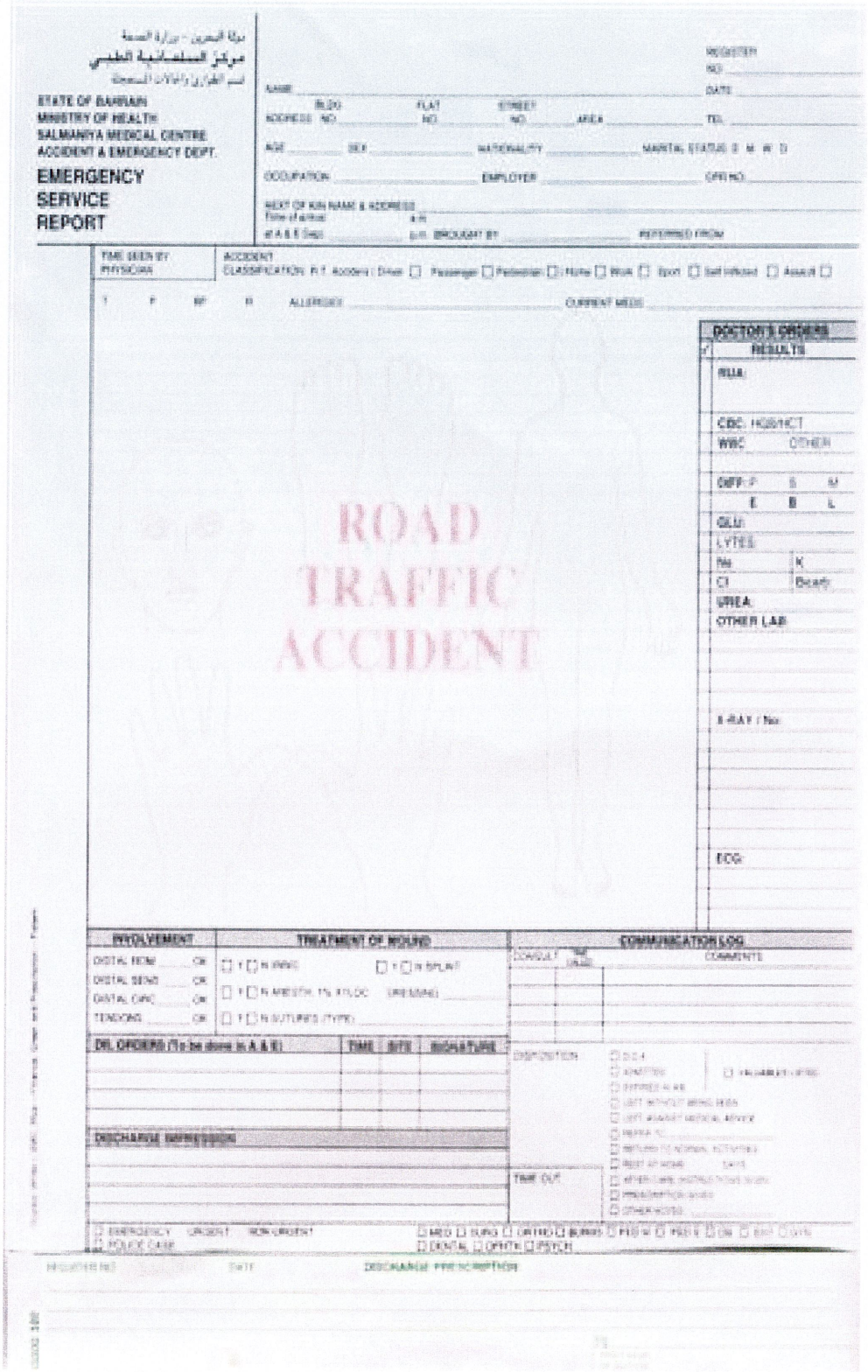
Medical Centre ____ المستشفى او المركز
To be filled by Police Staff املأ بواسطة الشرطة
PIS يرجى الفحص
Injured Name : ____ اسم المصاب
Nationality : ____ Sex : ____ Age : ____ العمر ____ الجنس ____ الجنسية
Address : ____ العنوان
CPR No. ____ Tel : ____ الهاتف ____ الرقم الشخصي
INJURED منطقة المصاب :
Driver سائق
Passenger راكب Front Seat المقعد الامامي Back Seat المقعد الخلفي
Pedestrian مشاة
With Seat Belt Without Seat Belt لم يتم استخدام حزام السلامة لم استخدام حزام السلامة
Place of accident ____ مكان وقوع الحادث
Date ____ Day ____ Time ____ الوقت ____ اليوم ____ التاريخ
Reported by ____ No ____ رقمه ____ مباشر الحادث
To be filled by Physician يملأ بواسطة الطبيب
Finding after Medical Exams : بعد الفحص الطبي تبين مايلي :
Type of Injury : Minor Injuries/Serious Injuries نوع الاصابة : بسيطة / خطيرة
Wounds & Contusions جروح ورضوض
Internal Injuries اصابات داخلية
Fractures كسور
Burns حروق
Joints and Ligaments اصابة المفاصل والعضلات
Penetrating Injuries in the Eye اختراق في العين
Others ____ اخرى

Injured Part : الجزء المصاب :
Head رأس Neck عنق Chest صدر
Spine عمود فقري L. Hand اليد اليسرى R Hand اليد اليمنى
Pelvis حوض R Leg الرجل اليمنى L. Leg الرجل اليسرى
Others ____ اخرى

Treatment Result : نتيجة العلاج :
1. Released from hospital after treatment تم علاجه وخرج من المستشفى
2. Kept in Day Care Unit under observation ارسل الى وحدة الاقامة القصيرة تحت الملاحظة
3. Admitted to Ward No. ادخل الى المستشفى جناح رقم

Injured Person Died : وفاة المصاب :
Died before reaching Hospital توفي قبل وصوله الى المستشفى
Died in hospital توفي في المستشفى

Appendix 10: Emergency Service Report (ESR) - Road Traffic Accidents - Ministry of Health



STATE OF BAHRAIN
MINISTRY OF HEALTH
SALMANIYA MEDICAL CENTRE
ACCIDENT & EMERGENCY DEPT.

EMERGENCY SERVICE REPORT

ROAD TRAFFIC ACCIDENT

Appendix 11: Injured

IRTAD	No definition: Data on slightly and seriously injured are compiled as provided by the individual countries
Australia	Slight or serious injury to any person resulting from a road vehicle crash on a public road.
Belgium	Slightly and seriously injured.
Canada	A person involved in a traffic collision that occurs on a public roadway, who suffers a non-fatal injury.
Czech Republic	Slightly or seriously injured.
Denmark	Persons with injuries for which medical treatment or hospitalization (even if only for observation) is normally required. Persons with lesser wounds, minor cuts and bruises are not recorded as injured.
Finland	Any person who was not killed but sustained injuries requiring treatment in hospital (incl. persons under observation) or at home. Very slight injuries (bruises, scratches etc.) requiring no treatment are excluded.
France	Slightly or seriously injured.
Germany	Slightly or seriously injured.
Great Britain	Slightly or seriously injured.
Greece	Any victim that was injured or whose health was affected as a result of an accident.
Hungary	See definition of slightly and seriously injured.
Ireland	Slightly or seriously injured.
Italy	Persons who have suffered personal injury as a result of an accident.
Japan	Seriously and slightly injured.
Korea	Seriously injured, slightly injured and minor injury.
Luxembourg	Person receiving injuries
Netherlands	A person involved in a traffic accident who is injured.
New Zealand	Person slightly or seriously injured.
Norway	A person who is slightly, seriously or dangerously injured in a traffic accident.
Poland	Slightly or seriously injured.
Portugal	Victim receiving injuries, with or without hospitalization.
Spain	Any person who does not die as a result of the accident but is slightly or seriously injured.
Sweden	Slightly or seriously injured.
United States	Someone killed or receiving an incapacitating, non-incapacitating, possible or unknown injury.
UN/ECE	Any person, who was not killed, but sustained one or more serious or slight injuries as result of the accident.

Appendix 12: Slightly Injured

Australia	Required medical treatment but not admitted to hospital as a result of injuries resulting from a road crash.
Belgium	Any person injured in an accident who is not fatally or seriously injured.
Canada	A person involved in a traffic collision that occurs on a public roadway, who suffers non-fatal injuries that do not result in hospitalization of a period of at least 24 hours.
Czech Republic	All injured road users who are not seriously injured.
Denmark	All injured road users that are not seriously injured.
Finland	Seriously and slightly injured are not separated in Finland.
France	Victim of an accident who needs medical treatment with or without hospitalization. If there is hospitalization, it is no longer than 6 days.
Germany	All injured road users who are not seriously injured.
Great Britain	Minor injury such as sprains, bruises or cuts which do not necessarily require roadside attention. Includes slight shock requiring roadside attention.
Greece	Injury of minor character such as sprains, bruises or cuts. Probable outpatient treatment in a hospital or by a doctor.
Hungary	Secondary injuries such as sprains or bruises.
Ireland	Injury of a minor character such as a sprain or bruise.
Italy	No definition available.
Japan	Persons who require medical treatment for up to 30 days.
Korea	Injuries that require medical treatment for less than 3 weeks to more than 5 days. (Minor injured: Injuries that require medical treatment for less than 5 days.)
Luxembourg	Person receiving injuries and in need of medical out-patient treatment.
Netherlands	An injured person not admitted to hospital as an in-patient (possibly as out-patient).
New Zealand	Injuries of minor nature such as sprains or bruises.
Norway	A person who has suffered minor injuries in a traffic accident, normally requiring only minor medical treatment and not leading to permanent medical disablement (negligible injuries such as bruises or scratches, etc., are not included).
Poland	A person injured in a traffic accident; injury of minor character, e.g. sprains, bruises that make the victim unable to work for a period of less than 7 days.
Portugal	Any person needing medical treatment after an accident, without hospitalization.
Spain	A person injured in a traffic accident to whom the "seriously injured" definition cannot be applied.
Sweden	Injured person who is not seriously injured.
Switzerland	Injuries with small effect on personal mobility, so as able to leave the site of the accident without help. Probable outpatient treatment in hospital or by doctor (for example abrasions without substantial loss of blood.).
United States	A police-reported non-incapacitating injury or possible injury.
UN/ECE	Secondary injuries such as sprains or bruises. Persons complaining of shock, but who have not sustained other injuries, should not be considered in the statistics as having been injured unless they show very clear symptoms of shock and have received medical treatment or appeared to require medical attention.

Appendix 13: Seriously Injured

Australia	Admitted to hospital as a result of injuries from a road crash.
Austria	Injury leading to a deterioration of health and the inability to work for a period of more than 24 days. There is always admission to hospital.
Belgium.	Hospitalization of at least 24 hours
Canada	A person involved in a traffic collision that occurs on a public roadway, who suffers non-fatal injuries that result in hospitalization, including for observation only, for a period of at least 24 hours.
Czech Republic	Serious failure of health or serious illness, judged by attending physician.
Denmark	Intracranial injury, skull fracture, face or eye injury; injury of trunk (chest and/or abdomen); injury of spine and/or pelvis; fracture/dislocation or severe sprain of shoulder, arm or hand; fracture/dislocation or severe sprain of hip, leg or foot; serious injuries in more than one main region, burn.
Finland	Seriously and slightly injured are not separated in Finland.
France	Victim of an accident needing hospitalization for more than 6 days.
Germany	All persons who were taken to hospital for in-patient treatment (of at least 24 hours).
Great Britain	An injury for which a person is detained in hospital as an inpatient or any of the following injuries whether or not detained in hospital: fractures, concussion, internal injuries, crushing, severe cuts and lacerations, severe general shock requiring medical treatment, injuries causing death 30 or more days after the accident.
Greece	Any person suffering from serious injuries like e.g. head injuries, multiple wounding, mutilation, resulting in the person feeling dazed; in danger of life.
Hungary	Fractures, concussions, internal lesions, crushing, severe cuts and laceration, severe general shocks requiring medical treatment and any other serious lesion entailing detention in hospital, in general requiring more than 8 days healing, are considered as serious injuries.
Ireland	Injury for which the victim is detained in hospital as an in-patient or any of the following injuries whether or not detained in hospital: fractures, concussion, internal injury, crushing, severe cuts and lacerations, severe general shock requiring medical treatment.
Italy	No definition available.
Japan	Persons who require medical treatment for more than 30 days.
Luxembourg	Hospitalization of more than 24 hours.
Korea	Injuries that require medical treatment for more than 3 weeks.
Netherlands	An injured person admitted to hospital as in-patient.
New Zealand	Fractures, concussion, internal injuries, crushing, severe cuts and lacerations, severe general shock necessitating medical treatment and any other injury involving removal to a hospital.
Norway	A person who has been involved in a traffic accident, leading to injuries which require at least one day of hospitalization and/or leading to 0-30% medical disablement. The person has, however, not been in danger of death. In addition there are those who have been "dangerously injured". They are persons who have suffered injuries in traffic accidents, leading to 30-100% medical disablement, or who have been in real danger of death, including those who die 30 or more days after the accident.
Poland	A person suffering from serious injuries e.g. fractures, concussion, internal injuries, severe general shock requiring hospitalization for more than 7 days.
Portugal	Any person injured in an accident who needs hospitalization.
Spain	A person who remains hospitalized for over 24 hours resulting from injuries caused by a traffic accident.
Sweden	See Standard Definition by ECE
Switzerland	Persons with severe visible injuries, disabling normal activities at home for at least 24 hours (loss of consciousness, fractures, hospitalization lasting more than 1 day).
United States	A police-reported incapacitating injury.
ECE	Fractures, concussion, internal lesions, crushing, severe cuts and laceration, severe general shock requiring medical treatment and any other serious lesion entailing hospitalization.

Appendix 14: Hospitalized

IRTAD	Accident victims admitted to hospital as in-patients, excluding all killed.
Australia	Any person involved in a road vehicle accident resulting in the injured person being admitted to hospital as in-patient.
Belgium	Hospitalization for at least 24 hrs.
Canada	A person involved in a traffic collision that occurs on a public roadway, who suffers non-fatal injuries that result in hospitalization, including for observation only, for a period of at least 24 hours.
Denmark	Hospitalized for at least 24 hours.
Finland.	Admitted to hospital for at least one day. Their number is calculated on the basis of the Hospital Discharge Register of Finland. In principle (but not in practice) hospitalized are a subgroup of the injured. The number of hospitalized is in many cases higher than the number of injured. The reason for this is the low coverage of the police data for injured persons, especially regarding injured cyclists in single accidents
Germany	All persons who were taken to hospital for in-patient treatment (of at least 24 hours).
Luxembourg	Hospitalized for at least 24 hours.
Netherlands	Admitted to hospital for at least one day.
New Zealand	Admitted to hospital for at least one night.
Norway	Persons who have spent at least one day in hospital as the result of a traffic accident. The figure covers all seriously and dangerously injured (people who die within 30 days of the accident, but who have spent some time in hospital before dying is not included).
Portugal	Victims of an accident that are hospitalized.
Spain	All persons injured in a traffic accident and whose condition requires hospitalization. A hospital census is made every 24 hours
Sweden	Admitted to hospital for at least one night. Statistics are based on the date when the patient leaves the hospital. (The problem is that some patients come to the hospital in one year and leave the following year.) One patient can be treated in several clinics/hospitals and sometimes on different occasions. Foreigners are not included. Hospital data: Low quality of classification by road user category.

Appendix 15: A Guided Semi - Structured Interview Form

			Serial Number

Time started the interview: ……:……
Date of the interview: ….. / …. / 2005

I- Interview Consent Form

Dear Participant,

You have been selected as a member of Accident and Emergency Department in Salmaniya Medical Complex to be part of a study on the validity and reliability of Road Traffic Injury Database System in the Kingdom of Bahrain, as part of the Master program of Health Policy and Population Studies in Arabian Gulf University. The purpose of this study is to evaluate the reliability and validity of the composite instrument used by both police and hospital systems. The data will be collected by Semi structure Interview that will take around 10 minutes and we would therefore like to interview you for the Qualitative Part of the Study, which will cover your comments, opinion, concerns, and suggestions on the structure and purpose of the Road Accident Injuries Police Report, and will be carried out and recorded by Dr. Hala Al-Mehzaa, Student interviewer from the Master Program.

The information you provide is completely confidential and will not be disclosed to anyone. You will not be identified at individual level, but will be identified as a whole group physicians of the Accident and Emergency Department. It will only be used for research purposes, and you will be informed, if you are interested, about the results of the statistical analysis, discussion, dissemination and publication of this data. Your name and other personal information will not be included in the interview, and only a code will be used without identifying you.

Your participation is voluntary. You are free to refuse to participate in the study. If you have any questions about this study you may contact me or the Master Program of Health Policy and Population Studies in Arabian Gulf University

Signing this consent indicates that you understand what will be expected of you and are willing to participate in this study.

INDIVIDUAL CONSENT FORM:

Respondent: ……

Interviewer: …… Date: … /… / 2005

An Evaluation of the "Road Accident Injury Report" System in the Kingdom of Bahrain; Health System & Policy Implications

Physician Interview
Re
The Road Accident Injuries Police Report RAIR

Master program of Health Policy and Population Studies
Department of Family and Community Medicine
Arabian Gulf University

Component of the Interview:

1. Demographic' of the Respondents.
2. Purpose of Road Accident Injuries Police Report.
3. Structure of the Report.
4. Physician Comments, Concerns, and Suggestions.

CONFIDENTIALITY:

Before we start, I would like to assure you again that this interview is confidential and completely voluntary. If we should come to any question which you do not want to answer, just let me know and we will go on to the next question.

II-The Interview Questions

Section 1 Demographic Characteristics of the respondents:

Start Time: ….. : …..

1-AGE: ☐☐

2-Gender

☐ Male ☐ Female

3- Nationality

☐ Bahraini ☐ Non Bahraini

4-Position

☐ Junior Resident ☐ Senior Resident

☐ Chief Resident ☐ Consultant

5- Working Experience in the Department:

☐ Less than 5 Years ☐ 5-10 Years

☐ More than 10- & Less than 15 Years ☐ More than 15 Years

Section 2 The Purpose of Road Accident Injuries Police Report

1-In general, what kind of purpose do you think this report was designed to meet?

.....
.....
.....
.....

Guideline Hints and Examples of the answer for the Interviewer:		
Purpose of the report:	Priorities Ranking (1 Most important- 6 Least Important)	Justification for this ranking
1- To Document the data for tracking purpose, media, or legal issues.		
2- To Identify the person involved in the accident- with regards to their role and responsibility (Driver- Passenger-Pedestrian)		
3- To Identify the characteristic of the person involved in the accident, with their Modified Risk factors (Seat Belt- Alcohol-Mobile phone usage)		
4- To identify the nature of Injury- i.e. The Severity of Injury.		
5- For Medico Legal purpose		
6- To Document the outcome of the accident (Disposal of patients, follow up, & Death).		
7- For the purpose of Prevention		

2- Do you feel that the purposes are clear? And understood in the same way?

.....
.....
.....
.....

3- Have you ever found yourself asking others about the purpose of this report? What did they reply?

.....
.....
.....
.....

Section 3 The Structure of Road Accident Injuries Police Report

1- What do you think of the overall design of this report?
e.g. Does it match or reflect its purposes?

.....
.....
.....
.....

2- Are all the purposes meeting your satisfaction?
.....
.....
Explain:
.....
.....
.....
.....

3- Does the classification into minor and serious injuries, match with how you classified injury?
.....
.....
Explain:
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.....
.....
.....

4-Do the categories of injuries as they are described in the report, match with your clinical classification?
.....
.....
Explain:
.....
.....
.....
.....

5- Do the sites of injuries satisfy your clinical examination?
.....
.....
Explain:
.....
.....
.....
.....

6- Does the treatment result component of the report, reflect the outcome decision?

.....
.....

e.g.: you need Wait and See category.

Explain:
.....
.....

Section 4 The Comments, Concerns, and Suggestions on Road Accident Injuries Police Report

1-Do you have any other comment about this report?

.....
.....
.....
.....

2- Do you have any concern about the report, how it is used or its adequacy?
e.g. Definitions and Criteria
Comprehensiveness
Adequacy of spell
.....
.....
.....
.....

Explain:
.....
.....
.....
.....

Do you have any suggestion about how this report can be modified or redesigned it process?
.....
.....
.....
.....

TIME ENDED: ...../.....

THANK YOU FOR YOUR HELP

Section 5 Interviewer Observation

After completing the interview, the interviewer should write a brief summary giving her impression of the respondent and the interview. This summary should cover any difficulties in communication or in achieving privacy that might have affected the accuracy or results, and any evidence of upset on the respondent's part.

.....
.....
.....
.....

The interviewer should also explain any interruptions in the interview.

.....
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.....

If there were any unusual aspects of the respondent's current status or history that would help to explain the answers obtained, they should be summarized here.

.....
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.....
.....

Appendix 16: OECD

The Organization for Economic Cooperation and Development (OECD) is an intergovernmental economic organization in which the 30 member countries listed below discuss, develop and analyze economic and social policy; The member countries rely on the OECD Secretariat in Paris to collect data, monitor trends, analyze and forecast economic developments, research social changes and patterns in trade, environment, agriculture, technology, taxation and other areas to inform their discussions and to assist them in pursuing their efforts to develop common policies and practices.

OECD Member Countries	
Australia	Austria
Belgium	Canada
Czech Republic	Denmark
Finland	France
Germany	Greece
Hungary	Iceland
Ireland	Italy
Japan	Korea
Luxembourg	Mexico
Netherlands	New Zealand
Norway	Poland
Portugal	Slovak Republic
Spain	Sweden
Switzerland	Turkey
United Kingdom	United States

Appendix 17: IRTAD

The principal objectives surrounding the creation of the International Road Traffic Accident Database (IRTAD) were to enhance international comparability of road collisions and traffic data; to enhance the quantity and quality of relevant data; to facilitate the international accessibility and dissemination of data; and to respond to the needs of researchers, governments, international organizations and private agencies.

One of the principal mandates of the International Road Traffic and Accident Database (IRTAD) Operational Committee when it first became operational in 1990, was to gather standardized traffic collision and exposure data among OECD member countries. This information was and continues to be used by program and policy makers to identify existing and emerging road safety problems and, if necessary, to help develop programs to curtail these problems.

Source: Axel Elsner, 'A Historical Overview of the International Road Traffic and Accident Database', International Seminar on Road Traffic Accident and Data Needs for the 21st Century, Vienna, Austria, August 2000

Appendix 18: Validity & Reliability Definitions

Validity	1. 'An agreement between two efforts to measure the same thing with different methods' -- Campbell and Fisk (as cited in Hammersley, 1987) 2. 'The measure that an instrument measures what it is supposed to' – (Black and Champion, 1976) 3. 'Accuracy' – (Lehner, 1979) 4. 'Degree of approximation of 'reality' -- Johnston and Pennypacker (1980) 5. 'Are we measuring what we think we are?' – (Kerlinger, 1964) 6. 'to the extent that differences in scores yielded…reflect actual differences' -- Medley and Mitzel (as cited in Hammersley, 1987)
Reliability	1. 'An agreement between two efforts to measure the same thing with the same methods' -- Campbell and Fisk (as cited in Hammersley, 1987) 2. 'Ability to measure consistently' – (Black and Champion, 1976) 3. 'Reproductibility of the measurements…stability' – (Lehner, 1979) 4. 'Capacity to yield the same measurement…stability' – (Johnston and Pennypacker, 1980) 5. 'Accuracy or precision of a measuring instrument?' – (Kerlinger, 1964) 6. 'To the extent that the average difference between two measures obtained in the same classroom is smaller than…in different classrooms' -- Medley and Mitzel (as cited in Hammersley, 1987).

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Appendix 19: The 21 Items that were included in the Overall Reliability test were as follows

1. Injured Person type (driver, passenger, or pedestrian)	• Component : Anatomical Site of Injury: 10. head, 11. spine, 12. pelvis, 13. neck, 14. left hand, 15. left leg, 16. right hand, 17. right leg, 18. chest, and 19. others.
2. Injuries Severity Component (MINOR or SERIOUS)	20. Component deals with the management and outcome results of the accident, and includes the following three categories or choices (released from hospital after treatment; kept in Day Care Unit (DCU) under observation, or admitted to hospital).
• Component: Nature of injuries; 3. wounds & contusions, 4. fractures, 5. joints & ligaments, 6. "pose contusion" (Concussion), 7. internal injuries, 8. burns, and 9. others.	21. Component deals with information resulting to a fatal injury, and includes two categories (died before reaching hospital, and died in hospital)

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ملخص البحث

تعتبر الإصابات الناتجة عن حوادث الطرق أحد أهم عشرة أسباب للأمراض و الإصابات على مستوى العالم و بالتالي فهي محمل اهتمام جميع الدول و التشريعات و بشكل عام فإن أنظمة تقنية المعلومات الخاصة بالإصابات الناتجة عن حوادث الطرق تنقصها الدقة، المصداقية و العمومية؛ و ذلك نظرا لعدم الاتفاق على نظام موحد للتصنيف و توصيف الإصابات .

و هكذا فإن المحاولات المبذولة لتجميع و توضيب المعلومات المتعلقة بمنع و تجنب حوادث الطرق تواجهه العديد من الصعوبات .

يعنى هذا البحث باستكشاف فعالية أحد الأدوات المستخدمة لتجميع بيانات حوادث الطرق في مملكة البحرين ألا و هو " تقرير إصابات حوادث الطرق *RAIR* " و مقارنة هذه النتائج مع المقاييس الدولية المتعارف عليها للحوادث و أنظمة المعلومات الخاصة بها على مستوى العالم .

لقد تم اعتماد الطريقة الوصفية في البحث بجزئيها النوعي (أسلوب الملاحظات المباشرة ، و المقابلات الشبه هيكلية مع الأطباء المعنيين بالموضوع) ، و بينما تم استخدام العناصر الكمية لتقييم فعالية و مصداقية و كيفية استخدام " تقرير إصابات حوادث الطرق *RAIR* " .

و قد ظهر جلياً من طريقتي البحث المعتمدتين وجود خلل في فعالية و مصداقية نموذج " تقرير إصابات حوادث الطرق *RAIR* " و كذلك وجود ارتباك لدى المستخدمين الرئيسين لهذا التقرير حول الهدف، النتائج المرجوة، و درجة الوضوح و خاصة عند تحديد و تصنيف مدى خطورة الإصابة .

لقد أظهرت نتائج البحث وجود عدة تساؤلات حول مختلف النواحي و خاصة التقارير الغير مبلغة، مشاكل حفظ و استعادة المعلومات، سرعة البت في نوعية الإصابات، و مدى التزام مختلف الجهات .

و الخلاصة؛ فإن " تقرير إصابات حوادث الطرق *RAIR* " يفتقر إلى الفعالية و المصداقية اللازمة لاعتماده كمصدر للمعلومات، و لهذا السبب فإن مساهمته في تجنب أو تقليل الإصابات الناتجة عن حوادث الطريق تبقى محدودة للغاية .

جامعة الخليج العربي

كليـــة الطب و العلوم
الطبية

برنـــامج السياسات الصحية
والدراسات السكانية

تقييم نظام "تقرير إصابات حوادث الطرق" في مملكة البحرين؛ النظام الصحي والسياسات المتضمنة

رسالة مقدمة كجزء من متطلبات الحصول على درجة الماجستير في
السياسات الصحية والدراسات السكانية

إعـــــــداد

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