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RESEARCH REPORT

PROJECT TITLE

CAUSES OF, AND TRENDS IN, CHILDHOOD MORTALITY IN A
RURAL SOUTH AFRICAN SUB-DISTRICT

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RESEARCH REPORT SUBMITTED IN PARTIAL FULFILMENT FOR
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Declaration:

I, Dr Daniel Ansong, declare that this research report is my own work. It is being submitted for the degree of Master of Science (Med) in the field of Epidemiology and Biostatistics in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

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28th day of November, 2005

Dedication

I dedicate this degree to the Lord God who has made it possible for me to complete this course.

I also dedicate it to my spouse (*Mrs. Jocelyn Ansong*) and children (*Nana Antwi-Boasiako Ansong and Oheneba Acheampong Ansong*).

Abstract

Background: Studies into childhood mortality present the opportunity to identify the leading and common causes of childhood mortality in different populations.

Objectives: To study the trends in all-cause mortality, and patterns of cause-specific mortality, in children 0-14 years living in the Agincourt sub-district of South Africa over the period 1992-2000.

Methods: Secondary data analysis based on the longitudinal database from the Agincourt Demographic and Health Surveillance System was used to study trends in childhood mortality between 1992 and 2000, and a comparison was made between the earlier period (1992-96) and the later period (1997-2000).

Results: Seven hundred and twenty four deaths occurred over the 9 year period, 1992 to 2000, in children aged 0-14 years in the Agincourt sub-district of South Africa. Over 80% of the deaths occurred in children under-five years of age. Death rates in children under one year in the periods 1992-1996 and 1997-2000 were 8.9/1000 live births and 18.0/1000 live births respectively. Children under five years between 1992-1996 and 1997-2000 had death rates of 18.0/1000 live births and 35.0/1000 live births respectively. There was a statistically significant difference in death rate in infants, and in children less than five years, in those who died over the period 1992-1996 and those who died during the later period 1997-2000, with mortality showing an increasing trend (p-values <0.0001 for infants and for children under five years). Overall mortality rates in all children under 14 years between 1992-1996 and 1997-2000 were 26.4/10000 person-years and 37.7/10000 person-years respectively. There was no significant statistical

difference in the overall mortality trend among children aged 0-14 years between the two periods of time (p-value 0.614). Infectious and communicable diseases were the leading causes of death with diarrhoeal deaths accounting for 15.2%, HIV/AIDS 9.7% and malnutrition 7.6%. Deaths from diarrhoeal disease between 1992-1996 and 1997-2000 were 481/million and 449/million person-years respectively. Deaths from HIV/AIDS within the same time periods were 107/million and 607/million person-years respectively. HIV/AIDS showed a statistically significant difference over the two periods with an increased risk ratio of 5.59 (95% confidence interval of 4.6 to 70).

Conclusion:

This analysis reinforced previous findings pointing to the fact that infectious and communicable diseases are the leading causes of childhood mortality in South Africa and other developing countries. HIV/AIDS and diarrhoeal diseases have emerged as major causes of mortality in this analysis. Efforts to control the HIV epidemic and prevent the spread of HIV/AIDS must be accelerated in the Agincourt sub-district.

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Acronyms and Abbreviations

AIDS:	Acquired Immunodeficiency Syndrome
ARI:	Acute respiratory tract infection
CNS:	Central Nervous System
DSS:	Demographic Surveillance System
EPI:	Expanded Programme of Immunization
HDSS:	Health and Demographic Surveillance System
HIV:	Human Immunodeficiency Virus
IMR:	Infant Mortality Rate
ICD:	International Classification of Diseases
IPT:	Intermittent Preventive Treatment
PTB:	Pulmonary tuberculosis
RTI:	Respiratory Tract Infections
SP:	Sulphadoxine-pyrimethamine
TB:	Tuberculosis
U-5 MR:	Under-five Mortality Rate
UNAIDS:	United Nations Joint Programme on HIV/AIDS
USAID:	United States Agency for International Development
UNICEF:	United Nation Children's Fund
WHO:	World Health Organization

1.0 INTRODUCTION AND LITERATURE REVIEW

1.1: MAJOR CAUSES OF CHILDHOOD MORTALITY IN AFRICA:

Childhood deaths in Africa, particularly Sub-Saharan Africa, continue to be a major health issue in the 21st century, even though the WHO Global Report 2002 has indicated a decline in under-5 mortality rates over the past 50 years (1, 2). Each year, over 10 million children (infants and under-fives) die from preventable diseases (3). Six countries, namely India, Nigeria, China, Pakistan, Democratic Republic of Congo and Ethiopia account for 50% of childhood deaths whilst 42 countries account for about 90% of childhood mortality world wide (3). The major childhood diseases that cause majority of these diseases are diarrhoea, measles, malaria, respiratory tract infections, tuberculosis, HIV/AIDS and malnutrition. These disease conditions are largely preventable (4, 5, 6).

1.1.1: Diarrhoeal Diseases:

Diarrhoeal diseases have a major impact on childhood mortality, and are among the leading cause of morbidity and mortality in children under-five years of age (7). On the average, each child in Sub-Sahara Africa has five episodes of diarrhoea per year and diarrhoeal diseases account for about 1.8 million deaths each year (7). Ninety percent of the diarrhoeal deaths occur in children under 5 years living in developing countries (8). Even though poor sanitation practices and unsafe water supply are the main cause of diarrhoeal diseases in Sub-Saharan Africa (7), the HIV/AIDS epidemics is emerging as a

contributing factor to the occurrence of diarrhoeal diseases in children (9, 10, 11).

1.1.2: Measles:

The WHO 2000 report stated that measles remains the leading cause of mortality due to vaccine-preventable diseases (7). The report estimated that about 30 million cases of measles and over 700 thousand deaths from the disease occur every year. It further indicated that about 50% of the deaths due to vaccine-preventable diseases that occur globally are due to measles (7). It was reported that in 2000, global measles vaccination reported coverage was 80%. with less than 40% of the countries surveyed reporting measles containing vaccine coverage of 90% and above (7). In the Americas from 1990 to 2001, it was reported that measles cases declined by more than 90%, from approximately 250,000 to a total of 537 confirmed measles cases. However despite the existence of a safe and efficacious vaccine, Africa still continues to have a high proportion of its vaccine preventable disease burden being due to measles. (7).

1.1.3: Malaria:

Malaria kills over one million people world wide (12). About 90% of the malaria deaths occur in Sub-Saharan Africa. A significant proportion of these are children living in the rural areas of Africa where access to health care and

medicine is poor (12). The populations at risk in Sub-Saharan Africa are children below the age of five years and pregnant mothers (12).

Recent clinical trials have identified potential preventive and treatment modalities that can greatly reduce the morbidity and mortality associated with malaria in both children and pregnant women (13). Among the preventable methods are the use of insecticide treated bed-nets, Intermittent Preventive Treatment (IPT), and most recently the use of vaccines (13, 14, 15). Studies conducted by Binka et al revealed a significant reduction in all-cause mortality in children aged 6 months to 4 years from the use of insecticide treated bed-nets (14). Intermittent preventive treatment for malaria is currently the most acceptable effective method of preventing malaria in pregnancy (13). Studies conducted in Kilifi, Kenya to demonstrate the effect of sulphadoxine-pyrimethamine (SP) on placental malaria and low birth weight, revealed that IPT during pregnancy can reduce placental malaria and low birth weight significantly (13). Vaccine trials in Mozambique have yielded significant clinical results: A phase III clinical trial into one of the newest vaccines, RTS,S/ASO2A, demonstrated a significant reduction in the occurrence of clinical malaria and also a reduction in the severity of malaria in children (15). The major problems facing malaria control and prevention programmes are due to the fact that majority of the population at risk are living in the rural areas where accessibility to care is not readily available and the population cannot afford treatment. Morbidity and mortality from malaria will therefore remain a major health problem in children in sub-Saharan Africa.

1.1.4: Malnutrition

Malnutrition as a major contributor to childhood deaths is wide-spread in Africa (16). It is estimated that 174 million children under-five years living in developing countries are malnourished and 230 million are stunted (16). Malnutrition is associated with about 54% of deaths (6.6 million deaths) among children under-five years (16). A WHO report has indicated that over two thousand million people lack essential micronutrients for growth and a further eight hundred million people cannot afford basic needs for energy and protein required for growth (16). In addition, hundreds of millions of people suffer from illnesses caused by unsafe food or as a result of unbalanced food intake (16). In South Asia the prevalence of protein energy malnutrition is about 50%, about five times higher in the Western hemisphere and in sub-Saharan Africa, the prevalence is about 30%. Overall, two thirds of the world's malnourished children live in Asia (especially south Asia) followed by Africa and Latin America (16). Malaria, measles, HIV/AIDS and other infectious conditions are usually associated with malnutrition and the outcome is always very poor (3, 4). Typically respiratory tract infection plays a leading role in causing childhood deaths. The impact is particularly severe when children have other conditions such as HIV and malnutrition (17, 18).

Recent analysis of changes in the trends of childhood malnutrition indicates that malnutrition is increasing and that stunting is rising in some countries and in many countries the prevalence is very high (19).

1.1.5: Tuberculosis:

Tuberculosis is gradually emerging as a major childhood problem because of the rising incidence of HIV/AIDS (17). Childhood tuberculosis is often regarded as unimportant in the epidemiology of tuberculosis because a greater proportion of childhood tuberculosis are sputum smear-negative for acid fast bacillus and therefore does not contribute to the immediate spread of the disease (20, 21). The source of infection in every child is an infectious adult, and children bear a significant burden of tuberculosis in areas of high adult prevalence. In a Malawian study, it was reported that 9% of all cases of TB were in children who had come into contact with an adult tuberculosis patient (22).

Furthermore, in 1998, a nationwide case finding and treatment outcome study in Malawi found 22,982 registered cases of tuberculosis. Of these, 2739 (11.9%) were children, accounting for 1.3% of all case notifications with smear-positive pulmonary tuberculosis, 21.3% with smear-negative pulmonary tuberculosis and 15.9% with extra-pulmonary tuberculosis (21).

In a study conducted into childhood tuberculosis in an urban population in South Africa from 1985 to 1994, the study showed that within a 10-year period, case notification was 3.5 times higher in children than in adults (23). This study identified 1383 cases of tuberculosis in children 0-4 years old and 361 in children 5-14 years old, representing 36% and 9% respectively of the total caseload. The total annual case load during the 10 year period varied from 327 to 458 per 100,000 and the annual childhood case load from 125 to

268 per 100,000. The study revealed that of 1744 children who had tuberculosis, 1710 (98%) were notified as having pulmonary tuberculosis and 34 (2%) as having extra-pulmonary tuberculosis. The high childhood case notification was found to be significantly associated with the level of parental education ($r^{\S} = -0.60$, $P < 0.001$), annual household income ($r = -0.64$, $P < 0.001$), but had a weak correlation with over-crowding ($r = 0.32$, $P = 0.046$) (23).

In a review article on childhood tuberculosis it was reported that accurate figures for the childhood tuberculosis burden in the world are not readily obtainable due to difficulties in diagnosing childhood tuberculosis, inadequate health information systems in developing countries and the lack of importance accorded to childhood tuberculosis by tuberculosis control authorities as possible factors (20). The review pointed out that tuberculosis caseload has been reported to be as low as 5% in developed countries and as high as 39% in developing countries (20). The epidemiology of childhood tuberculosis remains an area where greater effort should be devoted in order to provide accurate and reliable information for effective preventive and curative programmes.

1.1.6: HIV/AIDS:

The 2004 report on the global AIDS epidemic estimates that about 38 million people (range 34.6-42.3 million) are infected with HIV. Twenty million deaths

[§] : Correlation Coefficient

have been recorded since the first AIDS case was diagnosed in 1981 and sub-Saharan African countries have the greatest burden (24).

In Africa an estimated 25 million people are living with HIV, and two-thirds of this figure are in sub-Saharan Africa (24). The prevalence of the disease in countries like Madagascar and Swaziland is rising although there has been some decline in Uganda. In Africa, the prevalence of the disease varies in levels and trends. While in some six African countries the adult prevalence of HIV is below 2%, it is about 20% in six other African countries. In seven Southern African countries which have the highest number of cases, all the seven Southern African countries have prevalence rates of over 17%, with countries like Botswana and Swaziland having a prevalence rate above 35% (24).

People within the age group 15-24 years old account for close to half of the cases of new HIV infections world wide, and women of child bearing age are most affected in Sub-Saharan Africa (24). WHO 2004 global AIDS report states that, In Africa, on the average there are 13 infected women for 10 infected men (24).

Deaths of women of child bearing age from HIV/AIDS have led to the growing number of orphans. An estimated 12 million children in sub-Sahara Africa have been orphaned (24). It is likely that childhood morbidity and mortality from countries with high HIV/AIDS prevalence would soon see a rise as a result of the

poor care given to children in such countries as well as the high HIV/AIDS burden in the children who are affected with the disease (25).

1.1.7: Neonatal and peri-natal mortality.

World wide deaths occurring in the neonatal period accounts for about 4 million of all childhood deaths (26). Only 1% of these deaths occur in high income countries with the remaining 99% taking place in the middle and the low income countries (26). The southern Asian region of WHO has the highest neonatal deaths, followed by Africa which accounts for about 28% of neonatal deaths (26). These two regions account for about two thirds of the overall neonatal deaths (25). Death in the neonatal period (which is the first 28 days of life) accounts for 38% of the deaths occurring in children aged less than 5 years (26). Neonatal deaths are therefore an important contributor to childhood deaths.

Direct causes of the 4 million deaths in the neonatal period were estimated in the year 2000 to be due to prematurity (27%), birth asphyxia (23%), infections (36%) (Including sepsis/pneumonia-[26%], tetanus-[7%] and diarrhoea-[3%]) and congenital abnormalities -7% (26).

A study conducted in 73 state hospitals which included metropolitan areas, city and rural based hospitals in South Africa revealed perinatal mortality rates of 36.2/1000 births, 38.6/1000 births and 26.7/1000 births respectively. Neonatal mortality of 14.5/1000 live -births was highest in the cities followed by the rural groups which recorded 11.3/1000 live births. The study further revealed that complications of prematurity and hypoxia were commonest findings associated

with neonatal deaths in all the areas (27). Neonatal asphyxia and complications of preterm deliveries are therefore contributing to the burden of diseases in South Africa.

1.1.8: Accidental and intentional injuries:

Injuries that are intentional or non-intentional also account for morbidity and mortality in children. The National Injury Mortality Surveillance System in South Africa in year 2002 reported that between 70,000 to 80,000 non-natural fatalities occurred (28). Overall homicide accounted for 45 % of all the fatal injuries. In children aged 0-14 years, the leading cause of death was transport accidents, representing 38.9% of deaths in that age group (28). The study also showed that more males were dying from homicide whilst females were dying from transport accidents. The study again showed that in children aged 0-14 years, the leading cause of death from homicide was firearms, accounting for 38.5% of homicides in children. Hanging was the most common method used in suicide in children 0-14 years accounting for 77.1% of the total deaths due to suicide (28). Furthermore, the study identified motor vehicle pedestrians' deaths as the leading cause of external transport deaths (67%) in children 0-14 years (28). Drowning accounted for 36.1% of external causes of non-transport deaths, followed by burns 31.5% (28). This report revealed that apart from infectious conditions, children are also dying from non-communicable diseases like injuries and accidents.

1.2: CHILDHOOD MORTALTY IN SOUTH AFRICA

The population of children less than 18 years in South Africa is about 17 million (29). About 5 million of these are less than five years old (29). South Africa is a heterogeneous society with a broad spectrum of standards of living among children; some are from high socio-economic class and others from low socio-economic class similar to other sub-Saharan African countries (30). The majority of childhood illnesses seen in sub-Saharan Africa can be seen in rural settings in South Africa where socio-economic status is generally low. The children in these settings are therefore at risk of infectious diseases.

The South African National Burden of Disease Study (NBD) in 2000 estimated that over hundred thousand deaths occurred in children under 5 years and an additional seventy eight thousand deaths occurred in children aged between 5 to 14 years. HIV/AIDS, Low birth weight, Diarrhoeal diseases, Lower respiratory tract infections and Protein-energy malnutrition were the top five leading causes of death. Other important causes of deaths mentioned in the top twenty causes of deaths were birth asphyxia, congenital heart diseases and accidents. HIV/AIDS, diarrhoeal diseases and protein-energy malnutrition accounted for over 70% of deaths in children less than 5 years. The leading causes of deaths in male and female children both aged 5-9 years were road traffic accidents and HIV/AIDS respectively accounting for 28.8% and 33% respectively of deaths in these two groups. Road traffic accidents were again found to be the leading cause of death in children (both

male and female) aged 10-14 years accounting for 18.3% and 14.9% respectively (31.)

The HIV/AIDS epidemic has also derailed gains in mortality trends over the period. South Africa is now ranked sixty sixth (66th) in the world with regards to under-five deaths, with a worsening of under-five mortality. An annual rate of reduction of under-five mortality has declined from 2.6% to -1.5% from 1990 to 2001, meaning that under-five mortality is increasing in South Africa (Table 1 shows the health indices of South African children) (29).

Table 1: Health indices of South African children:

Health indicator	Measurement
Number of Child Death (2001)	78,000 deaths
Under-five mortality rank (2001)	66 th out of 260 countries
Infant mortality rate (2001)	56/1000 live births
Under-five mortality rate over 40 year period (1960-2001)	
• 1960	130
• 1990	60
• 2001	71
Annual rate of reduction of under-five mortality.	
1960-1990	2.6%
1990-2001	-1.5%
Estimated number of children 0-14 years living with HIV	250,000
Children 0-14 years orphaned by AIDS	660,000

Source: The state of the world's children report 2003 (29)

UNAIDS estimates for the year 2003 revealed that about 5.3 million people are living with HIV in South Africa and this represents about 21.5% of the population (24). About 28% of the population in South Africa is affected with HIV/AIDS and

13% of all the people living with HIV world-wide can be found in South Africa (32). The prevalence of the disease among antenatal clinic attendees varies across the provinces, the KwaZulu-Natal province has the highest rates of about 36.2% and the Western Cape province has the lowest prevalence of about 8.7% in the year 2000. In Gauteng the prevalence was 29.4%, Free State 27.9%, Mpumalanga 29.7%, North West 22.9 %, Eastern Cape 20.2%, Limpopo province 13.4% and Northern Cape 11.2% (33).

In 1992, the prevalence of HIV in antenatal attendees was 2.4% but this increased to 24.5% by the end of the year 2000 (33). The presence of HIV in antenatal mothers in South Africa directly or indirectly affects its prevalence in children since HIV is acquired in childhood mainly by vertical transmission (17). Children in South Africa are therefore affected with HIV/AIDS with the prevalence of HIV in females aged 2-14 years being 6% and males aged 2-14 years being 5% (33).

The mortality report on HIV/AIDS from the South African government showed that between 1997 and 2002 the overall annual number of deaths recorded increased by 57% and deaths among people aged 25-49 years rose by 116% (33). In 1997, the total population of children aged 0-14 years who died from HIV/AIDS was 40,495, and by the year 2000, the number of deaths had risen to 47,419. This represents an increase in mortality of about 17% within the three year period (33). HIV/AIDS is therefore one of the major public health concerns in South Africa in view of its contribution to the national disease burden.

Childhood nutrition plays a major role in child survival within the first 5 years of life. Malnutrition in children can be an indication of poor diet intake during childhood and also improperly conducted feeding techniques. According to WHO in 2003 only 6% of children in South Africa were exclusively breastfed, 25 % of the children under-five years had stunted growth, 14% were underweight and 3% showed signs of wasting (Table 2) (29).

Table 2: Nutritional status of South African children between 1995 and 2001

Percentage of Under-fives suffering from malnutrition (1995-2001)			
Underweight		Wasting	Stunting
Moderate to severe	Severe	Moderate & Severe	Moderate and Severe
12%	2%	3%	25%

Source: WHO. The state of the world's children report 2003 (29)

A survey conducted by the National Food Consumption Survey of South Africa has come up with findings which indicates that malnutrition is a health problem in children in South Africa. The study found that approximately one in five children between 1 to 9 years of age in South Africa are stunted (21.6%) and 1 in 10 (10.3%) is underweight for age. The prevalence of stunting was highest in children between 1 to 3 years old (25.5%) and lowest in those between 7 to 9 years old (13%). In terms of over-nutrition, the survey also reported overweight and obesity in 17.1% of the sample at the national level (34). Malnutrition is therefore a health problem in South Africa and could be an underlying health condition associated with other infections such as HIV/AIDS.

1.3: Mortality rates in children living in the Agincourt sub-district between 1992-1995.

The Agincourt sub-district of Bushbuckridge, Limpopo Province, contributes a share to the mortality in the country. The population of children less than 15 years old is over 42 000; infant and under-five mortality represent about 25% of all deaths in children less than 15 years between 1992-1995 (table 3) (35).

Table 3: Mortality rate by age and sex in the Agincourt sub-district

Age Group	Male		Female		Total		
	No. Deaths	Rate /million	No. Deaths	Rate /million	No. Deaths	Rate /million	M:F Ratio
0-4	108	74	108	75	216	75	0.99
5-14	26	9	18	6	44	8	1.44
15-49	145	34	99	21	244	27	1.65
50-74	183	252	138	136	321	184	1.86
75+	87	883	89	601	176	714	1.47
Total	549	59	452	44	1001	51	1.32

Kahn K et al: June 1999 (34)

Diarrhoeal disease, acute respiratory tract infection (ARI) including pneumonia, AIDS and vaccine preventable diseases represented the top four causes of death in children less than 5 years in the Agincourt population during the period 1992-95 (35). The trend of infections and worsening mortality is expected to increase in situations where poverty, malnutrition, and the HIV/AIDS epidemic remain a major challenge to health.

1.4: Role of verbal autopsy in the study design

A “verbal autopsy” technique is used to provide a reasonable estimate of the probable cause of death (36). It is a prototype epidemiological tool that is

widely used to ascribe causes of death by interviewing persons who have lost their relatives and where such relatives were not under medical supervision at the time of death (37). Agincourt DSS utilizes verbal autopsy to provide diagnosis of probable causes of death that occur outside the hospitals. In the Agincourt sub-district, each recorded death is subjected to a verbal autopsy in which specially trained fieldworkers interview the closest caregiver of the deceased in their mother tongue. The questionnaire is designed to have several parts, the most important part is the open section where the respondents (person most closely associated with the deceased during the terminal stage of the illness) describe all symptoms and signs preceding death in his/her own words. This is then followed by a series of filtering questions by the trained fieldworker. There are a series of questions, which are asked for the purpose of clarifying the information received. Thereafter, two medical practitioners, blinded to each other's assessment and diagnosis, review the information and assign a diagnosis for each death, 'Probable cause of death' is assigned if same diagnosis was reached by the practitioners. Where there is no agreement between them, a third medical practitioner, blind to their assessment, makes a further independent assessment. If two of the three diagnoses correspond, the medical practitioners discuss the case and if consensus is achieved the diagnosis is accepted, otherwise the cause of death was described as undetermined (ill-defined). As far as possible, a main diagnosis, immediate cause of death, and associated or contributory causes of death are assigned. Deaths that

occurred with field workers failing to locate close relatives who were available at the time of the death are classified as 'non-respondent (36). These deaths therefore have unknown causes.

1.4.1: Validation of Verbal autopsy

Validation of autopsy conducted by Kahn, et al over the 3-year period, 1992-1995 in Agincourt sub-district concluded that a single verbal autopsy instrument could be used as an instrument to provide a reasonable estimate of causes of death among both adults and children. Sensitivity of verbal autopsy diagnosis among children was 69%, specificity 96%, and positive predictive value of 90% for communicable diseases. Relatively lower values were found for non-communicable diseases: sensitivity 75% specificity 91% and positive predictive value of 86% (36). This study on verbal autopsy indicated that verbal autopsy needs to be validated before it can be applied to district health planning (36).

1.4.2: Possible biases anticipated in the use of verbal autopsy

Verbal autopsy is essentially the use of retrospective information surrounding the circumstances leading to the death of an individual. This information is gathered in a systematic manner in order to arrive at a diagnosis. Verbal autopsy therefore has the potential of measurement bias which could lead to misclassification of an outcome (example death from diarrhoeal disease may be classified as HIV/AIDS or vice versa). Clinicians who decide on the cause of death from the retrospective information given to them can make an inaccurate diagnosis based on retrospective report. Despite the importance of verbal

autopsy in contributing to the gap in knowledge of causes of deaths in areas where vital registration is inefficient, there are major challenges and limitations in the use of verbal autopsy as a tool for determining the cause of death. The misclassification of cause of death may be unbiased or biased. In the event of unbiased misclassification, non-differential misclassification measurement error occurs. However, if misclassification is biased then differential misclassification would occur. DSS data from studies conducted in hospitals in Ghana, Tanzania and Ethiopia to explore the application of sensitivity and specificity of verbal autopsy for adjusting the effect of misclassification error in verbal autopsy, found variabilities between sensitivity and specificity of verbal autopsy between populations depending on the epidemiology of the causes of deaths in these populations. In addition hospital based validation studies were found to be helpful in the understanding of misclassification error in verbal autopsy (38) The study further found out that in adjusting for the effect of misclassification error in the estimates of cause-specific mortality fractions, sensitivity and specificity of verbal autopsy determined from hospital-based validation studies are unlikely to be useful (38)

2.0 Objectives

2.1: Motivation

The increasing prevalence of infectious and preventable diseases for example diarrhoeal diseases, malnutrition, and HIV/AIDS in the community as well as other risk factors associated with childhood mortality in the community as shown by the review in the first chapter are alarming. The study therefore seeks to study the trend in childhood mortality over the period from 1992 to 2000. Analyzing available data with the aim of finding the causes and trends of morbidity and mortality in children under five in South Africa will provide a wealth of information that will be useful for planning interventional programmes aimed at improving child survival in South Africa. The Agincourt, South Africa database on mortality in children has not been analyzed completely, and this study proposes to analyze a portion of this data set on childhood mortality.

2.2: Rationale

The impact of HIV/AIDS on communities in South Africa has serious ramifications with regards to child health. HIV/AIDS was first recognized in South Africa in 1982 (31), and its prevalence has dramatically increased in number, affecting especially the rural poor and the less privileged. It is expected that HIV/AIDS will contribute to the increase in both overall childhood mortality and also mortality from tuberculosis in rural communities. The rationale behind this work is therefore, to describe and compare the trend

of childhood mortality between two major periods in the HIV/AIDS epidemic- the early and late stages of the epidemic in a rural community in South Africa.

2.3 Study Question.

What are the trends and causes of childhood mortality in Agincourt, a rural sub-district of South Africa?

2.4 Primary Objective.

To understand patterns of mortality in children aged 0-14 years living in a rural sub-district of South Africa over the period 1992 to 2000.

2.5 Specific Objectives.

- ❖ To study the trends in all cause mortality in children aged 0-14 years living in the Agincourt Sub-District of South Africa over the period 1992 to 2000.
- ❖ To describe the leading causes of death in children aged 0-14 years living in the Agincourt Sub-district for the period 1992 to 2000.
- ❖ To compare cause-specific mortality rates in children, between 1992-1996 and 1997-2000.

3.0 Methods and Design

3.1: Study site: Limpopo Province and Agincourt Sub-District.

The Agincourt study area, part of the South African lowveld, is a rural sub-district of Bushbuckridge (now called Bohlabele District), Limpopo Province, adjacent to the country's eastern border with Mozambique. The Agincourt field site (approx. 400sq km) extends from 24° 50' to 24° 56' south latitude and 31° 08' to 31° 25' east longitude. The altitude ranges from 400 to 600 meters above (mean) sea level. The field site has 21 villages that range in size from 100 to 1100 households. In 2001, the population comprised of 68 631 persons residing in 11212 households, representing approximately 170 persons per sq km (39). The 1999 census update reported a population of 66 840. Of these, the permanent population (resident in the site for more than 6 months of the preceding year) was 56 566. The sex ratio (male-female) in the total population was 0.929, falling to 0.712 in the permanent population age 15-49 years old due to migration to urban areas. The age structure in the total population at the end of 1999 was as follows: 2.3% were < 1 year old; 12%, 1-4 years old; 27.6%, 5-14 years old; 55.9%, 15-64 years old; 4.5%, ≥65 years old (40). Children less than 14 years old accounted for about 41% of the total population. The infant mortality rate among males and female was 43.0/1000 and 45.1/1000 respectively (40). (See map of area in appendix A.3).

3.2: Study Population.

The study population comprised of children 0-14 years living in the Agincourt sub-district of South Africa's Limpopo Province, over the nine year period 1992 to 2000.

3.2.1 Inclusion criteria:

- Children aged 0 to 179 months. (0-14 years)
- Children registered under the Agincourt HDSS in the Limpopo province
- Children whose deaths were recorded by the DHSS in the Agincourt sub-district.

3.2.2 Exclusion criteria:

- Children who are 15 years and above

3.3 Study Design

The study involves secondary data analysis of a prospective cohort of children 0-14 years that is part of the population of the Agincourt sub-district which has been under continuous longitudinal surveillance since 1992. The dataset is thus derived from the Agincourt Demographic and Health Surveillance System (DSS) which provides a comprehensive and systematic recording on an annual basis of all vital events and associated demographic, health and socio-economic variables occurring in a geographically defined population. Births, deaths, migration in-and out-, household relationships, resident status, educational status, antenatal and delivery health seeking practices are recorded. This demographic and health surveillance system provides data on trends in mortality by age, sex and other variables for the entire Agincourt population since 1992.

The objectives of the Agincourt DSS site are (40).

- ❖ To provide essential information on the demographic, health status, and fertility status of the Agincourt community, as a basis for the improved formulation, implementation and assessment of the district-level programs.
- ❖ To serve as a sentinel field site providing accurate information on the population dynamics of rural communities in South Africa. In addition, to inform the evolution of rural health and development policy.
- ❖ To provide the capacity and a database to support more advanced community-based studies and field trials in the future.

Data was collected by a well-trained team of local field workers who visited every household in the sub-district. Four levels of form verification occurred in a systematic manner in the field organization during data collection. Field workers were prompted whenever errors were detected. In certain situations revisits to the household were performed. Data was then entered onto a database via a custom-designed entry programme in Microsoft Access 2000.

3.4: Agincourt DHSS Database:

Data generated on routine yearly census and from verbal autopsies in Agincourt DSS is available on the Microsoft Access 2000 database in the Agincourt sub-district. Births, deaths and migration registration in this population are almost complete. The database is designed in such a way that records of each individual are entered irrespective of the entry period. Each individual therefore has a unique number recorded on an individual “master-file”. The recognition of individuals in the data set therefore provides the opportunity to compute person-years of follow-up as the denominator for rates.

3.5: Variables in the database:

Socio-demographic characteristics of each individual are documented. These include, age with date of birth, sex, village of residency, nationality, marital status, level of education, previous and present occupational status of parents (see Appendix A.1). Verbal autopsies are conducted on each death recorded (See verbal autopsy forms in appendix A.2).

Note: Using verbal autopsies, diarrhoeal diseases were diagnosed and distinguished from HIV/AIDS based on a history of a previously well child with acute episode or episodes of passing watery stools with associated dehydration and complications resulting in death. On the other hand HIV/AIDS was diagnosed based on the presence of chronic or persistent diarrhea, recurrent episodes of diarrhoea with range of other highly suggestive features of childhood HIV/AIDS infection such as failure to thrive.

Malnutrition: In most cases, the type of malnutrition diagnosed was kwashiorkor which is associated with weight loss and the presence of bipedal oedema and other features of micro-nutrients deficiency.

3.6: Classification of deaths

Using verbal autopsies, causes of deaths were identified and classified using the International Classification of Diseases 10 (ICD 10).

3.7: Ethical considerations

The Agincourt DHSS as a whole has a generic ethical clearance (Clearance No. M960270). In addition permission to conduct this secondary data analysis was granted by the Committee for Research on Human Subjects (Medical) in the University of the Witwatersrand, Johannesburg (Ref R14/49 Ansong). Prior to that, the postgraduate committee of the School of Public Health reviewed the scientific merit of the research report and granted approval.

The main ethical issue under consideration in this work is with confidentiality. Data retrieved from the database is related to deaths that have occurred in families in the Agincourt DSS. It would, therefore, be ethically right to keep names and identities of deceased persons and relatives confidential since deaths from diseases such HIV/AIDS and tuberculosis are associated with stigmatization.

4.0 Analysis.

4.1: Data processing and data cleaning.

The secondary data set from the Agincourt Health and Population Unit was further cleaned and then entered into a computer data base by the data manager for the project and the author. Data was imported and analyzed using EPI-INFO software version 6.04 (Centers for Disease Control and Prevention, USA and World Health Organisation, 1996) and STATA (Stata statistical software 1997: release 5.0, College Statistics, TX: Stata Corp).

Entries not consistent with the observations were eliminated. In addition missing data were not assigned a value in the analysis process.

4.2: Method of Analysis.

A descriptive analysis of the data was carried out on the numeric variable, that is age, and categorical variables such as sex, educational levels, employment status and village of residence. Measures of central location: mean and median age of the children and the spread of the distribution: variance, standard deviation and minimum and maximum values were determined.

To evaluate the differences in mortality rates between 1992-1996 and 1997-2000, chi-square analysis of trend was used to determine significant difference in mortality between the periods 1992-1996 and 1997-2000. Student t-test was used to test the statistical difference in the proportion of deaths (general and cause-specific mortality) between 1992-1996 and 1997-2000. Relative risk of death from a disease between the two periods of time was determined by

dividing the incidence of death from a particular disease occurring between 1997 and 2000 by incidence of death from the same disease, occurring between 1992 and 1996.

The mortality rate for a particular disease was determined using the number of deaths occurring from the disease as the numerator and person-years of follow-up during the specific period of time as the denominator (38). The Agincourt DHSS documents births and deaths, and in and out migration on regular basis in their data base. Person-years of follow up was determined using the duration of observation contributed by each individual in the DSS. A cumulative contribution from the total population over the observed period is therefore determined (38). The determination of person-years of follow-up is therefore a credible denominator to use in this analysis rather than the number of children at risk of the disease.

5.0: Results

5.1: Demographic status of children

A total of 724 deaths occurred in children aged 0-14 years from 1992 to 2000. There were 369 female deaths representing 51.8% of the deaths, and 344 male deaths representing 48.2% of the deaths. The deaths were recorded in 21 villages in the Agincourt sub-district which has a population base of over 70 000 persons [2000 Census]. South African nationals constituted 62.2% of the children who died while 37.8% were Mozambicans and other nationals (Table 4). The age distribution of the children is shown in Figure 1. It shows that a greater proportion (84%) of the children were less than 5 years old. Median age of South African nationals and Mozambican with other nationals was 18.2 months and 15.3 months respectively (Table 4).

Table 4: Descriptive statistics of children 0-14 years dying in the Agincourt Sub-district of South Africa, 1992-2000.

Socio-demographic Characteristics	No. of Children (%)	Median age in months	Interquartiles range in months
Sex			
• Male	351(48.5)	17.2	3.4-38.7
• Female	373 (51.5)	16.0	5.3-33.0
Nationality of children			
• South African	450 (62.2)	18.2	3.4-33.9
• Mozambican/others	274 (37.8)	15.3	6.5-38.7
Deaths within the two Periods			
• 1992-1996	345 (47.7)	16.3	5.1-36.7
• 1997-2000	379 (52.3)	16.7	3.7-34.6

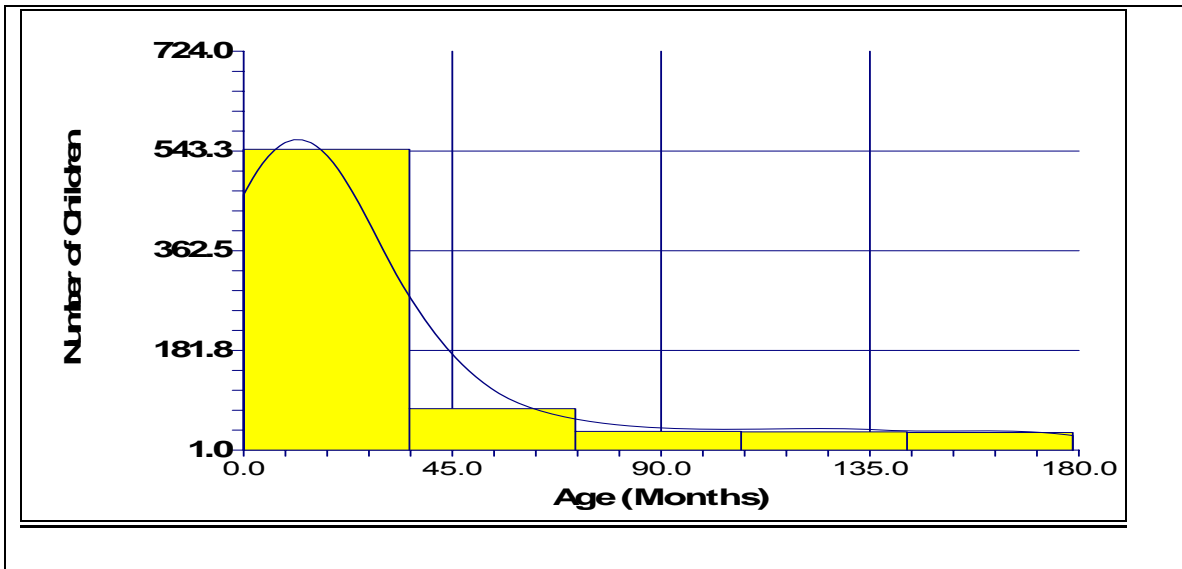


Figure 1: Age distribution of children age 0-179 months who died in the Agincourt sub-district of South Africa during the period 1992-2000

5.2: Trends in mortality over nine year period 1992 to 2000.

An analysis of mortality between 1992 and 1996 showed an initial increase in mortality between 1992 and 1993 followed by a decline in mortality from 1993 to 1996, and then a sharp rise in mortality in the latter part of the decade from 1997 to 2000 (Figure 2).

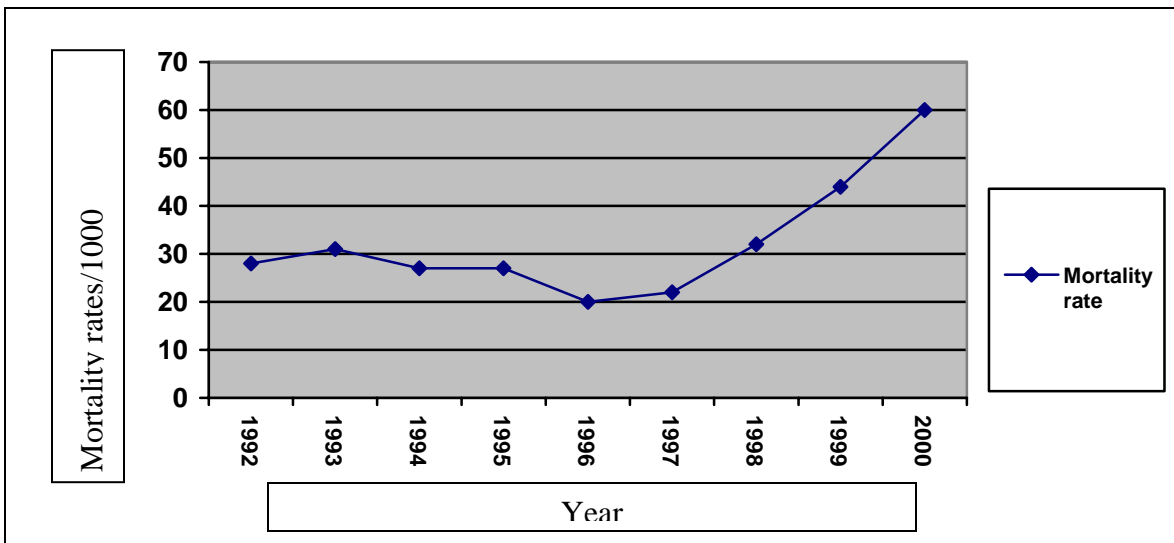


Figure 2: Overall trend of childhood mortality rates within the period 1992-2000.

The trend in age-specific mortality over the period of 9 years for infants and in those within the age group 1-4 years as depicted in Figure 3 is similar to the overall mortality trend shown in Figure 2. This again illustrates a gradual increase in mortality in the early part of the 1990s (1992-1994), then a decline in mortality from 1995-1997, with a steady rise in mortality in the latter stages of the decade (1998-2000). Infant mortality as well as mortality within the age group of 1-4 years mortalities were highest throughout the period. Mortality rates in children above 5-years of age were on the average much lower than mortality in infants and in the age group 1-4 years (Figure 3).

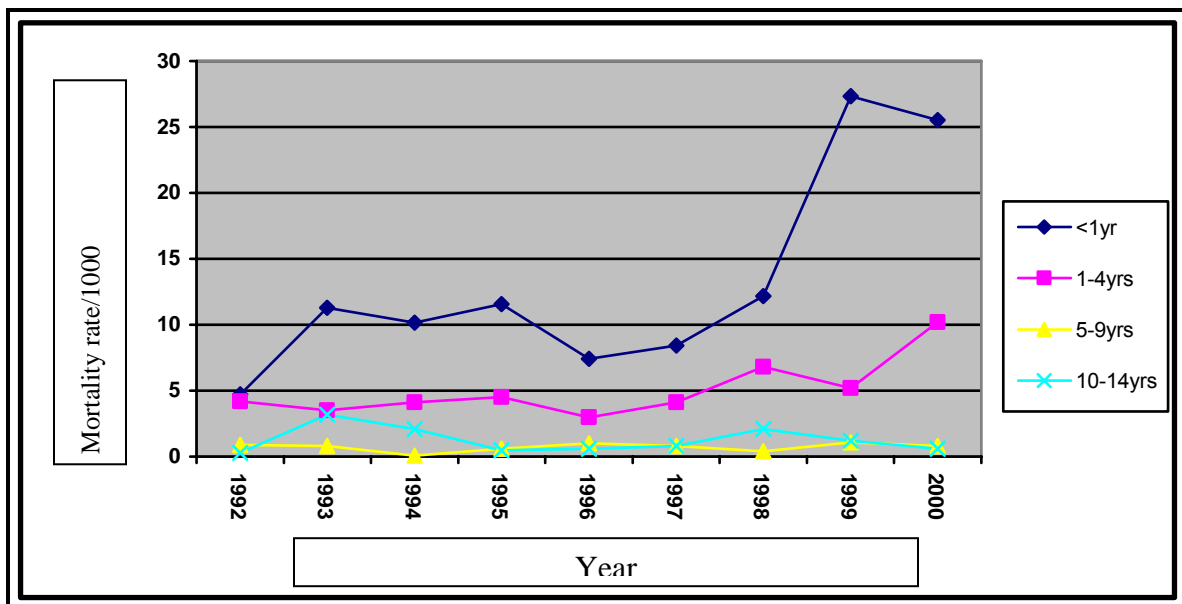


Figure 3: Trend in childhood mortality rates for the various age groups in children 0-14 years, from 1992-2000 in the Agincourt sub-district

5.2.1: Infant Mortality Rate (IMR) and Under-five Mortality Rate (U5MR) in children between 1992-2000

Table 5 shows infant and under-five mortality rates from 1992 to 2000 in the Agincourt sub-district. In 1992 the infant mortality rate was 4.66/1000 births.

This increased to 11.08/1000 in 1993. In 1994 and 1995 the infant mortality rates were 10.07/1000 births and 11.54/1000 births respectively. There was a decline in infant mortality rate in 1996 to 7.39/1000, as compared to the previous year. The lower figures reported in 1996 and 1997 as compared to the period 1993-1995 are much more likely to be due to under-reporting of deaths. In 1998 the infant mortality rate increased again to 12.13/1000 births and it further increased to 27.26 in 1999. The year 2000 recorded a higher mortality of 25.51/1000 births. Under-five mortality in the district showed a similar pattern of initial lower mortality rates between 1992 and 1996 with an increase in mortality rate in the latter years. In 1992 U5MR of 11.05/1000 births was recorded. In 1993 the rate was 19.66/1000 births. By 1994 and 1995 the rate had increased to 21.44/1000 births and 24.53/1000 births respectively. There was a decrease in mortality in 1996 (15.52/1000 births). Subsequently there was a gradual increase in mortality rates over the four year period 1997-2000, the highest mortality rate being recorded in the year 2000, a rate of 47.17/1000 births. There was a significant statistical difference in both infant mortality rate and under-5-mortality between 1992-1996 and 1997-2000, with p-values < 0.0001. Undercount in the early period of developing the recording systems for the DSS in the Agincourt region could be a factor accounting for difference.

Table 5: Infant and under-5-mortality rates in Agincourt sub-district between 1992-2000.

Year	Total number of births	Total number of infant deaths	Total number of Under -5 deaths	IMR per 1000 births	U-5 mortality per 1000 births
1992	3436	16	38	4.66	11.05
1993	3611	40	71	11.08	19.66
1994	3079	31	66	10.07	21.44
1995	2772	32	68	11.54	24.53
1996	2705	20	42	7.39	15.52
1997	2497	22	51	8.81	20.42
1998	2391	29	77	12.13	32.20
1999	2311	63	99	27.26	42.28
2000	2078	53	98	25.51	47,17
Total	24880	306	610	12.2	24.50

5.2.2: Comparing causes of infant mortality between 1992-1996 and 1997-2000.

A total of 303 deaths occurred in infants; this represented 41% (303/724) of the total number of deaths (Table 6). The three leading causes of deaths between the period 1992 and 2000 were diarrhoeal diseases which accounted for 16.2% of the cases, neonatal deaths which accounted for 15.2% of the cases and respiratory infection which was the third leading cause of death in infants, accounting for 13.2% of the cases in Agincourt sub-district (Table 6). The infant mortality rate for the periods 1992-1996 and 1997-2000 were 9 per 1000 births

and 18 per 1000 births respectively. There was a significant statistical difference in infant mortality over the two periods of time 1992-1996 and 1997-2000 (Pearson chi test for trend chi-square value = 22.66, p-value of 0.031). Similarly, there was a significant statistical difference in the neonatal mortality rate over the two time periods (chi square value 7.34, p-value of 0.007). Respiratory tract infection and HIV/AIDS were also important causes of mortality in infants. The second period experienced about a five-fold rise in the rate of deaths associated with HIV/AIDS infection (Table 6).

Table 6: Comparing the main causes of infant deaths between 1992-1996 and 1997-2000 in the Agincourt Sub-district of South Africa.

Causes of Death	1992-1996		1997-2000	
	No of Deaths (%)	Rate/10000	No of Death (%)	Rate/10000
Diarrhoeal diseases	23 (16.7)	26	26 (15.8)	44
Neonatal Deaths	18 (13.0)	20	28 (17.0)	47
Respiratory Tract Inf	15 (10.9)	17	25 (15.5)	42
AIDS	6 (4.4)	7	22 (13.3)	37
Other infections	7 (5.1)	8	2 (1.2)	3.4
Malnutrition	4 (3.0)	4.5	2 (1.2)	3.4
Accidents	2 (1.5)	2.3	0 (0)	0
Measles	3 (2.2)	3.4	0 (0)	0
Malaria	1 (0.7)	1.1	1 (0.6)	1.7
Malignancy	1 (0.7)	1.1	0 (0)	0
Liver disease	0 (0.0)	0	1 (0.6)	1.7
Ill-Defined**	4 (3.0)	4.5	6 (3.6)	10
Unknown††	54 (39.0)	61	52 (31.5)	87
Total	138 (100)	156	165 (100)	278

** Ill-Defined: Cause of death undetermined because there was no consensus achieved among verbal autopsy assessors

†† Unknown : Cause of deaths in situations where health workers did not find any resident or close relative to provide information on events leading to the death.

5.3. Cause specific mortality

The main causes of death in children aged 0-14 years were infectious diseases. A total of 110 cases of diarrhoeal diseases were documented representing 15.2% of overall deaths and occurring at a rate of 48/10 000 person-years of follow-up. Seventy cases of HIV/AIDS accounted for 9.7% of the overall deaths and occurred at a rate of 30/10 000 person-years of follow-up. Respiratory tract infections were the third commonest type of infectious disease. A total of 53 deaths were attributed to respiratory tract infection, representing 7.6% of the overall deaths with a rate of 23/10 000 person years of follow-up. Fifty five children died from malnutrition, representing 7.6% of overall deaths, and a total of 46 neonatal deaths occurred which accounted for 6.4% of the total deaths. Other infectious diseases causing mortality in the sub-district were measles, malaria and pulmonary tuberculosis (Table 7). Infections such as meningitis, hepatitis and septicaemia that have high case fatality were also recognized as causes of death, together comprising about 3.6% of the total deaths.

Birth defects and other non-communicable diseases comprised about 5.4% of the overall deaths. Ill-defined deaths accounted for 16.7% (n=121) of overall mortality, while deaths with unknown causes (being deaths for which field workers failed to locate close relatives who were present at the time of death) represented 15% (n=109) of total deaths (Table 7).

Table 7: Probable cause of childhood deaths, 0-14 years, as diagnosed by verbal autopsy over the period, 1992-2000, in the Agincourt Sub-District of South Africa.

Cause of Death	Number of Children	Proportionate mortality (%)	Rate/10 000
Diarrhoea diseases	110	15.19	48
AIDS	70	9.67	30
Accidents	60	8.29	26
Malnutrition	55	7.60	24
Respiratory Tract infections	53	7.32	23
Neonatal Deaths	46	6.36	29
Other infections	26	3.59	11
Birth Defects	22	3.04	9.5
Malaria	21	2.90	9
Central Nervous System/ Epilepsy	7	0.97	0.3
Pulmonary Tuberculosis /HIV-AIDS	6	0.83	0.25
Measles	5	0.69	0.21
Pulmonary Tuberculosis	3	0.41	0.13
Malignancy	3	0.41	0.13
Cardiovascular disease	3	0.41	0.13
Liver disease	2	0.28	0.008
Renal Diseases	2	0.28	0.008
Ill-Defined**	121	16.71	52
Unknown ^{††}	109	15.06	47
Total Death	724	100%	313

5.3.1: Sex distribution for the top five causes of death.

Overall proportions of death from infectious diseases, malnutrition and accidents did not vary considerably by sex: males 178 (53 %): females 176 (49.7). In the case of diarrhoea specifically, there were more female deaths (54%) than male deaths (46%). Similarly in cases of malnutrition, there was a predominance of females (53%) compared to males (47%). Females accounted for 51% of deaths due to respiratory tract infections and male 49%. There was no variation among the sexes in the case of HIV/AIDS. A total of 37 males representing about 62% died from accidents (Table 8).

Table 8: Sex distribution for the top five causes of death in children aged 0-14 years in the Agincourt sub-district between the period 1992-2000

Diseases	Number of Females (%)	Number of Males (%)	Total
Diarrhoea diseases	59 (54%)	51(46)	110 (100%)
HIV/AIDS	38 (50%)	38 (50%)	76 (100%)
Accidents	23 (38%)	37 (62.0%)	60 (100%)
Malnutrition	29 (53%)	26 (47%)	55 (100%)
Respiratory tract infections	27 (51%)	26 (49%)	53 (100%)
Total	176 (49.7%)	178 (50.3%)	354 (100%)

5.3.2: Age specific mortality for the top five causes of deaths

The analysis showed that a greater proportion of children aged less than 5 years died from diarrhoeal diseases and HIV/AIDS as compared to children above 5 years who died from the same diseases. A total of 101 children under five representing 91% died from diarrhoeal diseases, with 73 children representing 96% dying from HIV/AIDS (table 9). Diarrhoeal diseases and HIV/AIDS deaths are high due both to their primary causes and the interaction between these two diseases in children. Deaths from accidents were highest in those children one year and above. Twenty seven children, accounting for 45% of deaths from accidents, occurred in the age group 1-4 years old; and 52% of deaths from accidents, occurred in the age group 5 years and above (Table 9).

Table 9: Age distribution for the top five causes of death in the Agincourt sub-district between the period 1992-2000.

Diseases	Children <1 year	Children 1-4 Years	Children 5-9 years	children 10-14 years	Total
Diarrhoeal diseases	49 (45%)	52 (47%)	6 (5.%)	3 (3%)	110 (100%)
HIV/AIDS	28 (37%)	45 (59%)	2 (3%)	1 (1%)	76 (100%)
Accidents	2 (3%)	27 (45%)	12 (20%)	19 (32%)	60 (100%)
Malnutrition	6 (11%)	48 (87%)	1 (2%)	0 (0%)	55 (100%)
Respiratory Tract Infection	40 (75%)	12 (23%)	1 (2%)	0 (0%)	53 (0%)

5.3.3: Infectious and communicable diseases causing deaths

Diarrhoeal diseases as a group were the leading cause of deaths between the period 1992 to 2000, occurring at a rate of 48/10000 person-years of follow-up in children 0-14 years. HIV/AIDS occurred at a rate of 30/10000 person-years and respiratory tract infections occurred at rate of 23/10000 person-years. Malaria was the fourth commonest infectious disease occurring at a rate of 9/10000 person-years. Measles, pulmonary tuberculosis alone and pulmonary tuberculosis with HIV all occurred at rates below 1/10000 person-years of follow-up. In all, 9 cases of pulmonary tuberculosis (3 PTB and 6 PTB/AIDS) were identified. All cases had a positive history of contact with a family member with PTB (Figure 4).

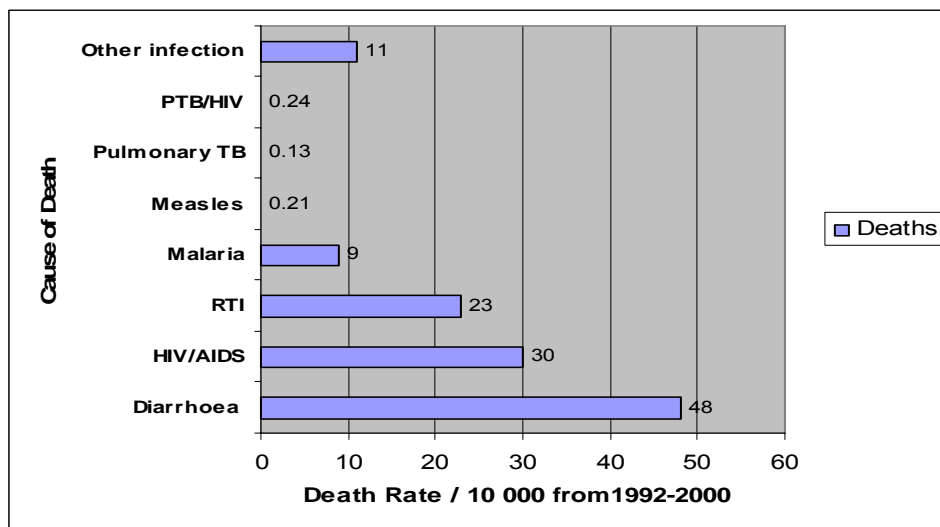


Figure 4: Causes of death attributable to infectious and communicable diseases in the Agincourt sub-district of South Africa from 1992-2000.

5.3.4: Neonatal causes of deaths

Neonatal deaths ranked 6th in cause-specific mortality (table 7), with pre-maturity being the leading cause of death during the neonatal period (Figure 5) accounting for fifty percent of the deaths. Birth asphyxia and neonatal sepsis were also important causes of mortality in the neonatal period. Preventable neonatal conditions like neonatal tetanus were responsible for only one death. South Africa has a nationwide Expanded Programme on Immunization (EPI) which could account for the low number of deaths from neonatal tetanus observed.

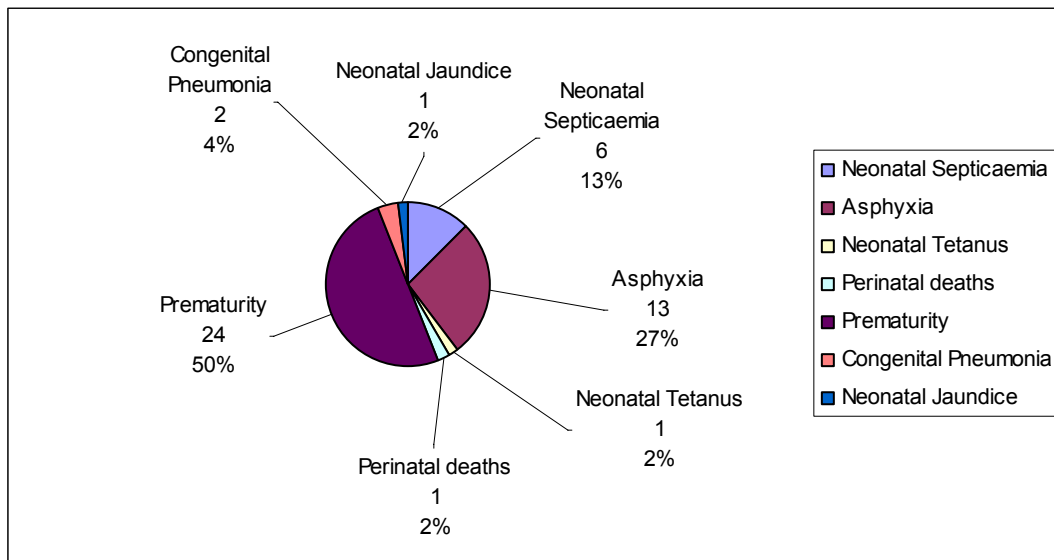


Figure 5: Causes of Neonatal Deaths over the period 1992-2000 in the Agincourt sub-district

5.3.5: Accidents and non-communicable causes of deaths

Accidents also contributed a major portion of the deaths in children living in the Agincourt sub-district, contributing 60 (78%) of the total number of deaths attributable to accidents and non-communicable diseases. Deaths from non-communicable causes involved the central nervous system-7 (9%), cardiovascular disease-2 [3%], malignancies-2 [4%], renal diseases-2 [3%] and liver diseases-2 [3%] (Figure 6).

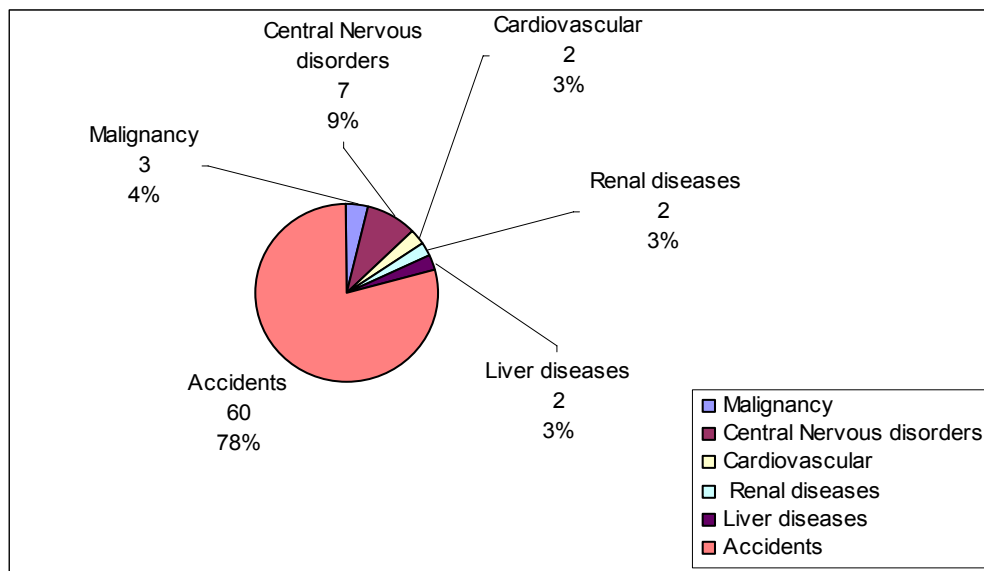


Figure 6: Deaths due to Accidents and Non-communicable diseases over the period 1992-2000 in children aged 0-14 years in the Agincourt sub-district.

Figure 7 shows the causes of death from accidents and injuries. Accidents due to motor vehicle accidents (n=15, 26%), household accidental injuries (n=15, 25%), drowning (n=9, 15%), suicide (n=8, 13%), and burns (n=7, 12%) were reported. Other causes of death included assault (n=3, 5%), fall from a height (n=2, 3%) and animal bite (n=1, 2%).

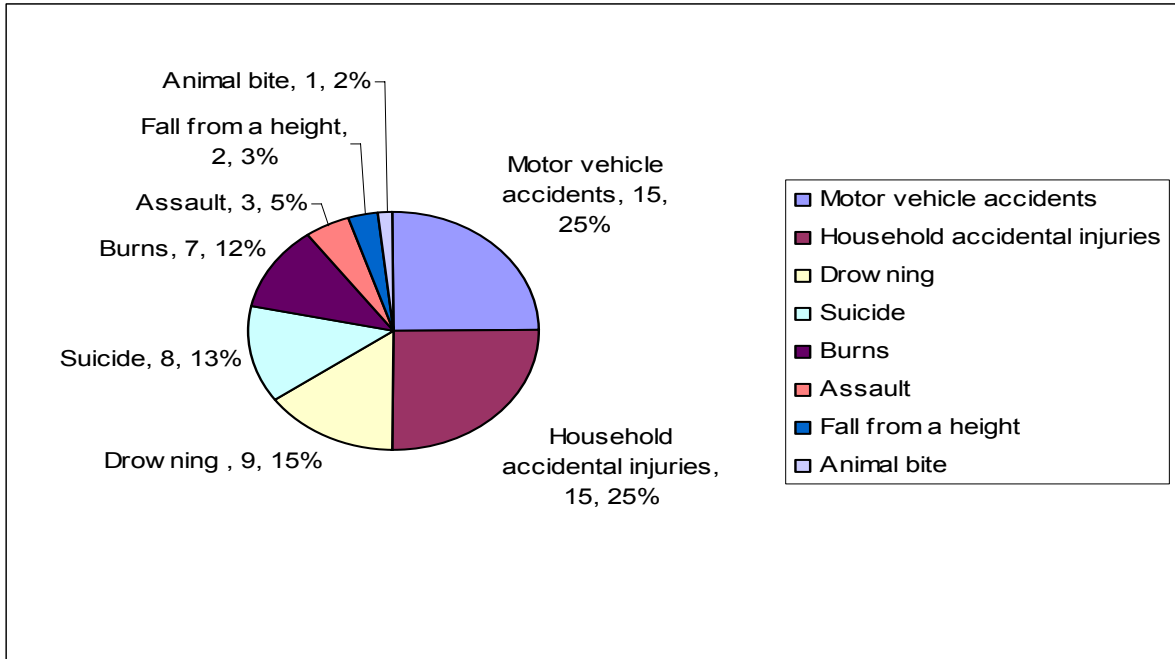


Figure 7: Deaths due to accidents and injuries in children aged 0-14 years in the Agincourt sub-district.

5.3.6: Deaths due to congenital malformations and birth defects

Although a relatively small proportion of deaths occurred in this category, there were twenty one deaths due to congenital malformations and birth defects. A broad range of congenital malformations were reported including hydrocephalus (n=3, 14%), spina bifida (n=3, 14%), and congenital heart diseases (n=3, 14%). Choanal atresia, congenital liver disease, sudden infant death syndrome, and congenital CNS abnormality were also reported.

5.4: Comparing the disease specific death rate between 1992-1996 and 1997-2000.

Comparing the major causes of death in the sub-district, the second half of the decade experienced a decline in the rate of deaths due to diarrhoeal diseases and malnutrition and a rise in the rate of deaths due to HIV/AIDS and respiratory infections (Table 10). There were statistically significant differences between the main causes of death in children over the two periods of time (Pearson chi-square (16) =81.1859 p-value =<0.0001). Deaths from HIV/AIDS occurred 5.8 times more in the period 1997-2000 than from 1992-1996 (95% confidence interval 4.8 to 7.1). Deaths from respiratory tract infections were 2.5 times higher in the period 1997-2000 than from 1992-1996 (95% confidence interval 2.08 to 3.09). Similarly neonatal deaths were 2.0 times more in the period 1997-2000 than from 1992-1996 (95% CI 1.64 to 2.49). Diarrhoeal disease was 0.97 times less within the period 1997-2000 than from 1992-1996. However, this was not statistically significant (95% CI 0.81 to 1.11). Malnutrition related deaths in 1997-2000 were 0.69 times less as compared to that of 1992-1996, and this was statistically significant (95% CI 0.57 to 0.83) (Table 10).

Table 10: Comparing the main causes of Deaths between 1992-1996 and 1997-2000 in children aged 0-14 years in the Agincourt Sub-district of South Africa.

Causes of Death	1992-1996		1997-2000		Risk ratio, 95% Confidence interval
	No of Deaths	Rate/million	No of Deaths	Rate/million	
Diarrhoeal diseases	63	481	47	469	0.97 [0.81 to 1.11]
HIV/AIDS	14	107	62	618	5.80 [4.8 to 7.1]
Accidents	36	275	24	239	0.87 [0.73 to 1.03]
Malnutrition	36	275	19	189	0.69 [0.57 to 0.83]
Respiratory Tract Infections	18	137	35	348	2.54 [2.08 to 3.09]
Neonatal Deaths	18	138	28	279	2.02 [1.64 to 2.49]
Other infections	14	107	12	119	1.11 [0.8 to 1.46]
Malaria	11	84	10	100	1.19 [0.89 to 1.59]
Birth Defects	13	99	9	89	0.89 [0.67 to 1.20]
Central Nervous System /Epilepsy	6	45	1	10	0.22 [0.11 to 0.44]
Measles	4	31	1	10	0.32 [0.16 to 0.66]
Pulmonary Tuberculosis	2	15	1	10	0.67 [0.30 to 1.48]
Malignancy	2	15	1	10	0.67 [0.30 to 1.48]
Cardiovascular	2	15	1	10	0.67 [0.30 to 1.48]
Liver disease	0	0	2	20	---
Renal Diseases	2	15	0	0	---
Ill-Defined**	81	619	40	399	--
Unknown ^{††}	23	175	86	857	--

5.5: Limitations of the Study

1. Data from the Agincourt DHSS has been systematically collected and documented since 1992. However, since causes of death were verified using verbal autopsy, the possibility of recall bias from close relatives could affect the quality of verbal autopsy findings.
2. Undercount of infant deaths in the early period of developing the DSS recording system could account for the unexpectedly low level of infant mortality seen in 1992. This was during the period when the DSS system was being strengthened and structures were being put in place.
3. The rise of the prevalence of HIV/AIDS in this area can lead to limitations in interpretation and analysis of the data. This could cause misclassifications in the determination of causes of death, for example, deaths due to diarrhoeal diseases and malnutrition could have been attributed to HIV/AIDS.

6.0: Discussion, conclusion and recommendations

6.1. Discussion of results.

6.1.1: Infectious and communicable diseases

The trend in childhood mortality mimics the trend seen in most African countries where infectious and communicable diseases are the leading cause of death (3). The role of communicable diseases as an important cause of death remains a major health issue in sub-Saharan African countries. In this study, over fifty percent of the deaths in children under-five years were due to communicable and infectious diseases which are potentially preventable (4, 5, 6, 26, 41, 42, 43). South Africa is ranked in the sixty sixth (66th) position out of 260 countries in the 2003 report of UNICEF, on global under-five mortality rankings (29). It is classified as a middle income country with a GDP per capita annual growth rate of 9% (1990-1999)(29). However, inequality in personal and household wealth puts most persons living in rural communities into a developing and low-income category where infectious diseases are prevalent and are a major cause of morbidity and mortality (44).

Trends in mortality over the nine year period, 1992-2000, have increased in the Agincourt Sub-district. Possible explanations for this increased trend are the HIV/AIDS epidemic and the re-emergence of infectious diseases such as pulmonary tuberculosis complicated by HIV/AIDS (45). Also to some extent poverty-up to 11% of the South African population spent below one dollar a day from 1990 to 1999(1) – could be the underlying factor responsible for the

increased trend in mortality in rural settings because poor people have increased risk of exposure to health risks and at the same reduced access to both preventive and curative health services or interventions (44). The study findings suggest an increase in mortality with a significant statistical difference in the trend in mortality with regards to HIV/AIDS. The increase in HIV/AIDS is an expected finding since the prevalence is very high in mothers of child bearing age and mother to child transmission is the most common mode of transmission in childhood. Malnutrition, diarrhoeal diseases and Infectious diseases such as HIV/AIDS were among the leading causes of death in the sub-district. In most African countries in the tropical belt, malaria and diarrhoeal diseases are the leading cause of death but in South Africa, diarrhoeal diseases and HIV/AIDS are the leading cause of death as was found in this study and other reports (9, 10, 11, 46). HIV/AIDS is the the underlying condition responsible for this occurrence. The overall picture of increased mortality with accompanying increases in mortality due to HIV/AIDS and diarrhoeal diseases are key findings that strongly suggest that HIV/AIDS is manifesting as an important and major cause of morbidity and mortality in the Agincourt sub-district. This is in agreement with earlier studies conducted in the sub-district (35) and other areas in South Africa (31, 47, 48).

It is important to point out that HIV/AIDS can lead to an increase in diarrhoeal diseases and other opportunistic infections in children. The relative decline in diarrhoeal diseases and malnutrition as the main causes of death does not imply

that the burden of these diseases is on the decline. Rather, the rise of HIV/AIDS has led to a proportional reduction in diseases such as diarrhea and malnutrition; in addition these diseases are now more likely to be classified as HIV/AIDS (49). The study findings that malnutrition and other communicable diseases were among the major causes of death, possibly relates to the low socio-economic status and possible lack of adequate childhood nutritional programmes in this rural setting (16, 46).

Cases of pulmonary tuberculosis identified in this study were few, however they are of public health relevance since some were associated with HIV/AIDS and all recorded cases of death from pulmonary tuberculosis in children had an adult contact within the household. The study findings of the association of childhood tuberculosis cases with adult contact is consistent with findings from an active follow up study in Malawi that showed that 63.8% of childhood tuberculosis cases had had positive adult contacts and were accompanied by an 18% HIV seropositivity in the children (50). Further studies and surveillance addressing this observation will be very important to determine whether the prevalence of HIV/AIDS is having a long term influence on tuberculosis levels among children in this rural community.

6.1.2: Neonatal deaths

Neonatal deaths represented 6.4% of the total mortality of children 0-14 years. There was a significant increase in the proportion of neonatal deaths within the

two periods 1992-1996 and 1997-2000. Prematurity, birth asphyxia and neonatal sepsis were the leading causes of death identified in the Agincourt sub-district. Similar findings were reported in a Kenyan district hospital (Kilifi), where severe infection and prematurity accounted for over 55% of the neonatal deaths (51). The neonatal survival series published by the Lancet in 2004 pointed out that neonatal deaths contributed significantly to infant mortality rates. The report identified birth asphyxia, preterm deliveries and neonatal sepsis as important causes of deaths (27).

Neonatal jaundice and neonatal tetanus in the Kenyan hospital report accounted for about 27% of deaths (50), while in Agincourt sub-district this accounted for only 4% of the total neonatal deaths (it must be noted that the Kenyan data is hospital rather than population based). Low levels of tetanus death can be attributed to the comprehensive immunization programme in the South Africa.

6.1.3: Accidental and intentional injuries

Accidents consisting of motor vehicle accidents, poisoning, drowning and burns, along with injuries from assault were among the major causes of death in the Agincourt sub-district. They ranked as the third major cause of death in this analysis. Accidents were mainly in children older than five years. Studies done in the sub-district in 1992-1995 ranked motor vehicle accidents as the number one cause of death in children 5-14 years, with motor vehicle accidents reported as the twelfth leading cause of death in children under-five years of age (35). In South Africa, accidents and injuries are important cause of morbidity and

mortality in the general population with vehicular accidents as an important cause of death after HIV/AIDS (52). These findings describing the main causes of death in children older than 5 years correlate well with the overall pattern of deaths in the country as a whole (31, 52).

6.1. 4: Birth defects and congenital malformations

Birth defects and congenital malformations have been reported as contributing significantly to neonatal and post-neonatal deaths in developing countries (53, 54) They ranked as the tenth cause of death in Agincourt sub-district from 1992-1995 (35). In this analysis these birth disorders ranked eighth. Maternal age, poor maternal nutrition, consanguinity, and lack of adequate antenatal maternal health services have all been identified as important factors contributing to birth defects and congenital malformations in Africa (53). Birth defects and congenital malformations have also been identified by WHO as important contributors to the high under-five mortality rates in developing countries, and efforts are underway to encourage primary health care programmes that will focus on reducing the level of birth defects and malformations in developing countries (54).

6.1.5: Verbal autopsy as a diagnostic tool

Verbal autopsy is used as a means of establishing the cause of death in regions where vital registration is limited or unavailable. In this respect, verbal autopsy is valuable as the only alternative in spite of its limitations. In children, the difficulty of verbal autopsy is that many childhood infections follow a similar terminal

process. In a typical situation, when death is associated with infections and malnutrition, it may be difficult to figure out the exact cause of death (55). In this analysis, about 121 deaths representing about 17% of children aged 0-14 years had their cause of death categorized as ill-defined. This proportion exceeds the leading cause of death, diarrhoeal diseases, in the sub-district with the majority of ill-defined deaths being among infants and children under-five years. However it is important to state that a validation study of the Agincourt verbal autopsy instrument conducted on all deaths in the sub district occurring between 1992 and 1995 found that the verbal autopsy tool could provide a reasonable estimate of causes of death (36). Studies in Namibia on validation of verbal autopsy have indicated that data from verbal autopsy can be useful to ascertain the leading cause of death in childhood, but also point out that the verbal autopsy may have limitations when used in health impact evaluation (56). Measuring the exact cause of death in rural settings and areas with limited vital registration will continue to be a challenge to the health system. In general, it is easier to identify causes of death due to conditions such as motor vehicle accidents, accidents in general and birth defects, than communicable diseases in infants and conditions associated with malnutrition among those under-five (36). Relatively high levels of labour migration in the Agincourt sub-district could partly explain the proportion of children (15%) with no respondent available to provide relevant information to support or guide in the diagnosis of cause of death based on verbal autopsy.

Since under-reporting and lack of effective vital registration exist in most developing countries (57), verbal autopsies will continue to be an effective tool to apply in establishing the causes of death.

6.1.6: Pulmonary tuberculosis

Diagnosis of childhood pulmonary tuberculosis deaths in the Agincourt sub-district was based on verbal autopsy assessments. Childhood tuberculosis ranked sixth among infectious diseases in this analysis. The apparently low rate of deaths from tuberculosis compared with other studies in South Africa (58) points to the fact that diagnosis of tuberculosis using verbal autopsy poses real challenges. The difficulties associated with diagnosing childhood tuberculosis deaths in a rural setting with verbal autopsy can under-estimate the extent of the burden of the disease. However, it is important to mention that, world-wide, the diagnosis of childhood tuberculosis is a huge challenge to clinicians since its presentation can mimic the majority of childhood medical conditions such as malnutrition, respiratory infections and HIV/AIDS (59, 60, 61, 62). It is important to mention that all the pulmonary tuberculosis cases in this study had close contact in the household with an adult having pulmonary tuberculosis. This information assisted in arriving at a diagnosis of tuberculosis using the verbal autopsy. Controlling for confounding variables such as malnutrition, overcrowding or poverty was not possible due to limited data available for analysis.

6.2: Conclusion.

The causes of childhood mortality across rural settings in Africa remain largely communicable and infectious diseases as revealed by this analysis. It can be expected that in regions with high HIV/AIDS prevalence, HIV/AIDS will increasingly be a major cause of death in the next decade as is evident in this analysis.

Child Survival initiatives carried out across the world in the early 1980s led to large reductions in infants and under-five mortalities, but these initiatives have declined due to lack of governmental support and poverty. In addition, ineffective coordination of health interventions such as immunization, health education, micronutrient supplementation, use of insecticide materials, and others that have proven records of reducing childhood deaths have also declined (3, 4). Inequalities in health services and lack of health services in poor rural settings as compared to excellent facilities in the urban areas have worsened the plight of children living in Africa (44).

To reduce childhood mortality, greater efforts must be directed towards effective coordination of preventive interventions. Scaling up preventive programmes such as Highly Active Anti-Retroviral Therapy (HAART) would be an important step in controlling HIV/AIDS. Also, it is very important to focus on ensuring comprehensive surveillance systems as demonstrated by the Demographic and Health Surveillance Systems in some African countries (40). This can ensure documentation of vital registration and generation of relevant health information for policy formulation, planning and evaluation.

6.3: Recommendations arising from this study:

1. Monitoring the trends in disease occurrence and the mortality associated with it, is always important in determining the impact of interventional programmes and policies that have been formulated to mitigate the effect of the health problems on communities. Efforts should therefore be made to continue surveillance activities into the causes of deaths in both rural and urban areas.
2. Vital registration of births and deaths is essential for surveillance activities everywhere. In most rural areas of the developing world, lack of vital registration or non-reporting of births and deaths makes it virtually impossible to estimate the population base of communities, and as such it is difficult to measure the impact of diseases. It would be appropriate for health authorities and public health officials to evaluate and improve on vital registration of births and deaths.
3. The report identified diseases like HIV/AIDS, diarrhoeal diseases, respiratory tract infections and malaria (All of which are infectious diseases) as leading causes of death in rural South Africa. These diseases are largely preventable through effective public health intervention programmes. Efforts should be made to scale up these preventative programmes in order to reduce the burden of these diseases.
4. Accidents causing death in rural communities should be given priority attention. Programmes should be designed to focus attention on causes and practical ways of educating parents to avoid these accidents.

5. Similar comparative studies looking at mortality patterns in children in other rural and urban settings will provide further insight into the burden the HIV/AIDS epidemic is placing on the health of South African children.

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Appendices

A.1 List Operational definitions

Age of Child:	Defined as age from birth to the end of the fourteenth birth day in years
Nationality:	Refers to country of birth.
Mother:	Biological mother
Educational status:	The highest standard passed at school
Accidents:	All deaths that occurred other than through disease or illness in children under 14years.
Birth Defects & Congenital malformations:	Structural and functional abnormality noticed at birth or after birth by physician.

AGINCOURT HEALTH AND POPULATION PROGRAMME
VERBAL AUTOPSY QUESTIONNAIRE

NO RESPONDENT _____ REASON

Village: _____

Gender: Male / Female

Household: _____

Age: _____

FW initials: _____

Refugee: Yes / No

Date of Int.: ____ / ____ / ____
d d / m m / y y

Date of death: ____ / ____ / ____
d d / m m / y y

know ____

Day of death: _____ Don't

Mon / Tues / Wed / Thurs / Fri / Sat / Sun

Xana una xona xitifiketi xa rifu kumbe fomo ya rifu ? **INA**____
EE____ **AT** ____

Do you have a death certificate or death registration form?

If yes, DATE OF DEATH recorded on form: ____ / ____ / ____
d d / m m / y y

CAUSE OF DEATH recorded on form:

Contributing causes:

Underlying causes:

If yes, but form unavailable, where can it be found?

Muhlamuli: manana bava kokwana nuna/nsati makwavo n'wana
van'wana

Respondent: mother father grandma spouse sibling child other

Xibangelo (Hi ku bona ka n'wina / ndyangu)

Cause (as declared by family)

<<>> [To FW: Ask only if deceased did not die at clinic or hospital]

Xana mufi u yisiwile e xibedhlele kumbe ekliniki evuvabyini bya yena?

Was the person taken to clinic or to hospital during this illness?

INA ____ EE

Loko mi nwi yisile, mi n'wi yise kwihi

: _____
If yes, where (name):

Hi siki rihi : ____ / ____ / ____

Date: d d / m m / y y

<<>> [If taken to clinic or hospital more than once, please write as many dates
as possible]

XANA MUFI U LOVE KA NGOZI

INA ____ EE

Was this an accident?

<<>> [To FW: if yes, complete the open history on page 3; page 4 for an
accident; and
sections 21, 22, 23, 24.]

Loko mufi angalovanga kangozi, u vabye nkarhi wa ku fika kwihi? (masiku,
mavikhi,

tinhweti, malembe) If this was not an accident, what was the duration of the illness?

Xana ku ve na vuvabyi byin'wana ke handle ka lebyi byi nga vanga rifu?

Was there any previous illness?

Ina

___ Ee ___

Loko kuri ina, hlamusela

If yes, describe

Xana ka vuvabyi lebyi bya vumbhiri, uvabye ku fikela rini?

Duration of this illness

COMPLETE IN THE CASE OF AN ACCIDENT ONLY

If a CAR ACCIDENT:

Xana khombo leri ra movha ri humelele kwihi?
Where did the car accident occur?

EDROBENI urban _____
EMATIKO XIKAYA rural _____
KUNWANA other _____

Xana mufi a ri
pedestrian _____

MUFAMBI HI MILENGE a

Was the deceased
driver _____

DIRAYIVHA the

MUKHANDZIYI a

passenger _____

Xana mufi a ri eku nweni ka byalwa hi nkarhi lowu ku nga humelela khombo? Ina ____
Ee ____ AT ____
Had the deceased been drinking alcohol at the time of the accident?

Loko mufi a nga ri yena dirayivha, xana dirayivha a ri eku nweni ka byalwa hi nkarhi wa
khombo?

If the deceased not the driver, was driver drinking alcohol at the time of the accident? Ina ____ Ee
____ AT ____

Xana a ku ri muxaka muni wa movha lowu swi nga endleka eka wona?

What vehicle was involved?

THEKISI taxi _____
MOVHA WA KARI

private car _____

MOVHA WA VHENE bakkie _____
UNWANA

other _____

Xana mufi a ambarile mabandhi ya vuhlayiseki ke?

Ina ____

Ee ____ AT ____

Was the deceased wearing a seat belt ?

Xana i ndhawu yini ya miri leyi yi vavisekeke? What part(s) of the body were injured?

If an ASSAULT:

Xana mufi a ri e ku nweni ka byalwa hi nkarhi lowu wa ku biwa ka yena?

Had the deceased been drinking alcohol at the time of the assault?

Ina ____

Ee ____ AT ____

Xana lava va n'wi xaniseke a va ri eku nweni ka byalwa hi nkarhi wa kona?

Had the attackers been drinking alcohol at the time of the assault?

Ina ____

Ee ____ AT ____

Xana timbanga ti vangiwile hi

Were the injuries caused by

KU TLHAVIWA stabbing_____

KU DUVULIWA gunshot_____

KU LWISANA fighting_____

SWIN' WANA other_____

Xana ku lwa loku a ku ri ka

Was the violence

XINDYANGU domestic_____

TIPOLITIKI political_____

EXITARATINI street_____

MAPHORISA police_____

SWIN' WANA other_____

Xana i ndhawu yihi emirini leyi yi vavisekeke?

What part(s) of the body were injured?

For ALL accidental deaths :

Xana mufi u lovile eka ndhawu leyi khombo ri humeleleke kona.

Did the person die at the site of the accident / assault (i.e. immediately) ?

Ina ____ Ee

____ AT ____

Loko ku ri ee xana u hete tiawara/masiku mangani anga si lova e ndhaku

ka khombo?

If no, how many hours / days after the accident did he/she die?

****** IF AN ACCIDENT, GO TO PAGE 19, QUESTION 21 ******

****** IF NOT AN ACCIDENT, CONTINUE ON THIS PAGE ******

<<>> [To fieldworkers:

1) Circle the answer given by respondent for Ina, EE, Andzi tivi.

2) If the answer is INA, ask all the questions in the section.

3) *If the answer is Ee or Andzi tivi, go directly to the next section (the next main question)]*

1. KU HISA KA MIRI / MIRI HINKWAWO WA VAVA

FEVER /HOT BODY

INA EE ANDZI

TIVI

Nkarhi (masiku, mavhiki, tinhweti)

Duration (days, weeks, months)

A swi sungule rini

When did it start

Swi herile rini

When did it stop

Ku hisa ka miri a ku vuyavuya

Fever was recurrent / persistent

Ku rhurhumela na ku hisa hinkarhi wunwe (mathutwana)

Ina ___ Ee

___ AT ___

Chills

2. KU CHULUKA

ANDZI TIVI

DIARRHOEA

INA EE

Nkarhi (masiku, mavhiki, tinhweti)

Duration (days, weeks, months)

A swi sungule rini

When did it start

A swi herile rini

When did it stop

Xana mufi aa chuluka swa mati ?

Ina ___ Ee

___ AT ___

Were the stools very liquid?

Xana thyaka ari huma na matheketheke ke ?

Ina ___ Ee

___ AT ___

Mucous in stools?

Xana ngati a yi huma ke ?

Ina ___ Ee

___ AT ___

Blood in stools?

Xana mufi a tshamela ku chuluka (ku tlula ka tsevu hi siku)

Ina ___ Ee

___ AT ___

Were stools very frequent?

Ku oma ka nomo / to rha leri kulu

Ina ___ Ee

___ AT ___

Dry mouth / very thirsty

Mahlo yo nghena endzeni

Ina ___ Ee

___ AT ___

Sunken eyes

Ku vuna ka nhlonge

Ina ___ Ee

___ AT ___

Loss of skin elasticity

<<>> [Ask the next question only if the deceased was a child less than two years of age]

Rhavarhava yo nghena endzeni

Ina ___ Ee

___ AT ___

Sunken fontanelle

3. KU HLANTA

INA EE

ANDZI TIVI

VOMITING

Nkarhi (masiku, mavhiki, tinhweti)

Duration

U hlante rini hi nkarhi wo va bya

When during illness

Muhlovo wa mahlanta

Colour

Mahlanta a ma hlangane ni ngati ke ?

Ina ___ Ee

___ AT ___

Was there blood in the vomit?

4. A RHURHUMELA, NHAMU YI OMILE, KU OMA KA MIRI, MIRI WU KHOTSEKELA ENDZHAKU.

SPASM, CONVULSIONS, STIFF NECK, STIFF BODY, BODY BENT BACKWARD

*INA EE ANDZI
TIVI*

Hlamusela leswi nga humelela

Describe what happened

Xana a swi humelela ro sungula ka mavabyi lawa?

Ina ___ Ee

___ AT ___

Did it happen for the first time during this illness?

Xana swi humelele ka ngani?

How many times did it happen?

Nkarhi wa xiphemu xin'wana ni xin'wana.

Duration of each episode

Xana swi endleke rini hi nkarhi wa vuvabyi

When during illness

Xana u huwelerile?

Ina ___ Ee

___ AT ___

Did he/she cry out ?

Ku rhurhumela ka miri

Ina ___ Ee

___ AT ___

Spasm (uncontrolled sudden movements)

Xana nhloko a yi jikele endzhaku Ina ___ Ee
___ AT ___
Head bent backward

Xana miri a wu omile u tlhela wu govekela endzhaku
Ina ___ Ee ___ AT ___

Body stiff and bent backward

Xana milenge a yi omile na yi ololokile kumbe yi tiya na yi govekela endzhaku.
Legs stiff and straight / bent Ina ___ Ee
___ AT ___

Mavoko a ma oma na ma ololokile kumbe govekile Ina ___ Ee
___ AT ___
Arms stiff and straight / bent

Mavoko ma endle swi bakele Ina ___ Ee
___ AT ___
Clenched hands

Xana tinhlaya ati omile (anga swi koti ku dya) Ina ___ Ee
___ AT ___
Clenched jaws (could not eat)

Xana mufi a tsakamisa Ina ___ Ee
___ AT ___
Urinating during episode

Xana mufi a luma ririmi hi karhi wa vuvabyi Ina ___ Ee
___ AT ___
Biting the tongue during episode

Xana a huma khuvi hi nomo Ina ___ Ee
___ AT ___
Frothing at the mouth

Rhavarhava a yi pfimbile (loko n'wana ari hansa ka malembe mambirhi)
Swollen fontanelle Ina ___ Ee
___ AT ___

Xana mufi a ri na mavabyi ya switshetshela? Ina ___ Ee
___ AT ___
Was this epilepsy?

Loko kuri ina, xana mufi u ve na swi tshetshela nkarhi wo tani hi kwihi?

If yes, for how long did the person have epilepsy?
___ AT ___

Ina ___ Ee

U tshunguriwile?
___ AT ___

Ina ___ Ee

Was the person treated?

Loko a tshungriwile kwihi? (xibedlhele, kliniki, n'angeni)

If yes, where? (hospital, clinic, traditional healer)

**5. KUTIKERIWA KU HEFEMULA
ANDZI TIVI**
DIFFICULT BREATHING

INA EE

Nkarhi (masiku, mavhiki, tinhweti)

Duration

Swi sungule rini

When did it start

Swi herile rini

When did it stop

Ku hefemula hi ku hatlisa
___ AT ___
Rapid breathing

Ina ___ Ee

Ku tikeriwa ku hefemula
___ AT ___
Difficult breathing (suffocating)

Ina ___ Ee

Ku hefemula a ku ri na huwa xana
___ AT ___
Breathing was noisy

Ina ___ Ee

Tinhompfu ta yena a tipfuleka-pfuleka xana
___ AT ___
Nostrils flaring

Ina ___ Ee

Xana xifuva xa yena a xi vuyela endzeni
___ AT ___
Chest indrawing

Ina ___ Ee

Xana a swi kota ku etlela a ololokile ke? Ina ___ Ee
___ AT ___
Was the person more breathless when lying flat?

Xana a ku ri na ku tikeriwa ka ku hefemula loko a tshamile kumbe wisile?
Was there difficulty breathing while the person was sitting or resting? Ina ___ Ee
___ AT ___

Xana a ku ri na ku tikeriwa ka ku hefemula loko ari eku fambeni ke?
Was there difficulty breathing when the person was walking? Ina ___ Ee
___ AT ___

Xana a tsandzeka ku famba hikokwalaho ka ku tikeriwa ka ku hefemula?
Was the person unable to walk because of difficulty breathing? Ina ___ Ee
___ AT ___

6. KU KHOHLOLA INA EE
ANDZI TIVI
COUGH

Nkarhi (masiku, mavhiki, tinhweti)

Duration

Swi sungule rini

When did it start

Swi herile rini

When did it stop

Xana mufi a khohlola na vusiku Ina ___ Ee
___ AT ___
Coughing at night

A phela marha loko a heta Ina ___ Ee
___ AT ___
Spitting after cough

_____ Loko ku ri ina, a ku ri na xikhohlola sputum ___ froth
If yes, sputum (mucus), froth, blood, bad smell?

blood ___ bad
smell ___

- A helela hi moya loko a heta ku khohlola
 ___ AT ___ Ina ___ Ee
 Losing breath after cough ?
- Xana a hlanta loko a khohlola?
 ___ AT ___ Ina ___ Ee
 Vomiting after cough?
- A ku ri mukhuhlwana wa xi mbyembye
 ___ AT ___ Ina ___ Ee
 Was this whooping cough?
- Xana mufi u love masiku mangani endzhaku ka ku sungula ka ku khohlola?
 How many days after the onset of the cough did the person die?
-
- Xana a dzuka nyk kutlurisa na vusiku?
 ___ AT ___ Ina ___ Ee
 Night sweats?
- Xana vuvabyi lebyi aa kuri TB?
 ___ AT ___ Ina ___ Ee
 Was this TB?
- Loko kuri ina, xana atshunguriwile exibedlhela?
 ___ AT ___ Ina ___ Ee
 If yes, was it treated at hospital?
- <<>> [To FW : ask only if the deceased is a child less than 5 years.]
- ___ AT ___ Ina ___ Ee
 Has the deceased child's mother or father ever had TB?
- ___ AT ___ Ina ___ Ee
 If yes, did the child live in the same house as the parent with TB?

7. **SWIRHUMBANA**
RASH

INA EE ANDZI TIVI

Nkarhi (masiku, mavhiki, tinhweti)

Duration

Swi sungule rini?

When did it start?

Swi herile rini?

When did it stop?

A swiri ka swirho swihi swa miri?

Where on the body?

A swi sungule ka swirh swihi swa miri?

Where did it start?

A swi sungule nkarhi wun'we kumbe a swi nga humelanga ehenhla?

Flat or raised

A swi ri makulu kumbe a ya ri matsongo?

Large or small

Aswi ri swa muhlovo wihi?

What colour was the rash?

Xana swirhumbana a swi ri na mati? Ina ___ Ee
___ AT ___
Contained clear liquid?

Xana swirhumbana a swi n, wayisa? Ina ___ Ee
___ AT ___
Itchy?

Xana aswi vavisa ke? Ina ___ Ee
___ AT ___
Was the rash painful?

Xana swirhumbana a swi horile mufi anga si lova? Ina ___ Ee
___ AT ___

Healed before death?

___ AT ___
Xana nhlonge ya mufiayi dzuvuka?
Desquamation of skin?

Ina ___ Ee

___ AT ___
A ku ri swimungwamungwana?
Was this measles?

Ina ___ Ee

Loko ku ri ina, xana mufi u love masiku mangani endzhaku ka ku sungula ka mabundzu?

If yes, how many days after the rash did the death occur?

**8. SWILONDZ / KU TSHWA
ANDZI TIVI**
WOUNDS / BURNS

INA EE

A swi ri kwihi emirini

Localisation

___ AT ___
A ku ri na vupfu
Was it infected?

Ina ___ Ee

9. KU HUMA KA NGATI KA SWIRHO SWA MIRI
BLEEDING FROM ANY SITE
TIVI

INA EE ANDZI

Ngati a yi huma kwihi ?

Localisation

Yi hume ka ngani?

How often?

A swi humelela rini enkarhini wa vuvabyi?

When during illness?

10. KU PFIMBA / KU PFIMBA KA MIRI / KU PFIMBA KA KHWIRI
OEDEMA / SWOLLEN BODY / SWOLLEN ABDOMEN (BELLY)

**INA EE
ANDZI TIVI**

Nkarhi(masiku, mavhiki, tinhweti)

Duration

A swi sungule rini?

When did it start?

A swi herile rini?

When did it end?

<<>> *[To FW: mark more than one answer if necessary]*

A swi ri ka swirho swihi swa miri?

What parts of the body?

mahlakala (ankle) _____ xikandza (face) _____ khwirhi (abdomen)

tintiho (fingers) _____

11. KU TIKERIWA LOKO A TSAKAMISA
ANDZI TIVI
DIFFICULTY IN URINATING

INA EE

Nkarhi (masiku, mavhiki, tinhweti)

Duration

A swi sungule rini?

When did it start?

Swi herile rini?

When did it end?

A twa ku vava loko a tsakamisa

Ina ___ Ee

___ AT ___
Pain on urinating

Xana a tsakamisa nkarhi na nkarhi

Ina ___ Ee

___ AT ___
Frequent urination

Loko ku ri na ku tikeriwa ku n'wana loku nga kona hi kwihi

Any other problems, explain

12. MUHLOVO WA MUXIXITI LOWU WU NGA TOLOVELEKANGIKI
ABNORMAL COLOUR OF URINE

INA EE

ANDZI TIVI

Vula muhlovo wa mutsakamiso

Specify colour

Swi endleke rini enkarhini wa vuvabyi

When during illness?

Muxixito a ri na ngati ke?
___ AT ___
Was there blood in the urine?

Ina ___ Ee

13. MUHLOVO LOWA MAPAPA LOWU NGA TOLOVELEKANGIKI

ABNORMAL CLOUR OF STOOLS

INA EE

ANDZI TIVI

Vula muhlovo

Specify colour

Rini hi nkarhi wa
vuvabyi

When during illness

Mapapa a ma ri na ngati ke?
___ AT ___

Ina ___ Ee

Was there blood in the stools?

14. MUHLOVO LOWU WU NGA TOLOVELEKANGA WA MAHLO

ABNORMAL CLOUR OF THE EYES

INA EE

ANDZI TIVI

Hlamusela muhlovo

Specify colour

Mahlo yo tshwuka na mihloti
___ AT ___

Ina ___ Ee

Red eyes with tears

Death of:	Newborn (<28 days)		Do sections 15, 16, 17 then 18
	Woman during pregnancy		Do section 15 then 18
	Woman during labour		Do section 15 then 18
	Woman < 42 days/ 6 weeks after delivery		Do sections 15, 16, 17 then 18
	Woman > 42 days/ 6 weeks after delivery		Go to section 18

	Babies > 28 days and children		Go to section 18
	Woman > 55 years		Go to section 18
	Males (except newborn)		Go to section 18

15. KU TIKA
PREGNANCY

Nkarhi wo tika – khwiri a riri na tinhweti tingani loko manana a lova kumbe loko n’wana a velekiwa (tinhweti)

Duration of pregnancy when mother died or baby born (months)

Xana manana u tikile ka ngaki a nga si kuma khwiri leri ro hetelela?

How many pregnancies did she have before this last one?

Xana manana a vabya hi nkari wo tika? Ina ___ Ee
 ___ AT ___
 Was the mother ill during pregnancy?

Loko kuri Ina, hlamusela

If yes, specify

Ku pfimba ka mavoko Ina ___ Ee
 ___ AT ___
 Swollen hands

Ku pfimba ka milenge Ina ___ Ee
 ___ AT ___
 Swollen legs

Ku pfimba ka xikandza Ina ___ Ee
 ___ AT ___
 Swollen face

Xana a byeriwile leswaku u na “high blood” Ina ___ Ee
 ___ AT ___
 Was she told she had high blood pressure?

___ AT ___ A endla onge u na switshetshela? Ina ___ Ee
Did she act as if she had epilepsy (having convulsions) ?

___ AT ___ Ku huma ngati hi le vusatini hi ngarhi wa ku tika Ina ___ Ee
Vaginal bleeding during pregnancy

Loko ku ri ina, a ku ri nhweti ya vungaki ya ku tika ka yena?

If yes, at which month in the pregnancy?

Xana u tshunguriwie kwihhi?

Where was it treated?

___ AT ___ Ku tshunguriwa? Ina ___ Ee
Any treatment?

Loko kuri Ina, hlamusela

If yes, specify

___ AT ___ Swakudya swo hlawuleka Ina ___ Ee
Diet (special)

Loko kuri Ina, hlamusela

If yes, specify

___ AT ___ A ya ka kliniki ya vanhu vo tika ? Ina ___ Ee
Did she attend ante-natal clinic?

Loko ku ri ina u ye ka ngani ?

If yes, how many times?

Loko ku ri ina, u thlaviwile njekixeni?
____ AT ____
Any injection?

Ina ____ Ee

Loko ku ri ina, ka swirho swihi swa miri?

If yes, where on the body?

Xana u ve vabya loko a tikile
____ AT ____
Was she sick during previous pregnancies?

Ina ____ Ee

Loko ku ri Ina, hlamusela

If yes, specify

A n'wa ngopfu byala
____ AT ____
Excessive alcohol use

Ina ____ Ee

A dzaha sikireti fole loko a tikile
____ AT ____
Did she smoke cigarettes during her pregnancy?

Ina ____ Ee

16. KU KUMA N'WANA
DELIVERY

Xana n'wana u tswaleriwe kwihi (ekaya, exibedlele)?

Where was the baby born (home, hospital etc)?

Xana a ku ri na ku tikeriwa hinkarhi wo veleka
____ AT ____
Any difficulties or complications during delivery

Ina ____ Ee

Loko ku ri Ina, Hlamusela

If yes, specify

Mahlwa

Ina ___ Ee

___ AT ___

Multiple birth, (eg. Twins, triplets)

U teke nkarhi wo tani hi kwihi ku veleka (awara,
masiku) _____

Duration of labour

Ku hume nhloko ku sungula

Ina ___ Ee

___ AT ___

Head came out first

Loko ku nga ri nhloko ku rhange yini?

If no, what part came out first?

Yindlu ya n'wana yi humile xana, na swona a yi helerile ke?

Ina ___ Ee

___ AT ___

Was the placenta expelled normally and complete

Xana manana loyi u hume ngati nkarhi wo leha ku tlula leswi languteriweke?

Did the woman bleed longer than expected?

Ina ___ Ee

___ AT ___

Loko ku ri ntiyiso, swi teke nkarhi wo tani hi kwihi?

If yes, how long

A juluka / mavoko ya yena ya titimela

Ina ___ Ee

___ AT ___

Did she have sweating / cold hands

17. XIYIMO XA N'WANA

CONDITION OF THE BABY

<<>> [To FW : If baby is dead, answer questions (e) to (m).

If mother is dead, answer questions (a) to (g) only]

a. U velekiwe a hanya

Ina ___ Ee

___ AT ___

Born alive

b. a Lovile (loko a tlula nkombo wa tinhweti) Ina ___ Ee
___ AT ___
Still birth (born dead at 7 months or more of gestation)

c. a nga velekiwanga Ina ___ Ee
___ AT ___
Not delivered

d. khwiri ri humile xana (Uvelekiwe a ri na nkarhi wa le hansi ka tinhweti ta 7) Ina ___ Ee
Aborted (born < 7 months)
___ AT ___

e. Xana n'wana a ri nkulu ngopfu, a ri ntsongo ngopfu, kumbe a ri kahle
Was the baby too big, too small, normal?
too big ___ too small ___
normal ___

f. Nhloko ya n'wana a yi ri yikulu ngopfu, a yi ri yintsongo ngopfu, a yi ri kahle
Was the head too big, too small, normal?
too big ___ too small ___
normal ___

g. Ku na leswi nga hoxeka emirini wa n'wana Ina ___ Ee
___ AT ___
Any malformation / defect?

Loko ku ri ntiyiso, hlamusela

If yes, specify

h. Xana n'wana u rilile a ha ku velekiwa Ina ___ Ee
___ AT ___
Did it cry immediately after birth?

i. Xana n'wana a hefemula kahle a ha ku velekiwa Ina ___ Ee
___ AT ___
Did it breathe normally after birth?

j. A tsakamisa kahle Ina ___ Ee
___ AT ___
Did it urinate normally?

k. A huma kahle Ina ___ Ee
___ AT ___
Did it defaecate normally?

l. A mama kahle Ina ___ Ee
___ AT ___

Did it breast feed?

m. Xana nkava wa n'wana a wu bolanga xana

Ina ___ Ee

___ AT ___

Did the cord get infected / smell bad?

- 18.** <<>> [To FW: This section is to be answered by all respondents UNLESS the deceased is a child younger than 2 years.]

Ku vava ka xifuva

Ina ___ Ee

___ AT ___

Chest pain

Loko ku ri Ina, Nkarhi

If yes, duration

Ku vava ka miri

Ina ___ Ee

___ AT ___

Body pain

Loko ku ri Ina, Nkarhi

If yes, duration

Ku pandza ka nhloko

Ina ___ Ee

___ AT ___

Headache

Loko ku ri Ina, Nkarhi

If yes, duration

Ku ka u nga voni kahle

Ina ___ Ee

___ AT ___

Trouble seeing

- 19. SWIKONBISO SWIN'WANA SWA MAVABYI INA EE**
ANDZI TIVI
OTHER SYMPTOMS

Hlamusela

Specify

Nkari

Duration

A swi sungule rini

When started?

A swi herile rini

When stopped?

20. <<>> [To FW: Ask the questions in this section to ALL respondents]

Ku ondza hi nkari wo vabya

Ina ___ Ee

___ AT ___
Weight loss

Xana muvabyi a ondze bya nkhwankhwa?

Ina ___ Ee

___ AT ___
Did the patient appear abnormally thin?

A ondzile angasi vabya

Ina ___ Ee

___ AT ___
Already thin before onset of illness

U tshike kudya loko a vabya

Ina ___ Ee

___ AT ___
Stopped eating during illness

A nga ha swikoti ku minta

Ina ___ Ee

___ AT ___
Could no longer swallow

Xana a twa ku vavisa loko a minta

Ina ___ Ee

___ AT ___
Painful to swallow

A khoma hi torha ngopfu hi nkari wa vuvabyi

Ina ___ Ee

___ AT ___
Very thirsty during illness

Mahlo yo nghena endzeni

Ina ___ Ee

___ AT ___

Sunken eyes

Ku vuna ka nhlonge

Ina ___ Ee

___ AT ___

Loss of skin elasticity

Xana a kuri na ku cinca eka ku huma (tirhuma, tipfuna) ka yena ehandle?

Was there any change in bowel movements?

Ina ___ Ee

___ AT ___

A hlangene nhloko hi nkari wo vabya, xik: aa hatlisa a rivala a lahleriwa hi miehleketo

Mental confusion with onset during illness but before death, e.g. forgetfulness/ loss of concentration

Ina ___ Ee

___ AT ___

Xana a ome miri kumbe swirho

Ina ___ Ee

___ AT ___

Paralysis of body or of limbs

Xana swirho swa miri a swinga tirhi kahle/ ku hela matimba

Ina ___ Ee

___ AT ___

Weakness of body or of limbs

[If weak or paralysed] Loko kuri ntiyiso, xirho xihhi xa miri

 If yes, which part of body

[If weak or paralysed] Tlhelo rinwe kumbe miri hinwawo one sided ___ both-sided ___

[If weak or paralysed] suddenly ___ gradually ___

Did the weakness start suddenly or gradually?

Ku karhala/ no hela matimba hi nkari wa vuvabyi (a nga si fa)

Ina ___ Ee

___ AT ___

Fatigue/ low energy during illness (before death)

Xana mufi ari na timvhiyaphi kupfimba e makeheleni, kumbe e tinyongeni ke?

Did the deceased have any swellings in the neck, armpit and/or groin?

Ina ___ Ee

___ AT ___

Loko kuri ina, xana hi swirho swihhi swa miri.
 groin

neck / armpit /

If yes, please circle where the swellings were: neck / armpit / groin

**Swi humelele nkarhi wo leha ku fikela
kwihi?** _____
How long were the swellings present (in days, weeks or months)?

Did the deceased have any swelling around the jaw, in front of the ear (parotids)?
Ina ___ Ee ___ AT ___
Ku lahlekeriwa h miehleketo u nga koti no vulavula. Ina ___ Ee
___ AT ___
Coma, loss of consciousness

Loko ku ri ntiyiso, a swi endleka rini hi nkarhi wo vabya

If yes, when during illness

Ku juluka Ina ___ Ee
___ AT ___
Sweating

Xana mavoko, milenge, nhamu, a swi cince muhlovo Ina ___ Ee
___ AT ___
Did the hands, feet, neck change colour

Xana nhlonge a yi guvukela Ina ___ Ee ___
AT ___
Peeling, scaling of skin

Loko ku ri ina, a ku ri eka swirho swihi swa miri?

If yes, which parts of the body?

Ku dya misava kumbe nkuma Ina ___ Ee
___ AT ___
Eating soil or ash

A qumbha Ina ___ Ee
___ AT ___
Constipation

Ku na van'wana lava nga na swi kombiso swo fana na leswi hi nkarhi lowo
Did other people have the same symptoms at the same time? Ina ___ Ee
___ AT ___

Loko ku ri ntiyiso, hi le ka ndhawu yihi (hlamusela)?

 If yes, in which place

<<>> [To FW : ask only if the deceased is a child less than 5 years.]

Misisi yo tshwuka yi tlhela yi olova. Ina ___ Ee
___ AT ___
Soft, reddish hair

Was there discharge from the ear/s for more than one month? Or on may different occasions? Ina ___ Ee
___ AT ___

Did the child stop doing things he/she could do before? Eg sit, walk, talk, play Ina ___ Ee
___ AT ___

Xana n'wana a ha mama bodlhela? Ina ___ Ee ___
AT ___
Was child still bottle feeding?

Xana n'wana a ha mama vele? Ina ___ Ee
___ AT ___
Was child still breast feeding?

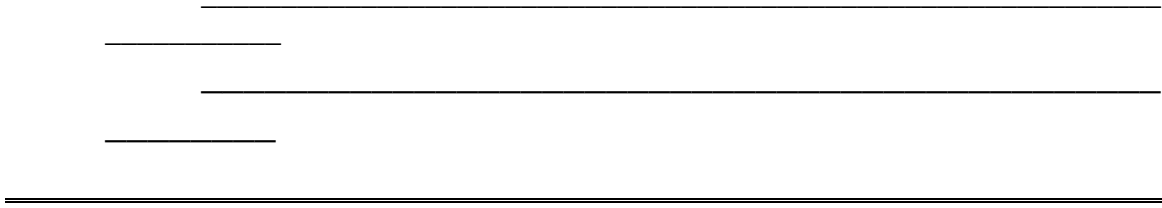
Did the child get more illnesses compared to other children in the family or the community? Ina ___ Ee
___ AT ___

Xana manana wa n'wana langa lova u hanya kahle ke? Ina ___ Ee
___ AT ___
Is the mother (of the dead child) healthy?

Loko kuri ee, u karhatiwa (vabya) hi yini
ke? _____
If no, what is her sickness?

Is the father (of the dead child) healthy? Ina ___ Ee
___ AT ___

Loko kuri ee, u karhatiwa (vabya) hi yini
ke? _____
If no, what is her sickness?



21. MAHANYELO
LIFESTYLE

Xana loyi a loveke a nwa byalwa eka lembe leri nga hundza ke? INA
___ EE ___ AT ___

Did the deceased drink alcohol during the last year before he died?

Loko kuru ina, anwa masiku mangani
evhikini? _____

If yes, how many days a week did he/she drink?

Loko kuri ntiyiso, a nwa byala byo fikela kwihi (hi siku)?

How much in one day?

U new nkari wotani hikwi (malembe)

For how long (years)

A nwa swipyopyisi swa muxaka wihi (swa xintima/swa xilungu/
xipayoni)? _____

What type of alcohol (e.g. African or Western beer, or traditional 'hot stuff')?

Xana kuvile na nkari lowu anga lahlekeriwa hi ntirho hi kwalaho ko nwa
byalwa ngopfu ke? Did the person ever lose a job because of alcohol use?

Ina ___ Ee ___ AT ___

Xana munhu loyi u tshamile a va ni nghozi hi kwalaho ko nwa byalwa ke?

Did the person ever have an accident because of alcohol?

Ina ___ Ee

___ AT ___

Xana u tshame a lwisa hikokwalaho ko nwa byalwa ke? Ina ___ Ee

___ AT ___

Did the person ever have a fight because of alcohol?

[In the week before death:]

Xana a pyopyiwile?

Ina ___ Ee

___ AT ___

Did the deceased get drunk?

Loko kuri ina, xana a dedeleka?
____ AT ____
If yes, was the deceased unable to walk due to drunkenness?

Ina ____ Ee

A dzaha fole
____ AT ____
Smoking

INA ____ EE

Loko kuri ntiyiso, a dzaha mafole mangani hisiku

If yes, how many cigarettes a day?

U dzaha nkari wotani hikiwi (malembe)

For how long (years)

Loko kuri boxer, xana phakithi ari heta masiku
mangani? _____
If boxer, how long does the packet last?

A dzaha swidzidzirisi (e.g. mbangi) xana
EE ____ **AT** ____
Was he abusing substances e.g. dagga?

INA ____

Loko kuri ina, xana a tirhisile xidzidzirisi xihhi? (mbangi, glue, petirolo,
mandrax etc.)
If yes, what substances?

Vutiolori/ kutirhisa miri
Physical activity

Ehleketi hi nkari lowu mufi anga si vabya:
Thinking about the time before the deceased became ill:

Xana munhu loyi ari loyi a tirhisaka miri wa yena masiku layo tala? (e.g
ku famba, ku hlakula, ku tsema tihunyi, ku rhwala mati etc.)
Was the person physically active most of the day? (e.g walking, hoeing, cutting wood, carrying water)?

____ AT ____

Ina ____ Ee

Xana mufi a ri munhu wa migingiriko ku fikela laha anga va na ku tikeriwa ka swilo leswi a lava ku swi endla (xik: ku famba, ku rhwala mati)

Was the person kept active but had difficulty doing the things he/she needed to do (e.g. walking, carrying water etc.)

___ AT ___ Ina ___ Ee

Xana ari na vulolo, a kumeka a tshamile minkarhi yo tala? Ina ___ Ee

___ AT ___

Was the person not active, spent a lot of time sitting?

Xana munhu loyi a kumeka a tshamile nkari wo tala – a nga swi koti ku tiendlela swa n’wa nchumu? Was the person immobile/ sitting most of the day, dependent on other people for care?

___ AT ___ Ina ___ Ee

<<>> [To FW : ask only if deceased is MALE.]

A tirha mayini / emgodini Ina ___ Ee
___ AT ___

Worked underground on a mine

Aku ri mayini wa yini xana, golida _____ ”asbestos” _____
swin’wana _____

What type of mine, gold, asbestos, other

Xana mayini kumbe mugodi lowu wu le kwihi (vula vito ra mugodi kumbe vito ra doroba laha wu kumekaka kona? Name and / or location of mine.

Xana a kumile mali yo n’wi rilisa eka mavabyi lama a ma kumeke loko a tirha emugodini ke? Any compensation for illness received ?

Ina ___ Ee ___ AT ___

U tirhe mayini/ emgodini malembe mangani

For how many years did he work underground?

Xana u hetelele rini ku tirha emayeni/mgodini _____

When last did he work underground?

22. MAVABYI LA MA NGA TSHUNGURIWEKI INA EE
ANDZI TIVI

CHRONIC DISEASE: high blood pressure, sugar diabetes, asthma, heart failure, epilepsy, mental illness.

Hlamusela mavabyi na ku tshunguleka loku ku nga kumiwa hi mufi
Specify disease and treatment

<<>> *To FW : this section is specifically about the treatment for the illness from which the deceased died. Include information on treatment from a traditional healer as well as from the health services*

23. KU TSHUNGURIWA KA MUFI (HLAMUSELA)
TREATMENT RECEIVED (SPECIFY)

Xana a tshunguriwile hi xilungu ke ? Ina ___ Ee
___ AT ___
Western treatment received?

Loko ku ri ina, a nyikiwile mirhi yihi xana ?
If yes, what medicine?

Xana a nyikiwile mirhi ya xintima ke ? Ina ___ Ee
___ AT ___
Traditional treatment received?

<<>> *(Include EVERYTHING not western eg. ZCC tea, prayers etc)*

Loko ku ri ina a ku ri muhlovo wihi wa
murhi?
If yes, what type

Loko atshunguriwile hi xilungu na xintima, xana hi wihi murhi lowu a nga sungula a kuma wona?

If both used, which treatment was sought first?

24. LOKO E RI NA SWIN'WANA SWO ENGETELA

OTHER REMARKS

ASSESSMENT TWO

CAUSE OF DEATH DIAGNOSIS

Probable main cause: _____

Probable immediate cause: _____

Probable contributing cause(s): _____

NAME OF MEDICAL DOCTOR: _____

ASSESSMENT ONE

CAUSE OF DEATH DIAGNOSIS

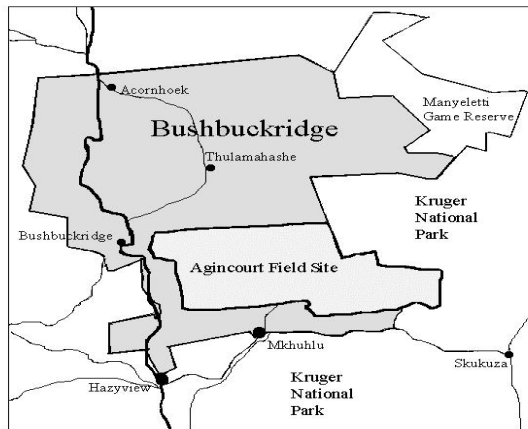
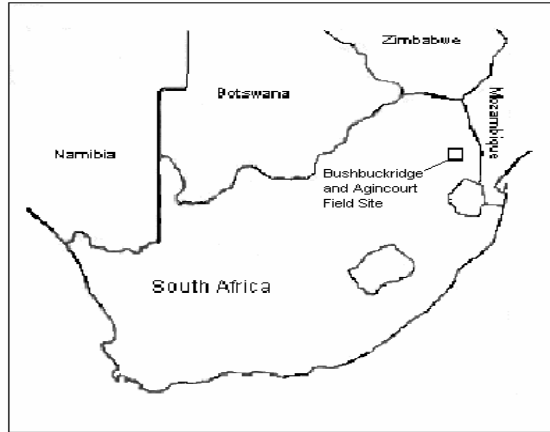
Probable main cause: _____

Probable immediate cause: _____

Probable contributing cause(s): _____

NAME OF MEDICAL DOCTOR: _____

A 3: Maps of Agincourt Demographic Surveillance Site and South Africa



A.4: Ethical clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)
Ref: R1449 Ansong

CLEARANCE CERTIFICATE PROTOCOL NUMBER MC3-07-03

PROJECT Epidemiology of Childhood Tuberculosis,
Mortality and Risk Factors Associated with
Tuberculosis Mortality in South Africa;
Agincourt Sub-District

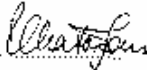
INVESTIGATORS Dr D Ansong

DEPARTMENT School of Public Health, Wits Medical School

DATE CONSIDERED 03-07-25

DECISION OF THE COMMITTEE Approved unconditionally

Unless otherwise specified the ethical clearance is valid for 5 years but may be renewed upon application.
This ethical clearance will expire on 1 January 2008.

DATE 03-07-28 CHAIRMAN.....  (Professor P E Cleator-Jones)

* Guidelines for written "informed consent" attached where applicable.

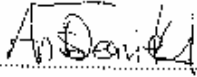
Supervisor: Prof S Tollman
Dept of School of Public Health, Wits Medical School
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DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10001, 10th Floor, Senate House, University.

I/we fully understand the conditions under which I/we are authorized to carry out the above-mentioned research and I/we guarantee to ensure compliance with these conditions. Should any departure be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. I agree to a completion of a yearly progress form. I/we agree to inform the Committee as to the study is completed.

DATE 18/08/2003 SIGNATURE 

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES