A MORTALITY PROFILE OF PATIENTS ADMITTED TO DR GEORGE MUKHARI HOSPITAL IN 2008

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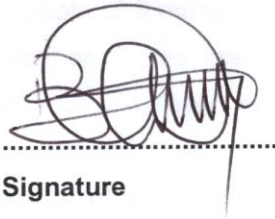
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DECLARATION

I, **Bafedile Evah Chauke** declare that the dissertation hereby submitted to the University of Limpopo, for the degree of Master of Medicine (Community Health) has not previously been submitted by me for a degree at this or any other university; that it is my work in design and in execution and that all material obtained herein has been duly acknowledged.

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ABSTRACT

Introduction: Mortality profiles form very important components of the public health information system and are used widely to inform important planning decisions at managerial level.

Aim: To determine and describe the mortality profile of patients admitted to Dr George Mukhari Hospital in 2008.

Methods and quality: Cause of death information was collected from the death notification register situated in the hospital mortuary. A representative sample of 6 months out of the 12 months of the year was chosen in such a way as to represent all the seasons of the year to minimize bias from seasonal variation that could influence cause of death patterns. A total of 3790 deaths were captured in the death register for 2008 and 1968 deaths (52%) of the deaths were analyzed. 53% of the deaths occurred in males while 47% were in females. Most of the records captured were complete with very minimal missing data variables for analysis.

Findings: Non-communicable conditions contributed to the highest burden of mortality at 43%, followed by communicable diseases at 38%. HIV and AIDS seemed to be prominently contributing to mortality in Dr George Mukhari Hospital. In keeping with global statistics, cancer was also a leading cause of death in the older age groups. The neonatal period was the highest risk period for death in children under 5 years of age. Post neonatal children die more from pneumonia, diarrhoeal conditions and malnutrition.

Discussions and conclusions: Routine statistics collected by the hospital should be modified to include some important variables such as additional information on the broad causes of death or even utilization of the National Injury Surveillance System to assist with decision making. There should be strategies to improve more accurate capturing of HIV and AIDS deaths and Injury related deaths. Based on the similarity of the mortality profile to the rest of the province and the country, existing national and provincial programme strategies can be used for better planning for the illustrated health service needs.

ACKNOWLEGEMENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AIDS – Acquired Immunodeficiency Syndrome

CIA – Central Intelligence Agency

CVA – Cerebro-vascular accident

CVS – Cardiovascular system

DGMH – Dr George Mukhari Hospital

ENT – Ear, Nose and Throat

ETAT – Emergency Triage and Assessment Training

FSB – Fresh Still Born

GIT – Gastro-intestinal Tract

HIV – Human Immunodeficiency Virus

HPV – Human Papilloma Virus

HST – Heath Systems Trust

ICD – International Classification of Disease

IMCI – Integrated Management of Child Illnesses

LBW – Low birth weight

MDG – Millennium Development Goals

MRC – Medical Research Council of South Africa

MSB – Macerated Still Birth

STATSSA – Statistics South Africa

TB – Tuberculosis

UN – United Nations

WHO – World Health Organization

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CHAPTER 1
INTRODUCTION

1.1   Rationale for the study

It is important to consistently look at and compare morbidity and mortality data so as to make informed decisions and to aid strategic planning. In the current era most communities are demanding more health services than are available due to limitations in resources. The decision makers therefore have to make sure that they have information about their burden of diseases and injuries together with the risk factors thereof and how they are likely to change with certain interventions.

Describing the disease burden helps to assess performance and judge progress over time, and may also sharpen the consideration for priority programmes in the light of local conditions. They may also increase knowledge as to where the largest number of training hours in medical schools should be directed in the light of limited resources and fixed hours for teaching. Health managers may be assisted in formulating a case for re-allocation of resources toward interventions that will result in the most health gains.[1]

Seeing that the demand for quality care is on the rise with limited resources, the management of Dr George Mukhari Hospital in the Tshwane Metropolitan Municipality of Gauteng Province, South Africa, commissioned a burden of disease study to assist with a better understanding of the surrounding communities; to assist in planning for priority interventions and to improve the quality of health care. The hospital mortality profile constitutes a significant part of the burden of disease study.

This kind of report can help managers to ensure an enabling environment for health care. Managers can ensure that facilities are adequately provided for, equipment and drugs are made available and ensure that posts are filled by appropriately skilled personnel. [2]

1.2   Aim of the study

To determine the mortality profile of patients admitted to Dr George Mukhari Hospital in 2008.

1.3   Objectives of the study

- To describe the prevalence of mortality of patients admitted to Dr George Mukhari Hospital in 2008.
- To describe the profile of these patients with respect to age, sex and cause of death.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In an era where societies must cope with increased demands for health services, they will inevitably have to make choices about provision of services, even if by default, the choices are a continuation of current practices.[3] Strategic health planning is very important and it can ensure acceleration of service delivery and attainment of health goals at low cost to countries. Policy makers therefore need to have a way of intelligently informing some of the strategies to be adopted to attain these goals.

A consistent and comparative assessment of burden of diseases and injuries and the determinants thereof is an important input into health decision making processes and health planning.[4]   The main problem for policy makers is how to analyse available fragmented data to make decisions.

Burden of disease studies form an important component in the measurement of community health status and determinants of health.[5]   Measuring how many people die and why they die is one of the most important means -- together with measuring how various disease and injuries affect the living -- for assessing health systems. Having those numbers helps authorities to see if they are focussing on the right interventions.[4]

Timeous and accurate information about causes of death are however necessary for this process and will depend on the quality of available information systems. Worldwide, including in South Africa, there have been efforts to improve quality of information on cause of death in order to better inform planning and prioritization of health interventions as well as planning in other sectors.

Death registrations have improved worldwide following the drive to obtain our better data in order to plan better. Despite improved registrations of death it is however important to note that this information is still not routinely collected at desirable levels to give adequate information about sub-population causes of death for planners and decision makers. Sub-population data is needed to monitor inequalities in health at community level. While policy is driven from national levels in most countries, local authorities need to better understand priorities at their level to come up with better suited strategies to address them.

It was for these reasons that the World Health Organization (WHO) developed a standard approach to assessing burden of diseases for countries. This approach is meant to assist countries in understanding their disease profiles better as well as continuously comparing with other parts of the world in order to track progress and learn from each other. The approach also provides an opportunity to use available data and present it in a format that is relevant for planning of health services.[6]

An important feature of the burden of disease framework is the use of a common metric to summarize the disease burden from diagnostic categories of the International Classification of Diseases (ICD) and the major health risks that cause those diseases.[3]

The first burden of disease study was commissioned in 1992 by the World Bank, aiming to provide a comprehensive assessment of the global burden of disease and its risk factors. This study, for the first time, tried to look at all regions of the world and non-fatal causes of disease. The plan was to recommend different health interventions for countries in different developmental stages through a combination of disease analysis and looking at cost effectiveness of interventions in different countries.[3]

The use of Disability Adjusted Life Years (DALY) and Years of Potential Life Lost (YPLL) due to diseases was also an important feature of this framework

Applications of burden of disease studies include the following:

- Assessing performance – Here the information collected from burden of disease studies can be used to track progress in performance and changes with respect to health priorities and goals set for the country.[6]

- Identifying national control priorities – Many countries use these to come up with a list of priority conditions. The aim is to target these conditions with high level strategies and resources hoping that reducing these conditions will yield larger impacts on health status. This is in an effort to maximize benefits from limited resources that are available to governments to gain large benefits through cost effective interventions.

- Generating forums for informed debate for values and priorities – Debating issues such as weights and desired quality of life at different ages provides a forum for strengthening objectives and priorities for national policy.

- Creating knowledge – Based on the fact that all resources are limited, knowledge about the conditions that constitute the highest burden enables planners as wells as academic and research institutions to allocate resources and teaching hours to conditions that will make the most significant impacts.

- Allocating resources across health interventions – Knowledge about disease burden will help identify those interventions that should be prioritized and allocated resources in order to achieve the greatest health gains at the lowest costs.

2.2. Global burden of disease

Slightly more than 56 million people died in 2006. Of this number, 10 million (approximately 20%) were children under 5 years of age. Of these 10 million deaths, 4.4 million occurred in the first month of life with an additional 3.3 million being stillbirths.[3]   Almost all of these deaths (99%) occurred in middle and low income countries and most of them could have survived with access to cheap and simple interventions via health system strengthening. [7]

5

The global burden of disease also shows that 30% of deaths in middle and low income countries are in young adults between the ages of 15 and 59 compared to 15% in high income countries.[3] This important fact needs closer attention as to possible causes and interventions. Based on available data from WHO, it is clear that many diseases responsible for death in middle and low income countries are quiet uncommon in high income countries. [8] In middle and low income countries the burden of disease is still primarily associated with infectious diseases including HIV /AIDS. Maternal causes and malnutrition are still high in developing countries despite more resources and better understating of interventions that work worldwide. Eight conditions are responsible for 29% of the disease burden in low and middle income countries i.e. HIV, TB, vaccine preventable diseases, diarrhoeal diseases, respiratory infections, malaria, neonatal and maternal conditions.[8]

The public health sector has been concerned with communicable disease control in low and middle income countries for some time. The first global burden of disease study was able to confirm a lot of ongoing speculation that non-communicable diseases are on the increase, not only in high income countries, but also in middle and low income countries. Recently there has been a shift to non-communicable disease control in these low and middle income countries upon realization that non-communicable conditions are rapidly growing and account for more than 50% of all deaths.[4] Globally, heart disease accounts for highest number of deaths. Of importance to note is that the profile of non-communicable conditions in low and middle income countries is similar to that in high income countries, meaning that the risk factors are similar and should respond to similar interventions. It is also estimated by the World Health Organization that at least 80% of the cardiovascular deaths could be prevented by healthy diets, exercise and avoidance of tobacco.[4]

In spite of the increased knowledge about HIV prevention and treatment, as well as global and local funding for HIV and AIDS, there is still a significant role that is attributable to this dreadful condition on the burden of disease. HIV remains the leading cause of death in Africa. Sub-Saharan Africa remains

worst affected by this epidemic and South Africa is still considered to have amongst the highest proportions of people infected by HIV in the world.[4,9] Young people aged 15 – 25 account for 45% of new infections.[9]   Weak health care systems and limited human resources keep on hampering better health care, despite significant progress in HIV prevention and treatment.

The increase in life expectancy of populations around the world, due to better health systems, better socio-economic environments and reduced fertility is contributing to a rise in some of the conditions associated with ageing. This is evidenced by the high prevalence of cancers and heart disease. This is in keeping with the demographic transition of many countries and is very important and relevant for strategic health planning. Care givers and health systems need to ready themselves for the burden of chronic diseases associated with ageing populations.

Lung cancer is the most common cause of death from cancer worldwide, but cancers display a geographic variation in developing and developed countries.[4]   The types of cancers predominating in developed countries -- lung, colorectal, breast and prostate cancer-- reflect factors such as early beginnings of the tobacco epidemic, earlier exposure to carcinogens through industrialization and diet and lifestyle changes. When one looks at developing countries however, the predominating cancers -- cervical, liver and stomach cancers -- are associated with chronic infectious conditions like human papilloma virus (HPV), Hepatitis B and *Helicobacter pylori*.[8]

Preventable pregnancy complications account for 15 % of deaths in women of reproductive age.[4]   The fact that 99% of maternal deaths occur in developing countries illustrates the large disparity in public health care with an average lifetime risk of death of 1 in 4 000 in high income countries, 1 in 61 in middle income countries and 1 in 17 in low income counties.[8] The reduction of these deaths is important if we are to meet the Millennium Development goal 5 of reducing maternal mortality. Maternal mortality rates are an important indicator of the status of a health system in a country.

Reducing maternal mortality requires an integrated health care delivery system that reaches communities with education and counselling, helps people avoid unwanted pregnancies, promotes good nutrition, screens for risk, assists healthy births and responds to obstetric emergencies effectively. [8]

Mental health conditions such as depression are among the 20 leading causes of disability worldwide, and less that 25% of those affected have access to adequate health services and care.[4]   Mental, visual and hearing impairments are amongst the most common causes of disability globally.[4] Most of these conditions affect the livelihoods of people significantly and could be addressed easily with cheap interventions such as cataract removals.

Mortality from road traffic accidents are on the rise and are projected to jump from the ninth leading cause of death in 2004 to the fifth leading cause of death in the world by 2030.[7]   It is important to make these anticipations and strengthen some of the control measures like road safety through use of safety belts, enforcement of driving laws such as speed limits and avoidance of driving under the influence of alcohol.

Under-nutrition is reported by the World Health Organization to be the underlying cause of death in 30% of a childhood deaths. Some of the risk factors identified include lack of breastfeeding as well as inadequate access to nutritious food.[7]

Mortality surveillance is a central aspect of the information required to identify the health needs of a community, monitor progress in the implementation of programmes and track changes over time.[5]   Table 1 below illustrates the leading causes of morbidity and mortality globally.

TABLE 1:   Leading causes of mortality and morbidity, WHO, 2004

MORTALITY		MORBIDITY (DALYs)	
	%		%
1. Ischaemic heart disease	12.2	1. Lower respiratory infections	6.2
2. Cerebrovascular disease	9.7	2. Diarrhoeal diseases	4.8
3. Lower respiratory infections	7.1	3. Depression	4.3
4. COPD	5.1	4. Ischaemic heart disease	4.1
5. Diarrhoeal diseases	3.7	5. HIV/AIDS	3.8
6. HIV/AIDS	3.5	6. Cerebrovascular disease	3.1
7. Tuberculosis	2.5	7. Prematurity, low birth weight 2.9	
8. Trachea, bronchus, lung cancers 2.3		8. Birth asphyxia, birth trauma	2.7
9. Road traffic accidents	2.2	9. Road traffic accidents	2.7
10. Prematurity, low birth weight 2.0		10. Neonatal infections and other	2.7

2.3. South African burden of disease

South Africa is undergoing profound changes in health and it is important to measure these changes for planning purposes.[5]   While the available information systems may be fragmented and not be in a position to give us comprehensive information about the changing trends, it is important to continue adopting other methods to critically analyse data to better understand the burden of diseases in our settings.

South Africa has been praised for having one of the best constitutions in the world which makes provision for the right of all to access health care and makes specific provision for children.[10]   There are also good policies for health and well tested interventions for common health conditions.

There is however rising mortality in children and adults, disparities and injustices in the distribution of quality health care between the rich and the

9

poor and the urban and rural settings. It is because of these factors that the attainment of these rights to survival remains elusive.[2]

The 2008 Central Intelligence Agency (CIA) World Factbook estimates the global life expectancy to be 66,26 years for both sexes combined and 64,35 years and 68,35 years for males and females respectively.[11]   It is in this report that South Africa is ranked number 183 out of the 191 UN member states. The bottom position is occupied by Swaziland. South Africa is estimated to have a life expectancy of 44,45 years for both sexes combined and 43,21years and 41,66 years for males and females respectively.[11] The South African Health systems Trust estimated the all sex life expectancy to be around 46 years at birth in 2005.[12]   This is very worrying for South Africa which has more resources for health than most other countries enjoying much higher life expectancies. While the population pyramids in developed countries are getting broader on top with more peoples people reaching old age due to modern health care, South Africa's population pyramid seems to be getting narrower on top with about a third of the population being under 15 years of age.[13]

Figure 1 below is the population pyramid for South Africa in 2001 and is an illustration of a country with of a growth that has high fertility and slow growth. The large proportion of children and young is likely to put pressure on the educational and health care systems as well as future provision of employment.[13]
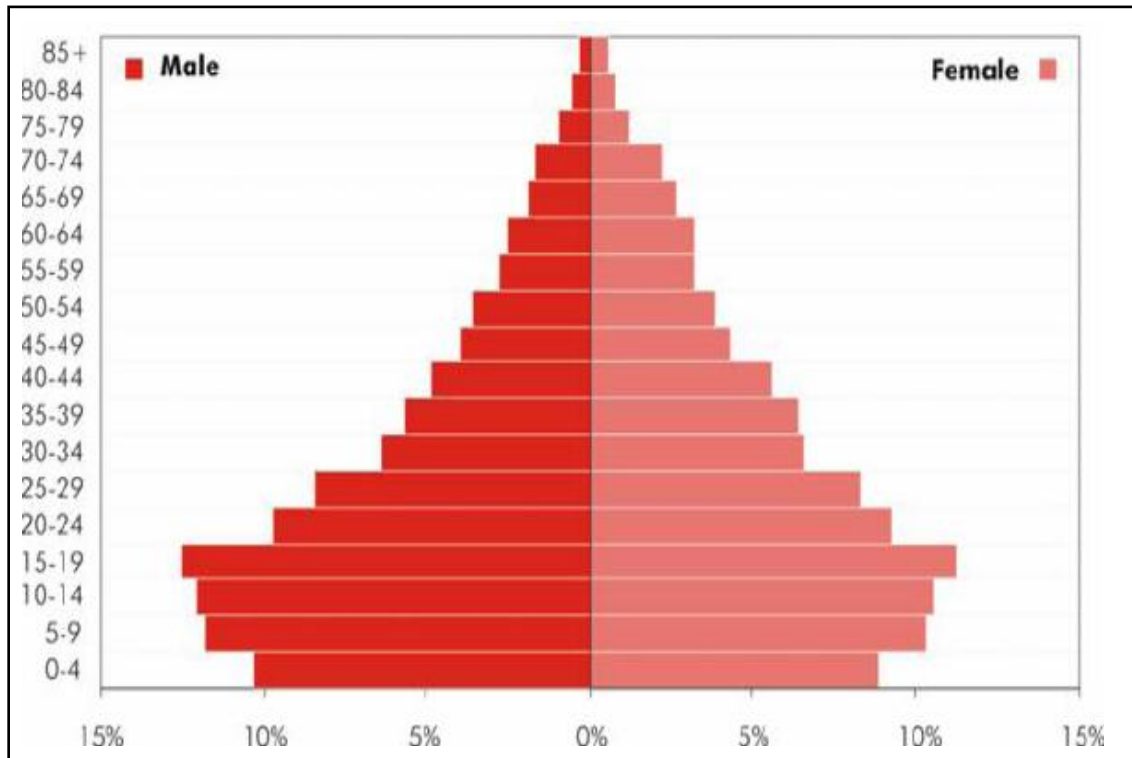
FIGURE 1: Population pyramid of South Africa, 2001   (Source: Statistics South Africa)

The MRC, in the burden of disease study 2000, described the cause of disease with respect to 4 broad categories. These include:

- HIV and AIDS
- Other communicable diseases, maternal, perinatal and nutrition causes
- Non – communicable diseases
- Injuries

Traditionally, in burden of diseases studies, there was use of the term 'double burden of disease' with reference to most developing countries whose disease burden was associated with unhealthy lifestyles as well as underdevelopment. The high rates of injuries led to the terminology changing to 'triple burden of disease'; while the rapidly changing disease profile in South Africa, due to HIV/AIDS, led to the term once again changing to 'quadruple burden of disease'.[6]

The MRC national burden of diseases report for 2000 illustrated very important information about the geographical distribution of mortality and provided a good summary indicator of overall health and development as wells as a measure of provincial inequalities. This study also illustrated the significant impact that HIV infection has on the mortality profile of South Africa. HIV was identified as leading cause of death (39% of total burden) in the whole country except for the Western Cape Province. There were marked difference between provinces, with KwaZulu-Natal and Mpumalanga having the highest burden compared to Western Cape which showed the lowest burden of HIV.[6]

Preventable communicable diseases like diarrhoeal childhood diseases seemed to cause more mortality in the poorer provinces like Limpopo and Eastern Cape while there were fewer deaths in the more affluent provinces like Gauteng and Western Cape.

Non-communicable diseases where shown to account for the most mortality and there was little variation shown among provinces. Injury levels were also shown to be on the increase especially in the more metropolitan areas of the country [6]. This was in keeping with the global burden of diseases mentioned in paragraph 2.2 above.

Life expectancy ranged from 63 years in the Western Cape to 53 years in KwaZulu-Natal, illustrating a 10 year difference between these provinces. [6] It is also important to note that these differences are largely informed by historic variations in health services.

The highest overall mortality, including child mortality, was in KwaZulu-Natal and the lowest in the Western Cape. Child mortality is an important indicator of health system inadequacies as well as an important determinant of life expectancy. These variations in distribution of causes of death are important and could indicate inequalities in distribution of wealth, development and access to good quality health services within the country.

As already discussed above, the lack of reliable data for analysis poses a challenge to getting comprehensive information about provinces and identifying the possible causes of prevailing health problems and death. This was also shown with very limited data available in respect of causes of injury in injury related deaths.

The burden of disease study was, however, able to illustrate that the country, and all provinces, are experiencing a quadruple burden of disease that needs numerous interventions ranging from lifestyle modifications and improved access to health care to more complex interventions for dealing with the HIV epidemic.[6] Some of the interventions will require multi-sectorial collaboration as well as collaboration with affected communities to combat the conditions.

The top 10 conditions that cause premature death in South Africa and Gauteng Province are illustrated in Table 2 below.

TABLE 2: Top ten causes of premature death in South Africa and Gauteng Province – MRC Burden of Diseases, 2000

	SOUTH AFRICA	GAUTENG PROVINCE
1.	HIV/AIDS – 39%	HIV/AIDS – 42.8%
2.	Homicide and violence – 6.8%	Homicide and violence – 8.3%
3.	Tuberculosis – 4.7%	Road traffic – 4.4%
4.	Diarrhoeal diseases – 4.2%	Ischaemic heart diseases – 3.5%
5.	Lower respiratory infections – 3.9%	Tuberculosis – 2.9%
6.	Road traffic accidents – 3.7%	Lower respiratory infections – 2.7%
7.	Stroke – 2.8%	Stroke – 2.7%
8.	Ischaemic heart diseases – 2.5%	Diarrhoeal disease – 1.5%
9.	Low birth weight – 1.7%	Suicide – 1.5%
10.	Protein energy malnutrition – 1.5%	Diabetes Mellitus- 1.4%

The MRC also reported the top 10 causes of death in children under 5 years of age. These are illustrated in Table 3. (They compare very closely to the global top 10 conditions as described by the World Health Organization in the Global Burden of Disease Report of 2004.)

TABLE 3: The top ten causes of death in children in South Africa - the MRC policy brief number 3, December 2003 [14]

	CAUSE OF DEATH	%
1.	HIV / AIDS	40.2
2.	Low birth weight	11.2
3.	Diarrhoeal diseases	10.2
4.	Lower respiratory infections	5.8
5.	Protein energy malnutrition	4.3
6.	Neonatal infections	2.8
7.	Birth asphyxia	2.4
8.	Congenital heart disease	1.2
9.	Road traffic accidents	1.1
10.	Bacterial meningitis	1.1

2.4 The Millennium Development Goals

International agreements have recognized the importance of reducing disease and improving health in middle and low income countries.[8] The year 2000 was marked by the signing of the United Nations Millennium Declaration by 189 countries. This Declaration translated into eight Millennium Development Goals (MDGs) to be accomplished by the year 2015. Amongst these goals there were three goals that specifically focussed on health. This signifies a growing recognition worldwide that the time has come to fulfil the longstanding pledge to make health services available to all.[15]

The three explicit health related MDGs were:

- MDG 4 -- Reduction of child mortality by two thirds by 2015;

- MDG 5 – Reduction of maternal mortality by three fourths by 2015; and

- MDG 6 -- Prevention of the spread of HIV, TB and malaria. [15]

These goals are clearly targeting some of the main contributors to the prevailing burden of disease globally and locally. Achievement of these goals will make significant impacts on health outcomes in countries.

When a closer look is taken at the MDGs, there is clear focus on control of infectious diseases to achieve better health in middle and low income countries. This assumption is, however, not entirely correct because non-communicable health related conditions have been demonstrated to account for more deaths globally with 80% occurring in middle and low income countries.[15]   Even in South Africa, where HIV / AIDS prevalence is high, cardiovascular conditions are ranked third in causes of mortality in women. [15]

Based on the evidence, demonstrated in the Lancet, that these conditions affect the young economically viable age groups, continuing to build vertical health programs that are disease based, is not strengthening the health system. There are cost effective programmes for controlling non-communicable health related conditions.[15]   There is an urgent need to re-focus international efforts towards control of non-communicable health related conditions.

A review of progress towards the MDGs by South Africa showed that, although the country is on track to meet some of the intersectional goals, progress towards health goals have been insufficient and even reversed.[16] The proportion of the disease burden borne by South Africa remains unacceptably high. This has been attributed to the reported quadruple burden of HIV, injuries and trauma, communicable conditions as well as the clear emergence of non-communicable health related conditions.[16]

Despite the challenges faced by the country, continued monitoring of progress towards these goals is a sign that the country is committed to MDGs and the attainment thereof.[16]

CHAPTER 3

METHODOLOGY

3.1 Study design

This was a cross-sectional, quantitative descriptive study of records of patients that died during year 2008 in Dr George Mukhari Hospital.

3.2 Study population

The study population consisted of all records as captured on the death notification register of the Dr George Mukhari Hospital during 2008.

3.3 The sample

A cluster sampling method was used in this study. A sample of six months of the twelve months of 2008 was captured. Months of the year were grouped into the four quarters of the year. Four months were then randomly picked from the quarterly clusters to reduce the chance of missing some seasonal variations. Two additional months were then randomly picked from the remaining 8 months to make a total number of 6 months of the year.

The months of January, February, May, July, September and November were selected and analyzed for this study.

3.4 Inclusion and exclusion criteria

Inclusion criteria: All deaths that occurred in Dr George Mukhari during January to December 2008 and that were captured in the death notification system.

Exclusion criteria: Deaths that were, for whatever reason, not captured in the death notification register and deaths that occurred before arrival at the hospital.

3.5 Data collection methodology

A retrospective review of all records of patients who died in the Dr George Mukhari Hospital during the sample months of the year 2008 was done. Cause of death information was collected from the death notification register to determine the causes of death with respect to age, gender and other variables relevant to the study

A data collection sheet was used to manually collect information from the death notification register at the hospital mortuary, which is the central reporting site for all deaths that occur in the hospital. (Examples of the data collection sheets and data summary sheets used are attached as Appendix 1 and Appendix 2).

3.6 Data analysis

The data was cleaned and analysed using Microsoft Excel and Epi-Info statistical packages. Deaths before arrival were excluded from the analysis. Stillbirths were included for analysis of neonatal causes of death but excluded for the rest of the analysis. There were 5 cases of death that were not classifiable due to lack of accurate information on age and these were excluded from the analysis. The completeness of information in the mortuary death register was approximately 99%.

The International Classification of Diseases system (ICD 10) classifying diagnosis was used to place patients in the different disease categories for comparability purposes. Following the cleaning of data the deaths were then classified into 5 broad categories as follows:

- Group 1: Deaths associated with communicable causes of death excluding HIV and AIDS.
- Group 2: Deaths associated with HIV and AIDS as a recorded cause of death. (Although this is not standard practice globally, it was kept

separate in this study because of the importance of HIV and AIDS in South Africa and this hospital in particular.)

- Group 3: Deaths associated with non-communicable causes of death, such as diabetes, strokes and cancers. This group also included the neonatal deaths associated with prematurity and low birth weight as well as malnutrition in children.

- Group 4: Deaths associated with both intentional and unintentional injuries as the recorded cause of death.

- Group 5: Deaths associated with surgical conditions as a recorded cause of death.

(Surgical conditions – were classified as any conditions that required sutures, incisions, manipulations or invasive procedures that usually but not always require local, regional or general anaesthesia. They included conditions for which surgery could be indicated but were initially managed non-surgically.)

Since the stillbirths do not provide enough information about the actual cause of death, this group of children were only included for the analysis conducted in neonatal deaths and excluded for the overall analysis of causes of death.

Ill defined causes of death like heart failure were distributed equally into the cardiovascular and the hypertensive groups, while cause of death such as respiratory failure were redistributed equally into chronic pulmonary diseases and acute respiratory diseases.

Deaths were stratified into the following age groupings: 0-4, 5-9, 10-14, 15-19, 20-29, 30-39, 40-59 and ≥ 60.

3.7 Reliability and validity of study

The study analyzed six months out of the twelve months of the year (52% of total recorded deaths). This sample may be considered to be statistically representative of deaths in Dr George Mukhari during 2008 and should eliminate some seasonal variations that could have occurred in the year. The

information should thus be reliable and generalizable to the hospital under study for 2008.

Dr George Mukhari is a referral hospital, and a disease burden study in the hospital may not reflect the problems of the community around it since patients come from a diverse geographical area. This however does not stop the management from preparing better and prioritizing resources for their burden of diseases based on what they see regularly.

3.8 Bias

The following types of bias could be encountered and were minimised as follows:

Misclassification bias – due to reliance on what the doctors classified / diagnosed the patient as, there may be some variations in the way different doctors classify. Some doctors were much more specific about the cause while some classified the cases vaguely as heart failure, dehydration, renal failure, etc. These ill defined causes of death were therefore equally distributed in the possible specific groups.

Information bias – because the hospital data was not collected for purposes of a research study, there were some vague data that may significantly skew the results with a lot of cases that could have been classified more accurately falling into the ill defined groups.

Selection bias – The researcher minimized this by selecting half of the year and making sure that representation of all the seasons of the year was achieved. There could be some selection bias due to abnormal occurrences in 2008 that made the deaths in the said year significantly different from the other years, but there is currently no reason to believe that 2008 was different from other years.

3.9 Ethical considerations

- The researcher received ethical clearance from the Medunsa Research Ethics Committee at the University of Limpopo.

- The researcher also received clearance from the Dr George Mukhari Hospital management to look into patients' records and analyze them.

- This study used hospital records to generate and aggregate data. There was no contact with the actual patients or individual patient records. The researcher looked at central hospital registers for discharge information or cause of death information. The researcher was therefore not looking for patient's individual identifiers but at demographic information and diagnosis information only, so as to inform valuable decision making by management. Based on the above information, there was no need for individual patient informed consent.

- Privacy and confidentiality of the records was ensured at all times, with the intention of doing no harm to the patients.

- The names and hospital record numbers were omitted from the report with no personal identifiers.

- All data belongs to the Dr George Mukhari Hospital.

- Study findings will be communicated to hospital management.

CHAPTER 4

RESULTS

(The raw data tables on which the following figures are based are contained in Appendix 3)

4.1 Introduction

There were 3790 deaths captured in the death register for 2008 and 1968 (52% of total recorded deaths) death records were analysed for the months of January, February, May, July, September and November 2008. Out of a total of 3790 deaths in 2008, 1968 were sampled and this was 52% of the total deaths, with a mean of 328 deaths, CI 95% 327 – 329. Of the recorded deaths, 53% were in males and 47% in females. There was a mean of 180, 95% confidence interval 179 – 182 for males, while there was a mean of 149 with 95% confidence interval of 147 – 150 for females over the period. This distribution was consistently found in all the months analysed as shown in Figure 2 below with an average number of deaths recorded per month being 328.
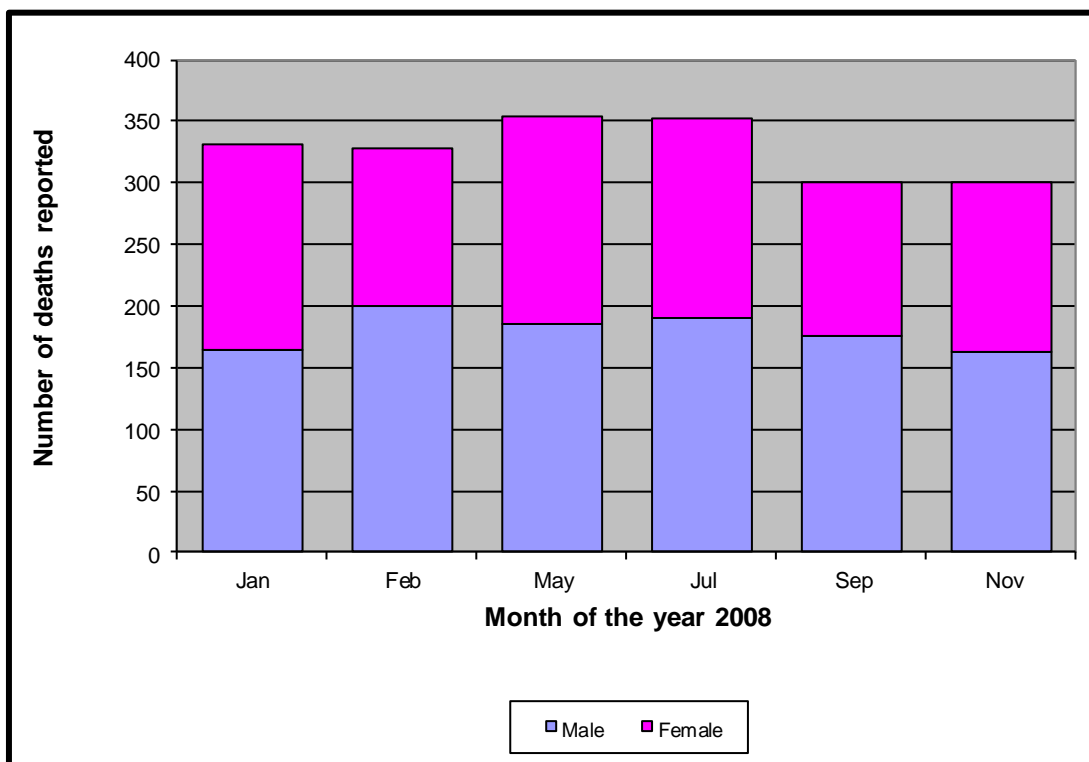
FIGURE 2: Distribution of deaths by gender

The majority (44%) of deaths resulted from non-communicable causes, followed by 37% from communicable causes, while only 8% had HIV and AIDS recorded as the cause of death. The prevalence of HIV in females was 0.108 compared to 0.06 in males. The odds ratio between males and females was 1.9 (CI 95% 1.3514 – 2.675) and risk ratio of 1.8035 (CI 95% 1.3174 – 2.469), p-value 0.00026. This showed a significant increase in HIV related deaths in females compared to males. The prevalence of injury related deaths in males was 0.0582 in males and 0.026 in females. The odds ratio between males and females was 2.665 (CI 95% 1.574 – 4.2775) and the risk ratio was 2.568 (CI 95% 1.542 – 4.2775) for males and females respectively. P value 0.0002. This showed significant (more than double the risk in males compared to females.

Figure 3 below illustrates the distribution of causes of death by broad diagnosis categories.
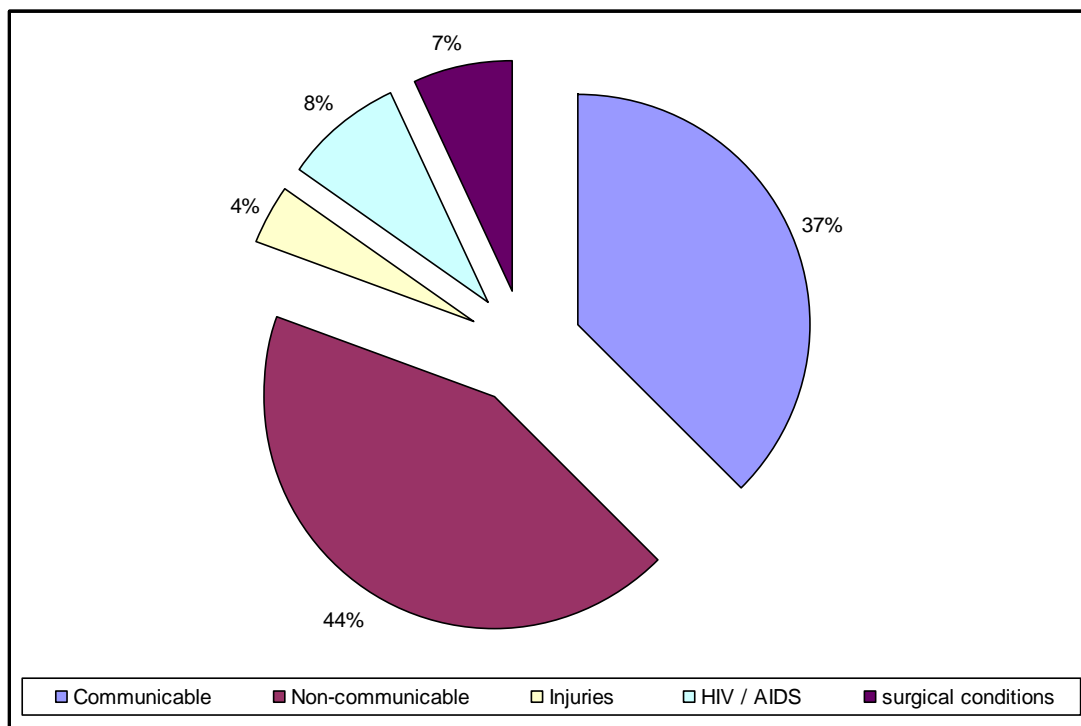
FIGURE 3: Causes of death by broad disease categories

Figure 4 below illustrates the age distribution of deaths. The largest burden of death was borne by the 30-39 years of age group (30%), followed by the 40-45 years of age (25%), then by the under 5 years of age group (17%) and then the above 60 years of age group. The least affected groups seem to be the 10 -14 years, 5 – 9 years and the 15 – 19 years of age at 0%, 1% and 4%, respectively.
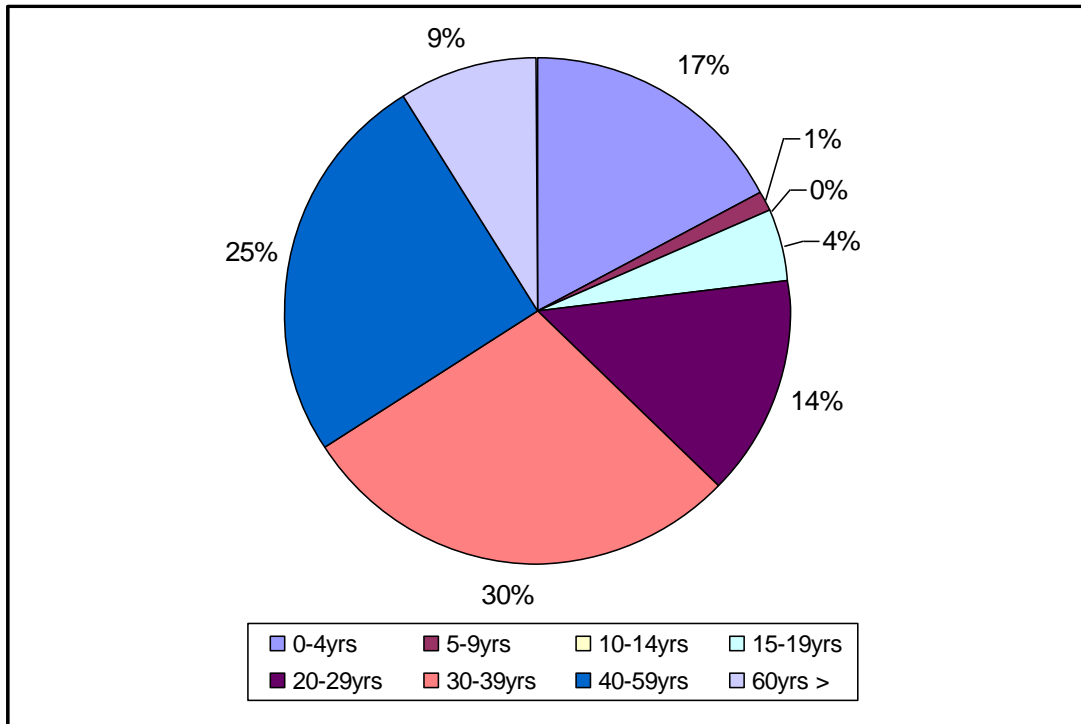
FIGURE 4: Death burden by age group

Figure 5 shows the distribution of death categories by age group. There is a clear illustration of communicable diseases playing an important role as a cause of death at earlier stages of life while older groups tend to die more from non-communicable disease with communicable disease playing a less significant role. The important role of HIV /AIDS in very younger to middle aged group who are in their child bearing ages and hence the apparent demonstrable role of HIV in much younger children under 5 years of age.
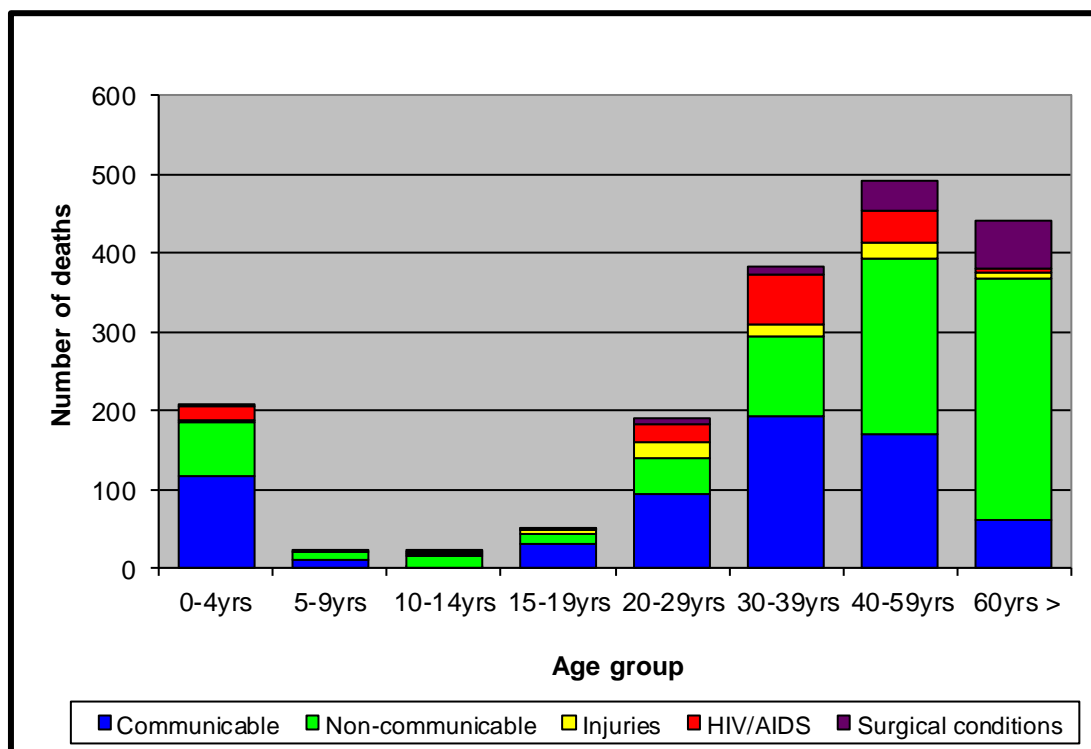
FIGURE 5: Distribution of deaths by cause and age categories excluding dead on arrival at hospital

The Figure 6 below also illustrates the different burdens of disease in the different age groups. Older groups died mainly from non communicable diseases with cancers and cerebrovascular accidents being prominent in this group. The younger groups as well as the middle aged adults are shown also affected by communicable disease, especially the 30 – 60 and the under 5 years of age groups. There is another peak in the HIV /AIDS category for the middle-aged groups.
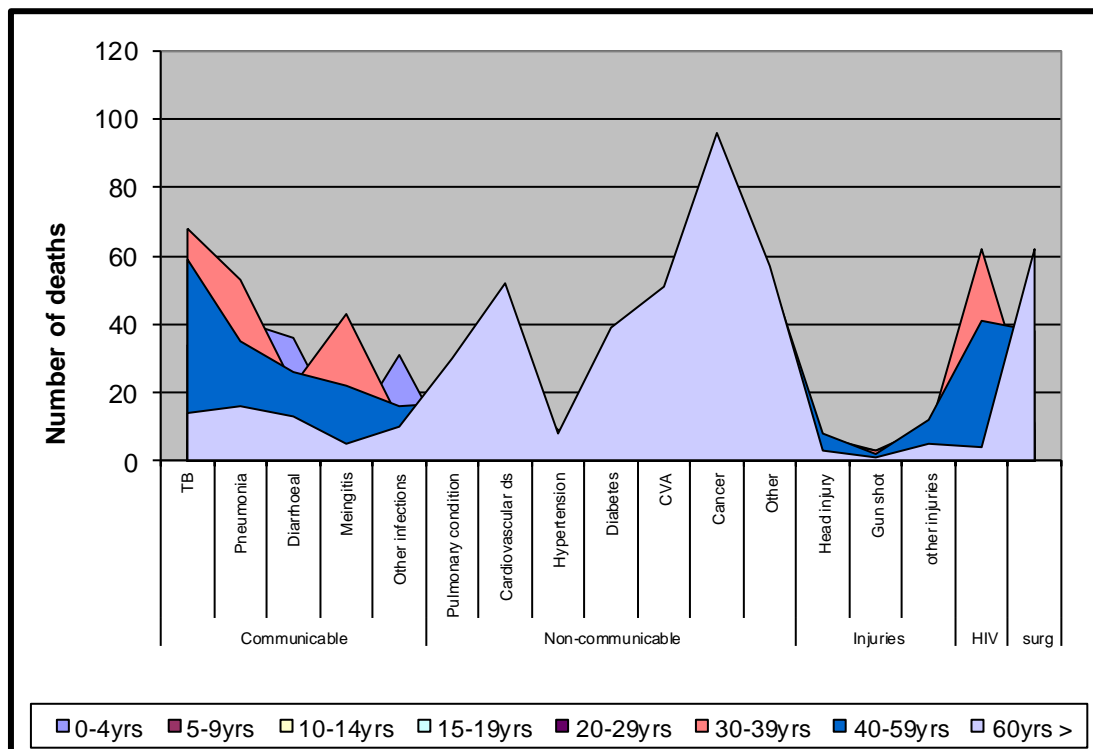
FIGURE 6: Distribution of death categories by age group

Burden of diseases in different age groups stratified by sex is demonstrated Figures 7 and 8 below. Although the disease distribution is very similar for communicable and non-communicable conditions, it would be important to note the larger prevalence of death from injuries in males as well as the greater prevalence of HIV in the female components of the analysis, which seems to start earlier in the 20's for females compared to the 30's for males.
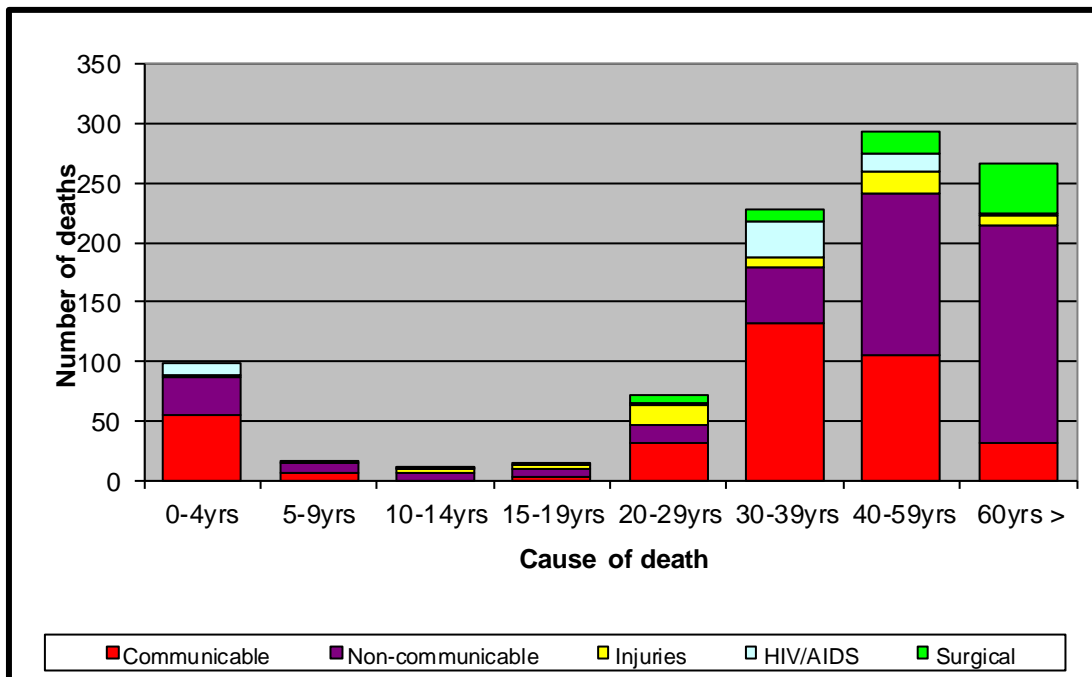
Figure 7: Distribution of cause of death by age – males
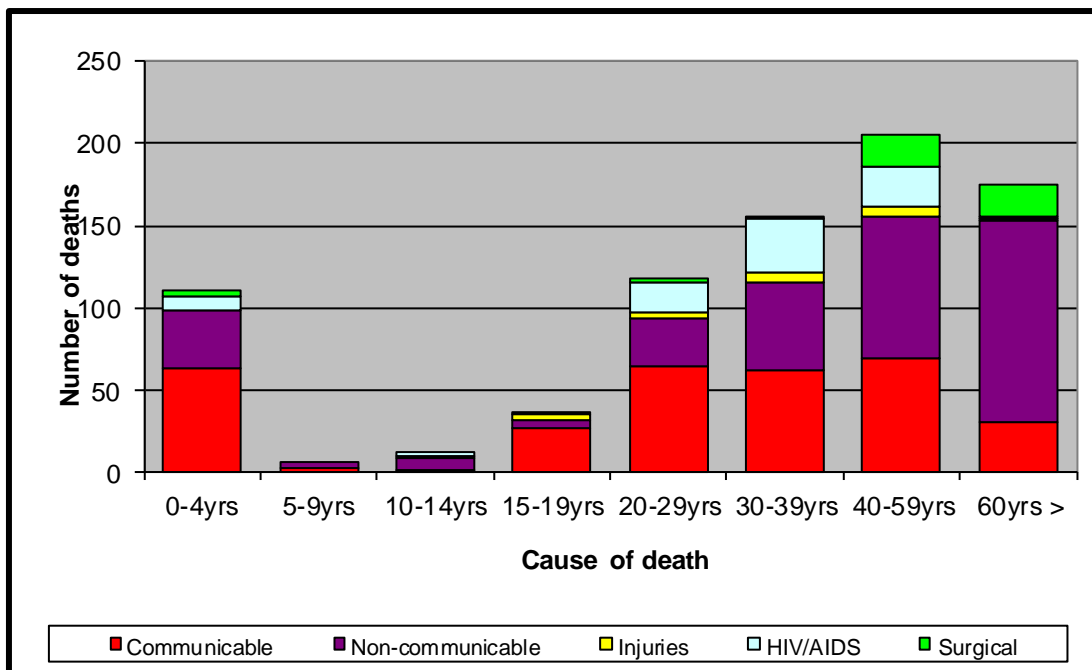
Figure 8: Distribution of cause of death by age and gender – females

As can be seen from the above tables non – communicable diseases were prevalent and seemed to increase as the age increased.

When looking at all cause of mortality for ages above 20 years of age, one found the top ten conditions responsible for death as illustrated in Figure 9 below.

Cancers seemed to be more common at 12.4%, followed by the important TB at 11.7% and HIV / AIDS and pneumonia following closely in fourth and fifth position at 8.6% and 8% respectively. In keeping with the literature on disease burden in South Africa, non-communicable diseases like cerebrovascular accidents and cardiovascular diseases form part of the top ten leading causes of mortality in Dr George Mukhari Hospital.
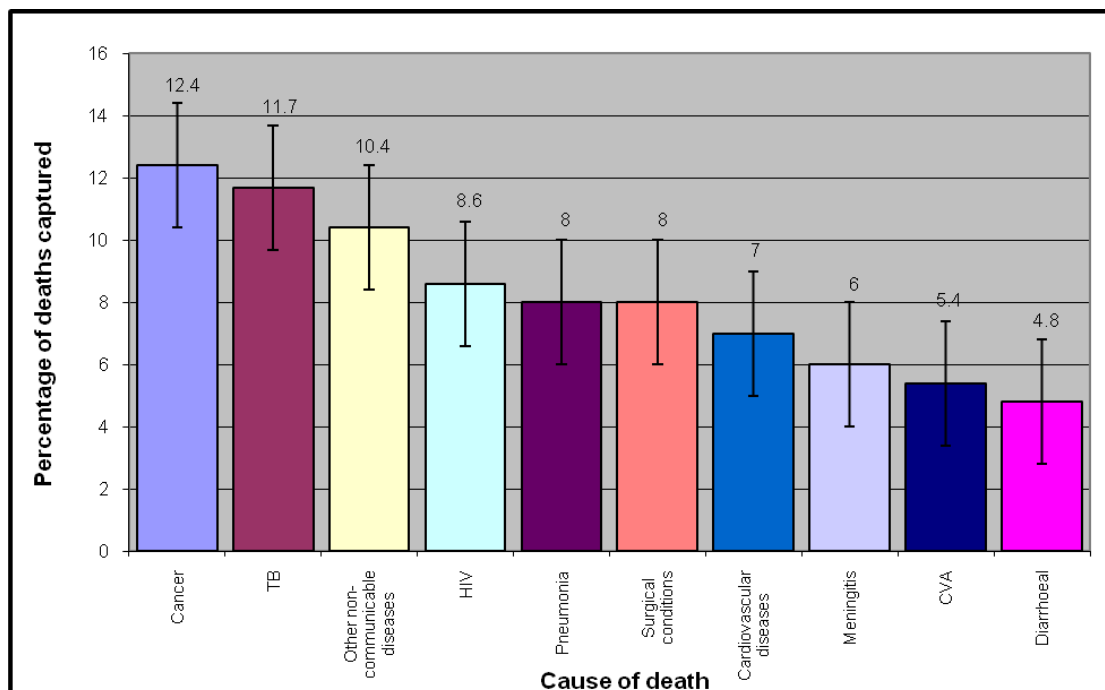
FIGURE 9: Leading causes of death in adults older than 20 years of age

The top ten causes of death for the different age categories are further analysed in Table 4 below. HIV and AIDS and TB feature in almost all the groups as a recorded cause of death especially in the very young and the young to middle-aged groups. The older children and elderly seem not to be prominently affected by HIV and AIDS as a recorded cause of death. TB, pneumonia, meningitis and diarrhoeal conditions are more prominent as a recorded cause of death in the very young and the young adult to middle aged

adult as in keeping with the apparent HIV prevalence in these groups. The contribution of non-communicable diseases to death in the older groups is illustrated in this table as well.

Neonatal causes are the leading cause of death in the under 5 years of age group, and infectious diseases seem to be more prominent as a recorded cause of death in this group. Malnutrition is still an important cause of death in this group as well.

There was also an important finding of injuries in the older children and teenagers as a cause of death. These groups seem to be less affected by infectious diseases.

TABLE 4: Top ten causes of death in all age groups for 2008 in Dr George Mukhari Hospital

Rank	0-4 yrs	5-9 yrs	10-14 yrs	15-19 yrs	20-29 yrs	30-39 yrs	40-59 yrs	60 and above
1	Neonatal conditions (40%)	Cancer (22%)	Injuries (22%)	Cardiovascular conditions (22%)	TB (20%)	TB (18%)	Cancer (14%)	Cancer (21%)
2	Other non-communicable conditions (11%)	Other non-communicable conditions (17%)	Cardiovascular conditions (22%)	Injuries (19%)	Other non-communicable conditions (13%)	HIV/AIDS (16%)	TB (13%)	Surgical conditions (13%)
3	Pneumonia (11%)	Pneumonia (17%)	Cancer (22%)	TB (11%)	Injuries (12%)	Pneumonia (14%)	Other non-communicable conditions (12%)	Other non-communicable conditions (12%)
4	Diarrhoeal conditions (9%)	TB (9%)	Other non-communicable conditions (17%)	Pulmonary conditions (11%)	Meningitis (11%)	Meningitis (11%)	HIV/AIDS (9%)	Cardiovascular conditions (11%)
5	Malnutrition (9%)	Diarrhoeal conditions (9%)	HIV/AIDS (9%)	Other non-communicable conditions (7%)	Pneumonia (9%)	Other non-communicable conditions (6%)	Surgical conditions (8%)	CVA (11%)
6	Other communicable diseases (8%)	Cardiovascular conditions (9%)	Surgical conditions (4%)	HIV/AIDS (7%)	Diarrhoeal conditions (6%)	Diarrhoeal conditions (6%)	Pneumonia (8%)	Diabetes (8%)
7	HIV/AIDS (4%)	Injuries (4%)	TB (4%)	Other communicable diseases (7%)	Cardiovascular conditions (6%)	Cancer (6%)	Cardiovascular conditions (6%)	Pulmonary conditions (6%)
8	TB (2%)	Surgical conditions (4%)	Other communicable diseases (0%)	Meningitis (7%)	HIV/AIDS (5%)	Injuries (4%)	Diarrhoeal conditions (6%)	Pneumonia (3%)
9	Meningitis (2%)	Other communicable diseases (4%)	Pneumonia (0%)	Surgical conditions (4%)	Surgical conditions (5%)	Cardiovascular conditions (4%)	Injuries (5%)	TB (3%)
10	Surgical conditions (1%)	Pulmonary conditions (4%)	Diarrhoeal conditions (0%)	Cancer (4%)	Other communicable diseases (5%)	Other communicable diseases (3%)	Meningitis (5%)	Diarrhoeal conditions (3%)

4.2 Communicable conditions

Figure 10 below shows the breakdown of communicable diseases by age group and illustrates the larger burden in the under 5 years of age and the young to middle-aged adult groups. Children under 5 seem to be more affected by pneumonia and diarrhoeal diseases, while TB is an important cause of death in the age groups of 20-29, 30-39 and 40-59 at 12%, 16% and 15% respectively.
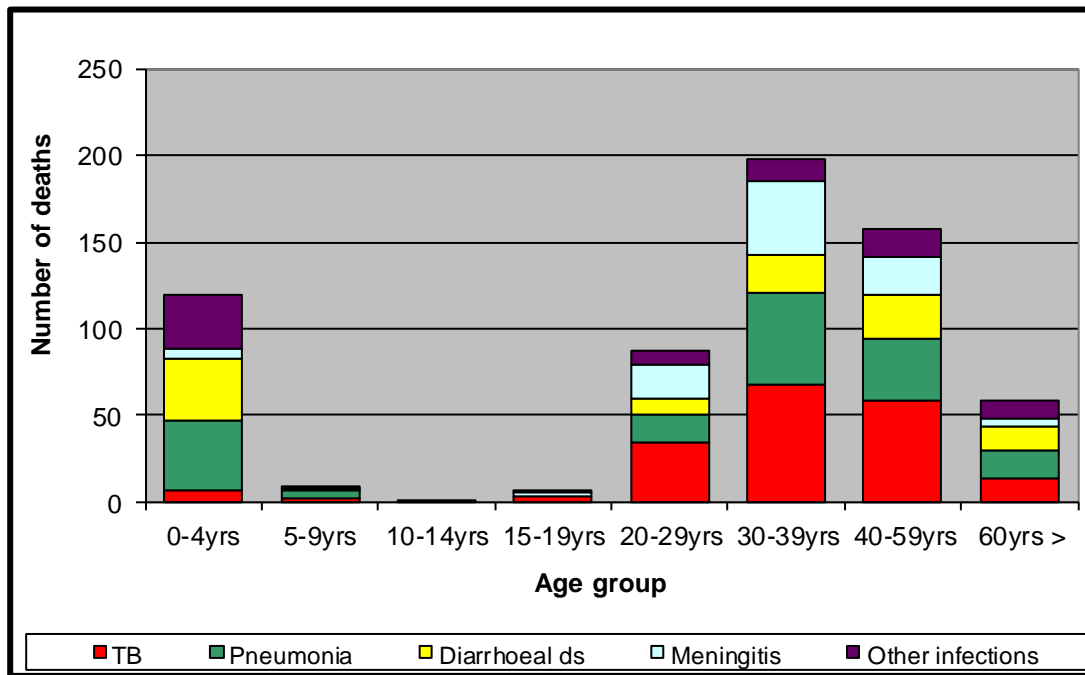
FIGURE 10: Most common communicable cause of death by age group

4.3 HIV and AIDS

Figure 11 below illustrates an almost identical pattern to the communicable disease distribution above with the age group 30-39 years of age accounting for 36% of the burden, the age group 40-59 responsible for 32% and the age group 20-29 years of age responsible for 18% of the HIV / AIDS diagnosis as a cause of death. The least affected groups are the 5-9 years, 10-14 years, 15-19 years and over 60 years at 1%, 1%, 2% and 7% respectively.
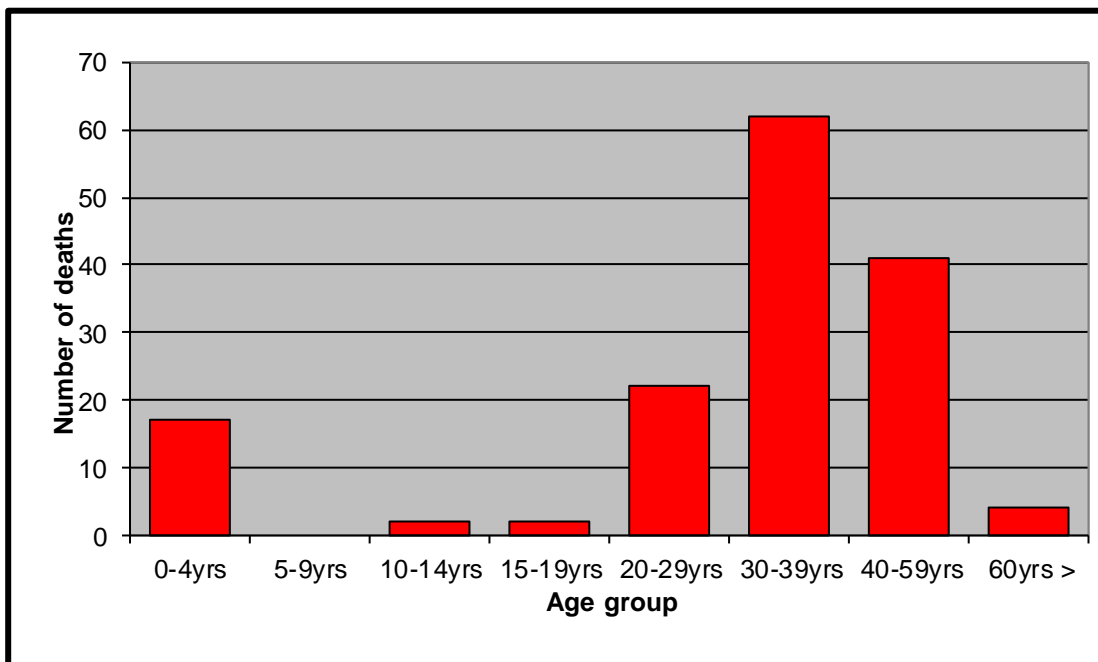
FIGURE 11: Death diagnosis captured as HIV / AIDS by age group

4.4 Non-communicable conditions

Non-communicable conditions were found to be the most common overall cause of death in this study. Figure 12 illustrates the different categories of non-communicable disease that were recorded as responsible for deaths in Dr George Mukhari Hospital in 2008. Of importance to note is the burden in the under 5 years of age group that later shows to be from neonatal deaths caused by prematurity and stillbirth (see Figure 19).

46% of non-communicable conditions occurred in the age group that is 60 years and older, while 25%, 12% and 9% occurred in the 40-59 years, 30-39 years, and 20-29

years of age groups respectively. Cancer seems to be an important cause of mortality in the older age groups compared to the young. The occurrences of cerebrovascular accidents, cardiac diseases, diabetes, chronic pulmonary conditions as well as hypertension seem to rise with increasing age as illustrated below.
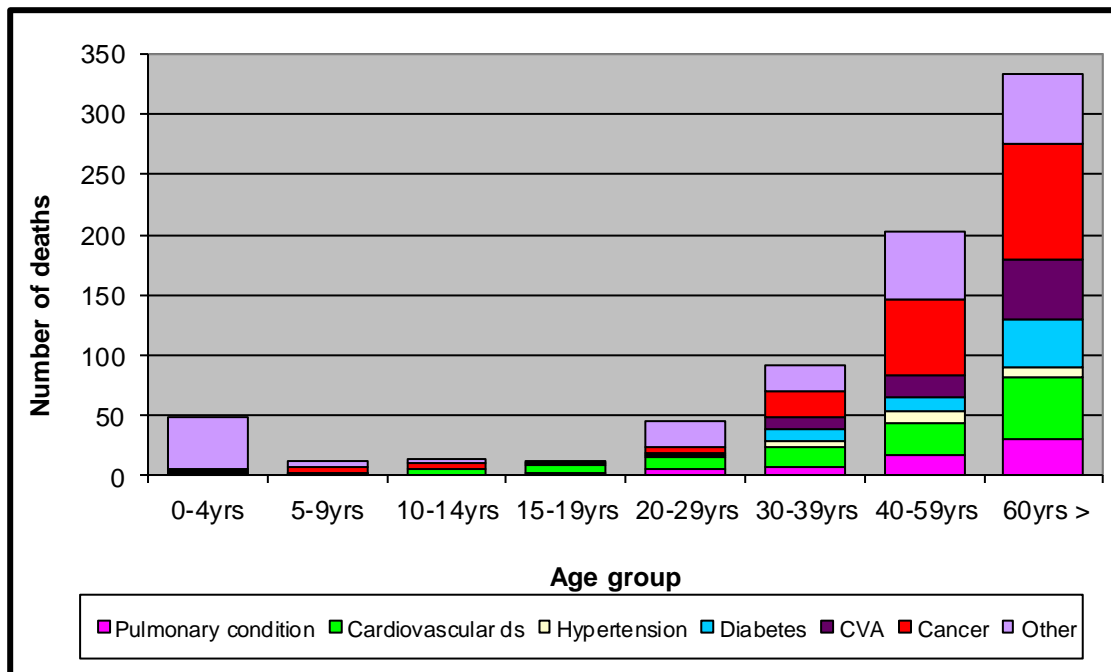
FIGURE 12: Distribution of non-communicable causes of death by age group

A further analysis of the cancer types and the age groups affected was done.

Figure 13 shows that cancer of the oesophagus was an important cause of cancer deaths in both the young adults and the elderly groups. Oesophageal cancer was responsible for 15% of all cancers. Renal tumours, leukaemia, lymphomas and sarcomas seemed to affect the under 20 years of age category more than the older age groups.

Cancers responsible for the highest number of deaths were further analysed (see Figure 14). The leading causes of cancer deaths seemed to affect the older age groups but were fairly equally distributed between the groups 20-59 years of age and 60 years of age and above. Oesophageal cancer, cervical cancer, ENT and oral cancers, lung cancer, prostate cancer, breast cancer and gastrointestinal cancers formed the top seven causes of cancers in Dr George Mukhari Hospital.
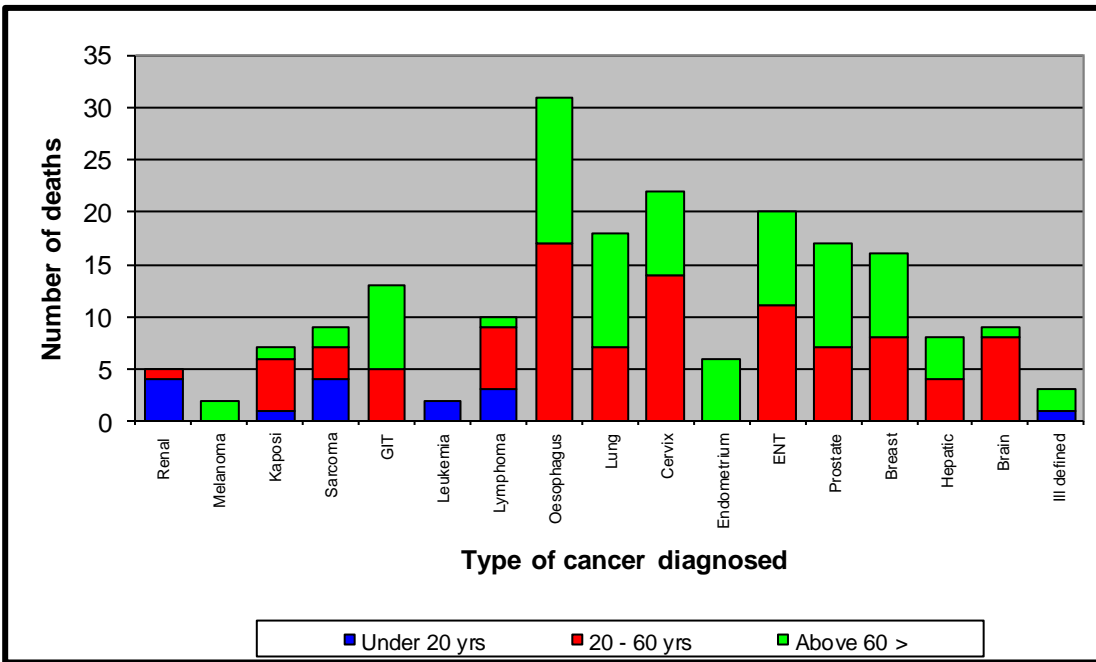
FIGURE 13: Distribution of common cancer deaths by type and age group
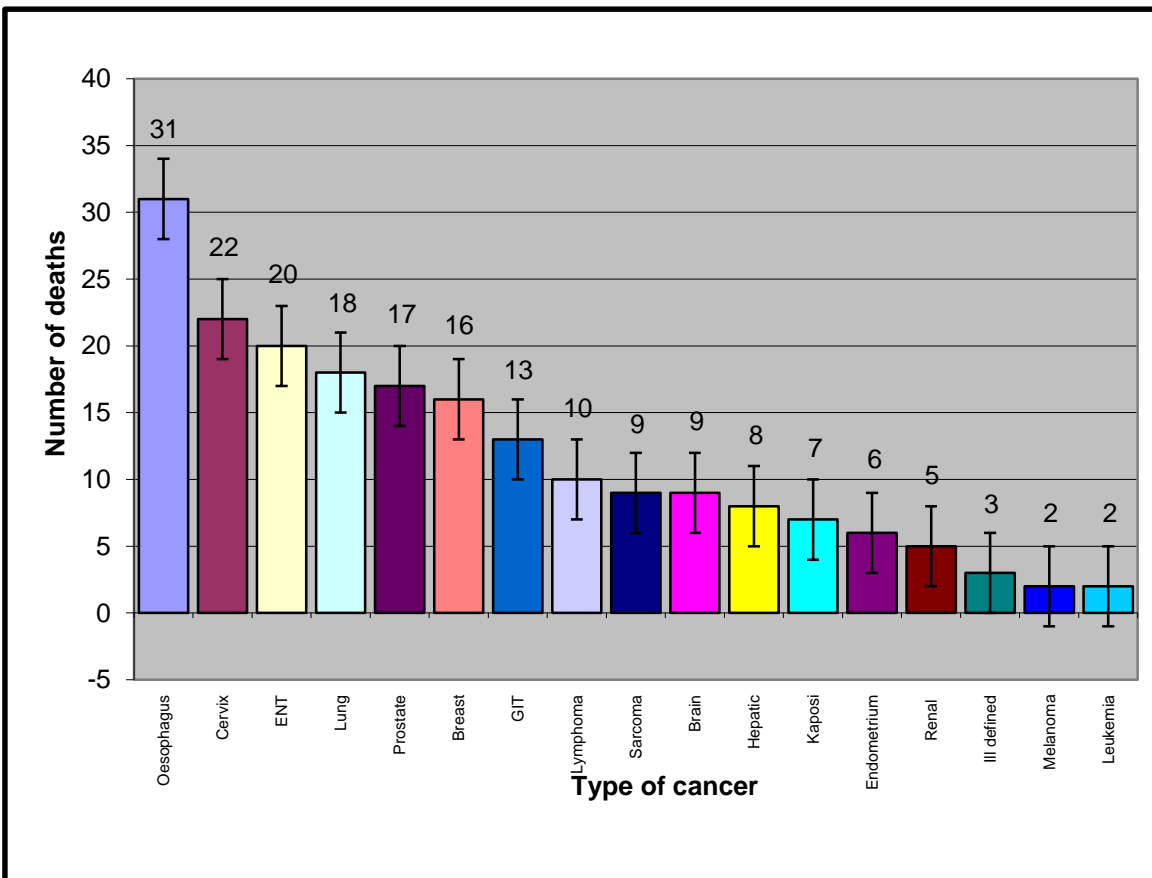
FIGURE 14: Leading cause of cancer deaths in adults

4.5 Injuries

Although injuries did not account for a large number of the overall deaths, an analysis on the type of injury was conducted in keeping with the reported emerging importance of injuries as an important cause of death globally and more specifically in South Africa.

Figure 15 shows the breakdown of the injuries as recorded in the death register. There could have been some misclassification of injuries where the recorder did not attribute the actual cause of death to some traumatic incident.

Head injuries were prominent in all age groups except the 5-9 year age group. 25% of the reported injuries occurred in the 40 – 59 years of age, 21% in the 20-29 years of age and 18% in the 30-39 years of age groups.

Deaths related to gunshot trauma were recorded mainly in young and middle- aged adults as seen below.
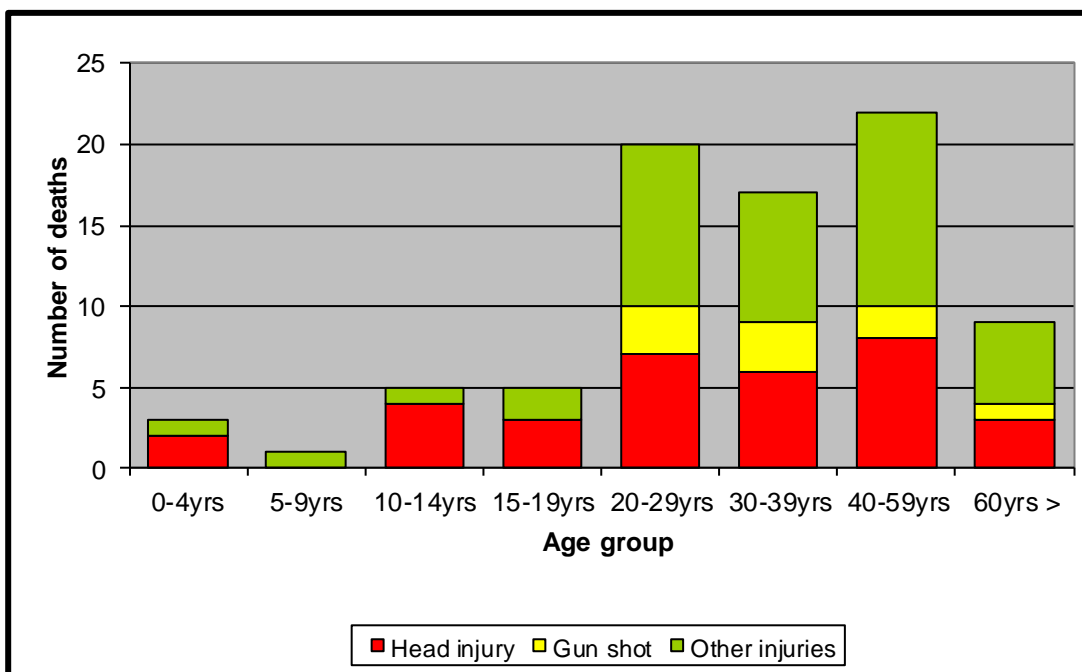
FIGURE 15: Distribution of injury related deaths by age group

4.6   Surgical conditions

Figure 16 illustrates the surgical conditions seen and recorded as a cause of death in the death register. (Surgical conditions were classified as any conditions that required sutures, incisions, manipulations or invasive procedures that usually, but not always required local, regional or general anaesthesia. They included conditions for which surgery could be indicated but that were initially managed non-surgically.)

The age group of 60 years and above bore the largest burden at 48%, while 30 % of the deaths occurred in the between the ages of 40 and 59 and 9% happened in the 30 – 39 year age groups.
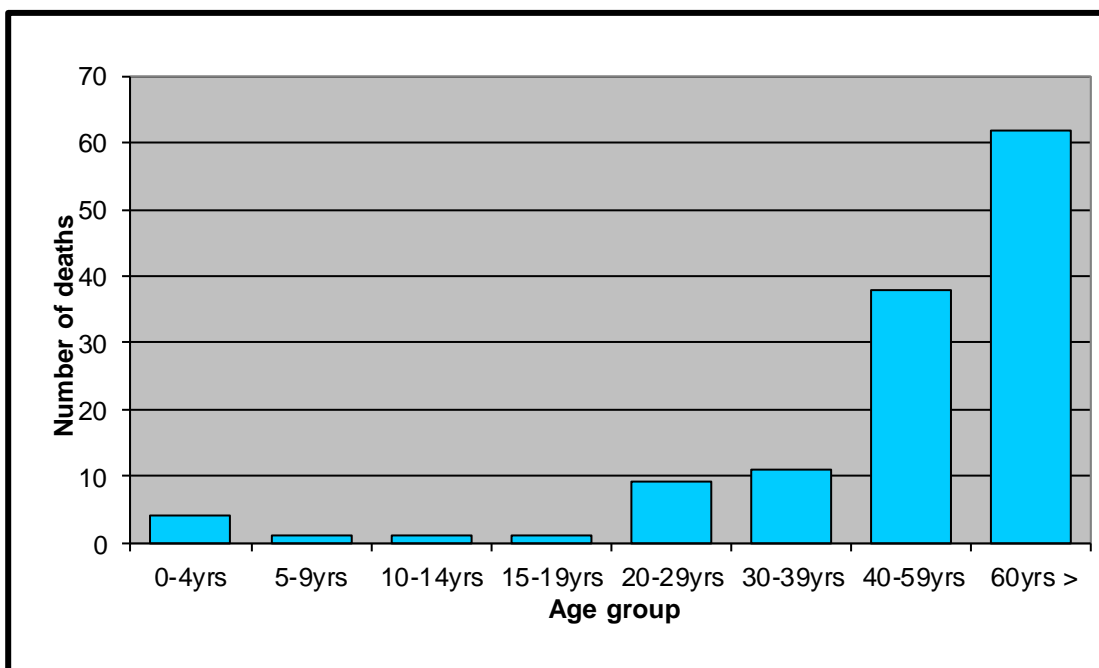
FIGURE 16:   Deaths associated with surgical conditions by age group

4.7   Child Deaths

The majority of child deaths encountered in this study were during the perinatal period. Perinatal deaths accounted for 53% of mortality in the under 5 age group. The leading cause of perinatal deaths were stillbirths and death associated with prematurity and low birth weight at 39% and 34% respectively. (see figure19 below). Other important causes of death in the perinatal period included birth asphyxia, neonatal infections and other non-infectious conditions at 8%, 8% and 4% respectively. (All conditions that were not caused by a pathogen were classified as non-infectious conditions.)

Outside the neonatal period pneumonia, diarrhoea, malnutrition and HIV/AIDS are illustrated in Figures 17 and 18 as important causes of mortality.

Figure 18 shows that even when stillbirths are excluded from the analysis, neonatal deaths still account for a significantly high proportion of deaths at 40% of the burden of mortality. The pattern of large prevalence of pneumonia (15%), diarrhoeal conditions (13%), malnutrition (9%) and HIV/AIDS (6%) still persist on exclusion of stillbirths. There is very little burden of non-communicable conditions in this age group at 2% of the burden of mortality
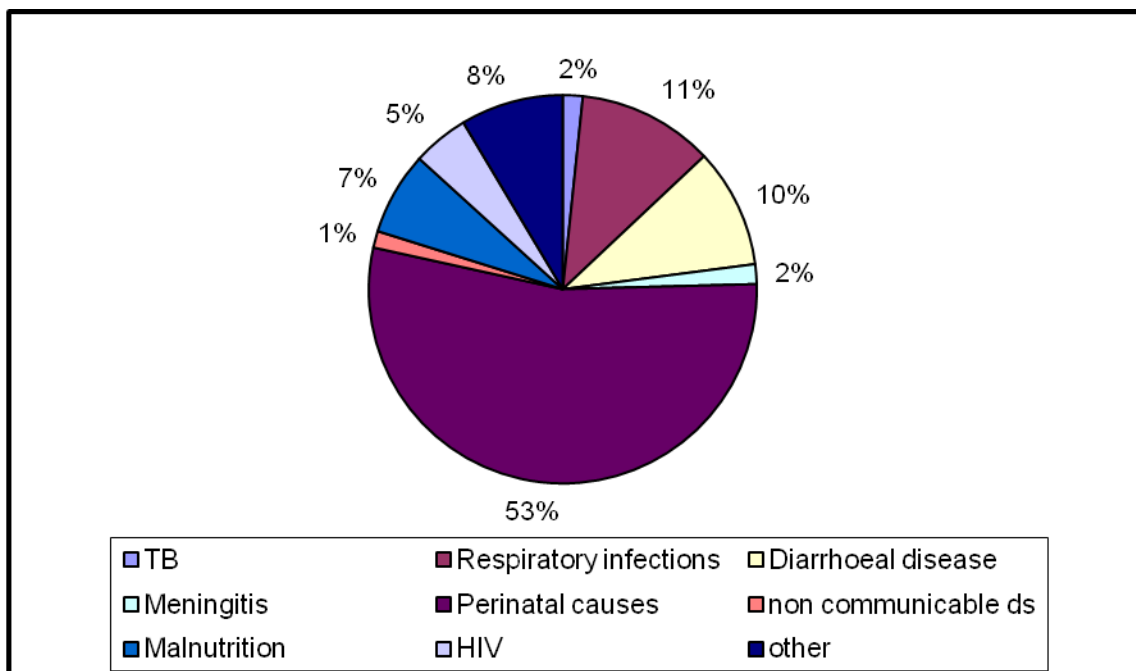
FIGURE 17: Causes of death in children under the age of 5 years
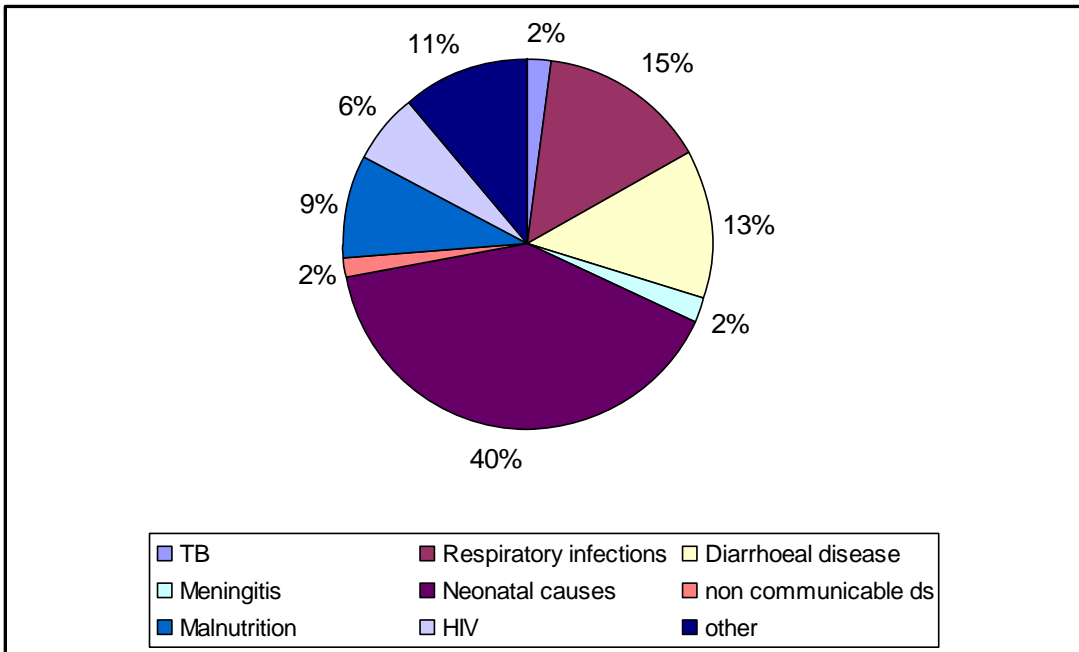
FIGURE 18: Causes of death in children under the age of 5 years excluding stillbirths
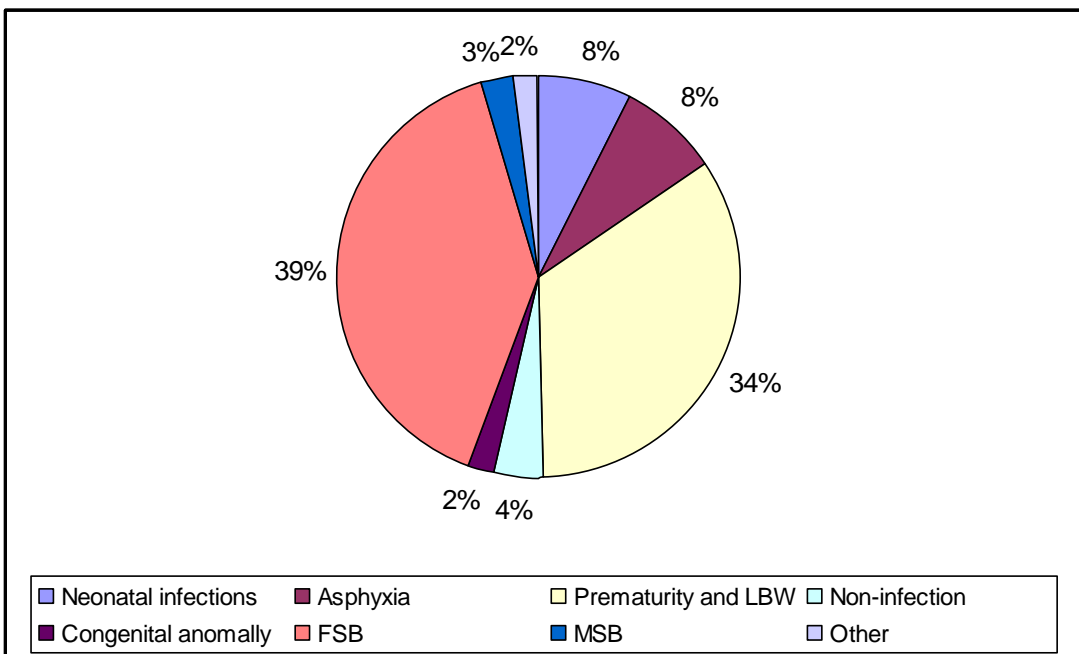
FIGURE 19: Perinatal causes of death

CHAPTER 5

DISCUSSION

5.1 Introduction

The mortuary death notification system in Dr George Mukhari Hospital contains very important information about causes of death that can be used to inform certain important decisions by hospital management for purposes of planning for services. The data analysed and some of the findings illustrated in this study will however have to be interpreted cautiously as the study findings cannot be generalized to the community of Ga-Rankuwa and mainly represent the patients seen at this hospital coming from all over the province and even neighbouring provinces.

5.2 Overall mortality

When looking at overall mortality, non-communicable health related conditions were the leading cause of death followed by communicable diseases and HIV/AIDS.

Although at face value the older groups of above 60 years of age seemed to be more affected by death compared to other groups, when standardized for age the group that was shown to be most affected by death was the 30 – 39 years of age group, followed by the 40 – 59 years age and the very young adults of between the ages of 20 and 29. This is in keeping with the literature that illustrates that, due to the high prevalence of HIV in South Africa, the younger generations are more affected by death than the older groups, in contrast to countries with lower burdens of HIV and AIDS.[1]

Communicable diseases played an important role in causing death in the very young and young to middle-aged adults, but also seemed to be disappearing with increased age as non-communicable health related conditions take over as the main cause of death.

Males and females had similar patterns of death throughout the ages for communicable diseases and non-communicable health related conditions, but had

differences with respect to increased occurrences of deaths associated with injuries in males as compared to females, especially in the over 20 years of age groups.

The other difference between males and females included the apparent earlier onset of HIV associated deaths in females in their 20's when compared to their male counterparts in this age group. This is also in keeping with the literature that indicates that women tend to be infected much earlier than males with HIV through sexual intercourse.[18]

According to WHO/UNAIDS estimates of 2008, in Sub-Saharan Africa, women comprise 60% of people living with HIV. There is also evidence that gender inequalities remain one of the main drivers of HIV, through social norms that allow men to have many partners, young women being married off to older men, gender violence and some of the other barriers to access to health services that prevail in communities.[12]

5.3 Communicable conditions

TB is the leading cause of death in the young adults in their 20's and 30's, and it is also significant cause of death in all ages except children in their early teens and the elderly above 60 years of age. Based on the similarities in distribution of TB deaths and HIV / AIDS, this highlights the close link between TB and HIV as an important cause of death. Pneumonia and diarrhoea associated deaths are more prominent in very young children under 5 years of age as well as the age groups that seemed to be more affected by HIV and AIDS.

Although an invasive and previously rare form of disease, meningitis deaths also seem to be re-emerging as an important cause of death and seem to follow the apparent pattern of increased prevalence in the age groups between 20 and 39 (4th most common cause of death), which were the groups most affected by HIV and TB.

5.4 HIV and AIDS

HIV and AIDS was recorded as the second leading cause of death for the ages of 20 to 39. HIV was also associated with death in almost all age groups.

The recording of HIV and AIDS as a cause of death is not always done by physicians and that means that, even with these significant proportions of deaths associated with HIV and AIDS as per records, this could just be the tip of the iceberg. The apparent trend of communicable diseases including TB, pneumonia, diarrhoea diseases and meningitis could very well be linked to underlying, unrecorded HIV and AIDS.

5.5 Non-communicable health related conditions:

Cancer was the leading cause of death recorded in the overall cause of death and the non-communicable conditions category in Dr George Mukhari Hospital in 2008. This is in keeping with global literature describing cancer as the leading cause of death worldwide.[19]   The older age groups were most affected by cancers, strokes and diabetes mellitus. In keeping with the literature on common causes of death in South Africa, there seems to be a significant prevalence of diseases associated with unhealthy lifestyles.[6]

The most common cancer associated deaths reported for Dr George Mukhari Hospital in 2008 were cancers of the oesophagus, cervix, ENT, lung and prostate. This is in keeping with the WHO burden of cancer estimates rating lung cancer, cervical cancer and prostate cancer as the leading causes of death worldwide. [20]

It is also of importance to note that three of the top five cancer associated deaths reported in the hospital (oesophagus, lung and ENT) are very closely linked to smoking while one (cervical) is in the centre of the debate in South Africa for introduction of an HPV vaccine to combat the reported high burden.

5.6 Injuries

Injuries were more prevalent in males with the young to middle-aged adults most affected. Head injuries, from whatever causes, were responsible for injury associated deaths at all ages. Gunshot associated deaths were also more prominent in the young to middle-aged adult (20 – 59) group.

As with the recording of HIV and AIDS as a cause of death, this category of deaths associated with injuries could have missed some of the injuries and result in under-

estimations. For example, if reporting doctor did not capture the association between a motor vehicle injury and a surgical condition that developed secondarily to the injury.

5.7 Surgical conditions

The patients of older age groups were most affected by surgical conditions as causes of death. These were mainly bowel obstructions, post operative complications as well as fracture related deaths.

5.8 Child Health

Children under 5 years of age died mainly of neonatal causes. This is in keeping with the literature that indicates that the majority of children under 5 years of age die in the neonatal period. This is also in keeping with the WHO child death fact sheet that describes the 1st month of life as the highest risk period for death in children. These children died mainly of prematurity, low birth weight, asphyxia and neonatal infections.

Of the neonatal deaths, 39% were stillborn babies, but there was not much information about the cause of the stillbirths. This is however an important group of deaths that, with further probing, could provide important information about the quality of care provided during pregnancy, skills of birth attendants at delivery and some clinical aspects like warmth and attention to breathing at delivery.

Pneumonia, followed by diarrhoeal conditions was responsible for the majority of child deaths outside the neonatal period. This is the case not only in Dr George Mukhari Hospital but also in the country and globally.[21] Malnutrition was an important cause of death in the under 5 years of age group. This is also in keeping with the WHO report that lists malnutrition as an underlying cause of death in 30% of all child deaths globally.[7]

Although the Prevention of Mother to Child Transmission (PMTCT) programme is supposed to be available in this country, HIV and AIDS is still a key role player as a cause of death.

CHAPTER 6

LIMITATIONS OF THE STUDY

The study was retrospective and looked at data that was originally not collected for research purposes and some diagnoses were not specific.

The underlying cause of death could sometimes not be ascertained because of the vague death diagnosis provided by the health worker. Non- specific diagnoses were found in approximately 4% of cases while underlying cause was unavailable in approximately 15% of cases.

Co-morbidity –some co-morbid conditions that could have led to death could have been missed where only one condition was captured. For example, someone whose death diagnosis is capture as pneumonia or Kaposi sarcoma could have also been HIV positive and been at the end stage of AIDS.

Dr George Mukhari Hospital being, a tertiary level (referral) hospital, means that the data analyzed includes patients from outside the community of Ga-Rankuwa and the results may therefore not necessarily be representative of the Ga-Rankuwa community.

Deaths from certain complex conditions like cancers that are not be treatable at lower level hospitals, may be over-represented at Dr George Mukhari Hospital.

The same may also apply to the more common conditions, that are easily treatable at lower level hospitals, being falsely under-estimated because of the decreased likelihood of referral of these conditions to a tertiary hospital like Dr George Mukhari Hospital.

The differences in the way doctors classify the cause of death could lead to slightly different results if the study were to be repeated at a later date.

CHAPTER 7

CONCLUSIONS

This study report is a profile of deaths that occurred in Dr George Mukhari Hospital in 2008 and the following conclusions can be made:

Non-communicable health related conditions were responsible for the majority of deaths recorded in the death notification register. Cancer is the leading cause of death in older age groups followed by some cardiovascular conditions and strokes.

Deaths associated with injuries were more prevalent in males, while HIV deaths seemed to be higher, in young adulthood, in females as compared to males.

Even though HIV was illustrated to be an important role player in the cause of death in the young to middle-aged adults, it is highly likely that the prevalence of HIV deaths is underestimated because the link between the conditions diagnosed is not routinely captured by clinicians.

Deaths due to communicable conditions like TB, pneumonia and diarrhoeal conditions in adults parallel the trend that HIV deaths follow and a link may be postulated.

In children under 5 years of age, the highest burden of death was in the neonatal period. Deaths were largely from prematurity and low birth weight, asphyxia and neonatal infections.

Post-neonatal period children were more likely to die from pneumonia, diarrhoea and malnutrition.

CHAPTER 8

RECOMMENDATIONS

Routine statistics currently collected by the hospital, on a monthly basis, are only on the number of deaths and the age and sex. Without cause of death data there is very little decision making that can be based on the available monthly statistics. It is therefore recommended that the routine statistics include some information on broad causes of death or even a request to departments reporting deaths to list the cause of death so as to give an idea of the important causes of death.

Based on the findings in this study of ambiguous classifications, vague and ill defined diagnosis and the tendency of not reporting underlying HIV and AIDS conditions, there should be strategies to engage clinicians with the aim of reducing the prevalence of these vague diagnoses and under-reporting of HIV and AIDS.

To mitigate the apparent under – reporting of deaths due to injuries, the hospital could utilize the National Injury Surveillance System, a mortuary based system, to provide a more complete picture of injury related deaths.

The finding of non-communicable health related conditions as a major cause of death should prompt the hospital management to include health promotion activities in their community outreach activities. Health education messages could also be shared with existing hospital boards that include community members. This information should be distributed to the feeding hospitals and provinces to engage in strategies that will promote healthier lifestyles, early screening and detection of cancers and other relevant health related conditions.

Some of the key risk factors for non-communicable health related conditions include obesity, physical inactivity, tobacco smoking, alcohol abuse, high blood pressure, unhealthy diets and malnutrition.[8] These conditions require co-ordinated interventions to change unhealthy lifestyles. Several community level programmes have already been developed to promote healthy lifestyles and prevent non-

communicable conditions like 'Vuka South Africa: Move for your health', 'Healthnutz for children' and 'Fit for work.' [22]

The high number of stillbirths and birth related deaths in the neonatal period should prompt an investigation into the causes thereof in order to identify preventable causes such as non-availability of resources, lack of skill of birth attendants and poor quality of care in high risk pregnancies.

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APPENDICES

Appendix 1: Data capturing sheet

Observation number	Age	Gender	Cause of death	ICD 10 group

Appendix 2: Data summary sheet

Age grouping: e.g. 0-4 years

Gender: male / female

Communicable	Non-communicable	Injuries	HIV/ AIDS	Other causes
TB	Pulmonary	Road traffic acc.		
Resp.				
	Cardiovascular			
Diarrhoeal				
		Homicide: gun		
	Hypertension			
	CVA			
Meningitis				
	DM	Homicide: other		
Other				
	Cancer			
Prematurity & LBW	Poisoning	Falls		
Neonatal infections	Other	Other		

Appendix 3: Raw data tables

Non- communicable conditions by age group

Age group	Pulmonary condition	Cardiovascular disease	Hypertension	Diabetes	CVA	Cancer	Other	Total
0-4yrs	2	2	0	0	0	1	43	**48**
5-9yrs	1	2	0	0	0	5	4	**12**
10-14yrs	0	5	0	0	0	5	4	**14**
15-19yrs	3	6	0	0	0	1	2	**12**
20-29yrs	6	10	2	0	1	5	22	**46**
30-39yrs	8	16	5	10	10	21	22	**92**
40-59yrs	17	27	9	12	18	64	55	**202**
60yrs ≥	30	52	8	39	51	96	57	**333**
Total	**67**	**120**	**24**	**61**	**80**	**198**	**209**	**759**

Overall causes of death in the under 5 age group

TB	6
Respiratory infections	41
Diarrhoeal disease	36
Meningitis	6
Neonatal causes	195
non communicable conditions	5
Malnutrition	25
HIV	17
other	31
Total	**362**

Deaths under 5 years of age excluding stillbirths

TB	6
Respiratory infections	41
Diarrhoeal disease	36
Meningitis	6
Neonatal causes	111
Non-communicable conditions	5
Malnutrition	25
HIV	17
other	31
Total	278

Breakdown of neonatal causes of death

Neonatal infections	15
Asphyxia	16
Prematurity and LBW	67
Non-infection	8
Congenital anomaly	4
FSB	79
MSB	5
Other	4

Injuries by age group

Age	Head injury	Gun shot	Other injuries	Total
0-4yrs	2	0	1	3
5-9yrs	0	0	1	1
10-14yrs	4	0	1	5
15-19yrs	3	0	2	5
20-29yrs	7	3	10	20
30-39yrs	6	3	8	17
40-59yrs	8	2	12	22
60yrs ≥	3	1	5	9
Total	33	9	40	82

Cause of death by age and sex – males

Age group	Communicable	Non-communicable	Injuries	HIV/AIDS	Surgical	Total
0-4yrs	54	33	2	9	0	**98**
5-9yrs	6	9	0	0	1	**16**
10-14yrs	0	6	3	1	1	**11**
15-19yrs	3	7	2	0	1	**13**
20-29yrs	31	15	17	2	6	**71**
30-39yrs	132	47	9	30	9	**227**
40-59yrs	105	137	17	16	19	**294**
60yrs ≥	31	183	8	2	43	**267**
Total	**362**	**437**	**58**	**60**	**80**	**997**

Breakdown of cancer causes of death by age

	Under 20 yrs	20 - 60 yrs	Above 60 yrs	Total
Renal	4	1	0	5
Melanoma	0	0	2	2
Kaposi	1	5	1	7
Sarcoma	4	3	2	9
GIT	0	5	8	13
Leukemia	2	0	0	2
Lymphoma	3	6	1	10
Oesophagus	0	17	14	31
Lung	0	7	11	18
Cervix	0	14	8	22
Endometrial	0	0	6	6
ENT	0	11	9	20
Prostate	0	7	10	17
Breast	0	8	8	16
Hepatic	0	4	4	8
Brain	0	8	1	9
Ill defined	1	0	2	3

Cause of death by age and sex - females

Age group	Communicable	Non-communicable	Injuries	HIV/AIDS	Surgical	Total
0-4yrs	63	36	0	8	4	**111**
5-9yrs	3	3	0	0	0	**6**
10-14yrs	1	8	1	2	0	**12**
15-19yrs	27	5	3	2	0	**37**
20-29yrs	64	30	3	18	3	**118**
30-39yrs	62	54	6	32	2	**156**
40-59yrs	69	87	5	25	19	**205**
60yrs ≥	30	123	1	2	19	**175**
Total	**319**	**346**	**19**	**89**	**47**	**820**

Communicable causes of death by age group

Age Group	TB	Pneumonia	Diarrhoeal	Meningitis	Other infections	Total
0-4yrs	6	41	36	6	31	**120**
5-9yrs	2	4	2	0	1	**9**
10-14yrs	1	0	0	0	0	**1**
15-19yrs	3	0	0	2	2	**7**
20-29yrs	34	16	10	19	8	**87**
30-39yrs	68	53	22	43	12	**198**
40-59yrs	59	35	26	22	16	**158**
60yrs ≥	14	16	13	5	10	**58**
Total	**187**	**165**	**109**	**97**	**80**	**638**

Leading cause of death

Age Group	Cancer	TB	Other non-communicable	HIV	Pneumonia	Surgical	Cardiovascular	Meningitis	CVA	Diarrhoeal
5-9yrs	22	9	17	0	17	4	9	0	0	9
10-14yrs	22	4	17	9	0	4	22	0	0	0
15-19yrs	4	11	7	7	0	4	22	7	0	0
20-29yrs	3	18	12	12	9	5	5	10	1	5
30-39yrs	6	18	6	16	14	3	4	11	3	6
40-59yrs	14	13	12	9	8	8	6	5	4	6
60yrs ≥	21	3	12	1	3	13	11	1	11	3

Appendix 4: Ethics clearance certificate

UNIVERSITY OF LIMPOPO
Medunsa Campus
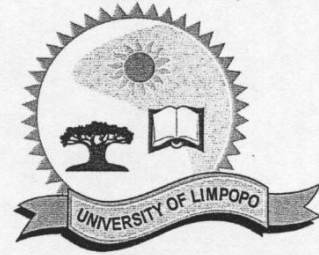
MEDUNSA RESEARCH & ETHICS COMMITTEE

CLEARANCE CERTIFICATE

P O Medunsa
Medunsa
0204
SOUTH AFRICA

MEETING: 01/2010

PROJECT NUMBER: MREC/M/01/2010: PG

Tel: 012 - 521 4000
Fax: 012 - 560 0086

PROJECT :

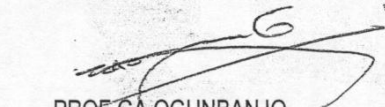Title: A mortality profile of patients admitted to Dr George Mukhari Hospital 2008

Researcher: Dr B Chauke
Supervisor: Dr Rautenbach
Hospital Superintendent: Dr R Nathan
Department: Community Health
School: Medicine
Degree   MMed (Community Health)

DECISION OF THE COMMITTEE:

MREC approved the project.

DATE: 04 February 2010

2010 -02- 0 4

PROF GA OGUNBANJO
CHAIRPERSON MREC

Note:
i)   Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
ii)   The budget for the research will be considered separately from the protocol.
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.