

# Analysis of impact of HIV/AIDS on deaths certified at Mosvold Hospital, Ingwavuma, Northern KwaZulu-Natal from 2003 to 2006

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## Abstract

### Background

Mosvold Hospital is a government district hospital situated in northern KwaZulu-Natal, a province with an antenatal HIV prevalence of 39%. A previous study indicated that 45% of deaths certified at Mosvold Hospital were due to HIV/AIDS. The antiretroviral roll-out programme commenced at Mosvold Hospital on 16 September 2004.

### Methods

Data from deaths certified at Mosvold Hospital from 1 January 2003 to 31 December 2006 were analysed for trends in diagnosis and age at death. The period included 20 months prior to the start of the antiretroviral roll-out at the hospital in September 2004, and the first 28 months of the programme.

### Results

Of the deaths between 2003 and 2006, 53% were certified as having HIV/AIDS as the underlying cause of death. Between 2003 and 2005 there was a significant reduction in the average age at death for males and females, with an increase in mortality in the zero to four years age group. In 2006 there was a significant increase in the average age at death of females compared to 2005, although this increase was not demonstrated to be due to an improvement in mortality from HIV/AIDS.

### Conclusion

HIV/AIDS continues to be the dominant public health concern in the sub-district. To date, public health measures such as the antiretroviral roll-out programme cannot be demonstrated to have affected mortality from the disease.

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## Introduction

Mosvold Hospital is situated in northern KwaZulu-Natal near the borders of Swaziland and Mozambique. According to estimates by the Department of Health, the hospital serves a population of about 108 000.<sup>1</sup> The population is rural and poor, with adult unemployment at 60%. Five per cent of households have piped water and 3.6% of households are supplied with electricity. Government healthcare in the Ingwavuma sub-district, in which Mosvold Hospital is situated, is provided by the hospital, 10 residential clinics and three mobile clinic teams.

Entering of death statistics from Mosvold Hospital into a database was begun by the author in 2003 in order to be able to provide the information frequently requested from various sections of the Department of Health regarding patterns of mortality. It was also considered that such statistics would be useful for indicating the effectiveness of health services and priority areas for attention. It became immediately apparent that HIV/AIDS was the disease responsible for most mortality and primarily responsible for a low life expectancy.

In a previous study by the author, an analysis of eight months of mortality data from January to August 2003 indicated that HIV/AIDS was responsible for 45% of deaths and appeared to cause deaths in women at a younger age than in men.<sup>2</sup> On 16 September 2004, anti-retroviral drugs (ARVs) were first prescribed to sufferers of AIDS at Mosvold Hospital as part of the National Antiretroviral Roll-out Programme. By 31 December 2005, 638 patients (399 females; 239 males) had been started on ARVs at Mosvold Hospital and attached clinics. By 31 December 2006, a total of 1 507 patients had started ARVs, of which 910 were females and 597 were males. This analysis was undertaken to investigate the continuing impact of HIV/AIDS on mortality and life expectancy and to see whether any effect of the antiretroviral roll-out programme could be observed 28 months into the programme.

The use of nevirapine for the prevention of maternal to child transmission was commenced in 2002, prior to the start of the study.

In a report, 'The impact of HIV/AIDS on adult mortality in South Africa', the authors estimate that 40% of the deaths of adults aged 15 to 49 years, and 20%

of all adult deaths in South Africa in the year 2000 were due to HIV/AIDS.<sup>3</sup> This estimate was based on the dramatic increase in female deaths in the 25 to 29 years age group compared to 1985, and a less marked increase in male deaths in the 30 to 39 age group. The peak for female deaths was found to be between 25 and 29 years, and the peak for male deaths to be between 30 and 35. The authors noted that the details completed on death certificates tended to concentrate on opportunistic infections, rather than on the underlying HIV/AIDS. In another report, 'Causes of death in South Africa 1997-2001', the proportion of deaths due to HIV amongst females aged 15 to 29 was estimated to be 22.5%, compared to 8.5% for males of that age group.<sup>4</sup>

The National HIV and Syphilis Sero-Prevalence Survey of women attending public antenatal clinics in South Africa in 2005 estimated that KwaZulu-Natal was the province with the highest provincial sero-prevalence of HIV amongst antenatal attendees at public antenatal clinics, with 39.1% of antenatal clinic attendees being HIV positive, compared to an overall national HIV prevalence of 30.2%.<sup>5</sup> With a higher antenatal HIV prevalence than the national average, it is probable that the province will also have a higher proportion of deaths from HIV/AIDS compared to the rest of South Africa.

## Methods

Data from the death certificates were

**Table 1:** Diagnoses presumed HIV/AIDS as underlying cause of death. Date of death Jan 2003 to Dec 2006. Deaths certified at Mosvold Hospital, Ingwavuma, KwaZulu-Natal

Diagnosis	Total
Acquired immunodeficiency	86
Immunocompromised	61
HIV entered under 'Other significant diagnosis'	55
Retroviral disease	39
Kaposi's sarcoma	9
Pneumocystis carinii pneumonia	6
Cryptococcal meningitis	6
Immunosuppressed	2
Immune deficiency	2
Acquired immunosuppression	2
Immunosuppression	1
Cerebral toxoplasmosis	1
<b>Total of presumed HIV/AIDS diagnoses</b>	<b>270</b>
Total deaths entered as HIV/AIDS	3956
<b>Percentage of HIV/AIDS presumed from other diagnoses</b>	<b>6.8%</b>

captured mainly by the author, who is medically qualified. For five months of data capturing, from April to August 2005, the author was assisted by a data capturer, whose entries were checked by the author. Where a clear euphemism had been given, the author entered the underlying diagnosis as HIV/AIDS (see Table 1).<sup>6</sup>

Data from counterfoils of form 83/BI-1663, Notification/Register of Death/Stillbirths (Republic of South Africa, Department of Home Affairs) completed at Mosvold Hospital from 1 January 2003 to 31 December 2006 were entered into a database (Microsoft Access). The items that were entered were as follows:

- ID number
- Surname
- First name
- Date of birth
- Date of death
- Age
- Sex
- Race
- Pregnant
- Smoker
- Underlying (or only given) diagnosis
- Diagnosis presumed to be HIV/AIDS (if applicable)
- Immediate diagnosis
- Other significant diagnosis
- Method ascertained
- Place of death
- Facility name
- Home area

**Table II:** Top 10 underlying causes of death in persons aged older than nine. Date of death: Jan 2003 to Dec 2006. Deaths certified at Mosvold Hospital, Ingwavuma, KwaZulu-Natal, South Africa

Underlying or only diagnosis of cause of death	2003	2004	2005	2006	Total 2003-2006	Percentage 2003-2006
HIV/AIDS	419	477	495	450	1841	52.8%
Tuberculosis Pulmonary	61	48	43	45	197	5.6%
Stroke	45	36	27	31	139	4.0%
Pneumonia	41	22	36	28	127	3.6%
Tuberculosis (other respiratory organs)	4	18	49	37	108	3.1%
Heart failure	38	24	14	24	100	3.1%
Natural causes	29	13	26	28	96	2.8%
Old age	11	10	11	36	68	2.8%
Gastroenteritis	18	16	16	9	59	1.7%
Bacterial meningitis	11	10	15	14	50	1.4%
Total deaths registered for period	883	819	920	865	3487	
Percentage deaths due to HIV/AIDS	47%	58%	54%	52%		

**Table III:** Top five underlying causes of death in children aged younger than ten years, excluding stillbirths for 2003 to 2006. Date of death: Jan 2003 to Dec 2006. Deaths certified at Mosvold Hospital, Ingwavuma, KwaZulu-Natal, South Africa

Deaths per year						
Underlying or only diagnosis	2003	2004	2005	2006	Total 2003-2006	Percentage 2003-2006
HIV/AIDS	9	33	37	32	111	26.1%
Pneumonia	11	10	18	18	57	13.4%
Gastroenteritis	6	7	24	19	56	13.1%
Malnutrition	5	3	5	8	21	4.9%
Prematurity	2	4	7	3	16	3.8%
Total deaths for time period	43	82	148	153	426	

The items mainly followed those on the death notification form. The underlying diagnosis was captured in the same field as an only diagnosis.

Certain euphemisms and AIDS-defining illnesses for HIV/AIDS (see Table I) were captured as HIV/AIDS. In the case of an underlying diagnosis being interpreted by the author as HIV/AIDS, the underlying diagnosis was entered as HIV/AIDS and the original diagnosis was recorded under 'Diagnosis presumed HIV/AIDS' (see Table I). After the commencement of data collection, medical officers were encouraged to be as clear and truthful as possible in their death notification entries.

The categories of diagnoses available in the database's drop-down list of diagnoses consisted of the notifiable medical conditions with HIV/AIDS.<sup>7</sup> Other diagnoses were added to the list as they were encountered.

### Ethical considerations

The publication of statistics on the causes of death certified at Mosvold Hospital was approved by the Mosvold Hospital Ethical Committee on 11 September 2003.

### Results

Of all the deaths entered as due to HIV/AIDS, 6.8% were inferred from the diagnoses given in Table I.

### Cause of death

Table II shows the top ten underlying causes of death for persons aged older than nine years from January 2003 to December 2006. Despite diagnoses not being classified according to ICD10,<sup>8</sup> HIV/AIDS was by far the most common underlying cause of death, attributed to 52.8% of deaths from 2003 to 2006, and between 47% and 52% for the individual years.

Table III shows the top five underlying causes of death for persons aged younger than 10 years. HIV/AIDS is the commonest individual cause of death in 2004, 2005, 2006 and for the combined years 2003 to 2006, attributed to causing 26% of deaths in children aged younger than 10 years between 2003 and 2006.

### Pattern of deaths according to age and sex

Figure 1 demonstrates age at death for male and female deaths certified at Mosvold Hospital from January 2003 to December 2006.

There is a peak of deaths in the 20 to 49 year age groups. There are also peaks in the zero to four year age group and between 70 and 84 years. The peak of deaths between the ages of 20 and 49 years appears to occur earlier among women than among men. The peak oc-

Figure 1:

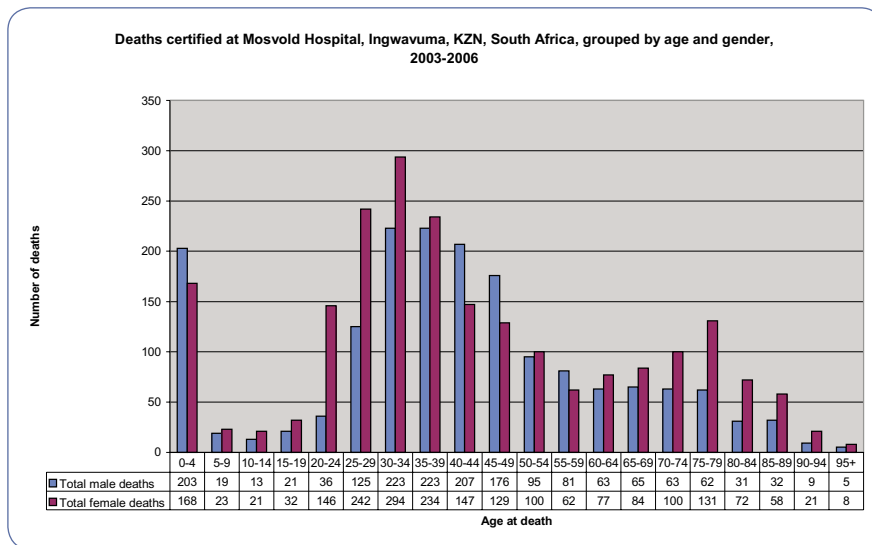


Figure 2

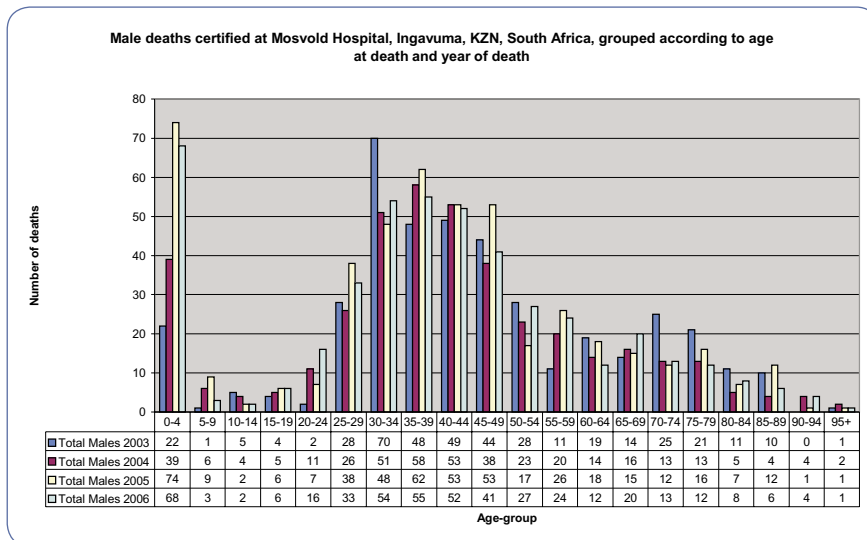
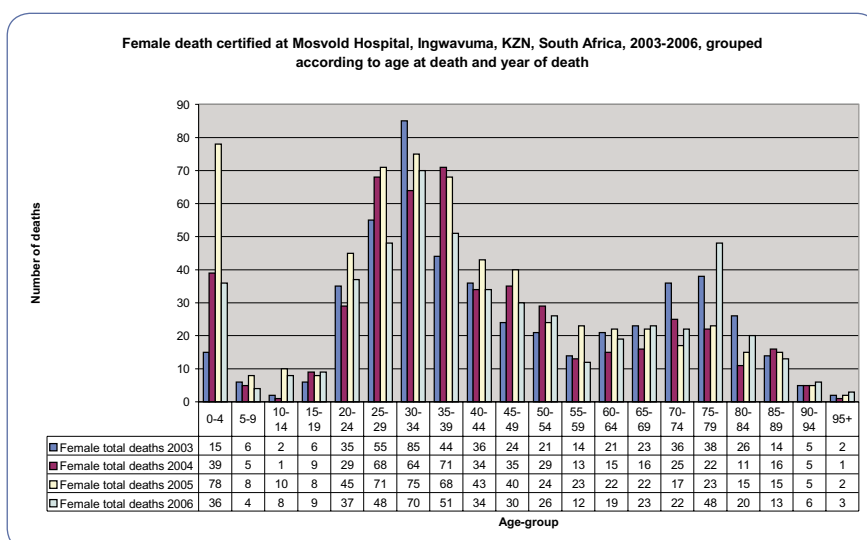


Figure 3:



curing in the 70 to 84 age group is more pronounced amongst women.

Figures 2 and 3 compare the data for males and females for the three years 2003 to 2006. The most striking finding is the increase in deaths in the zero to four age group between 2003 and 2005, for both males and females. There is a slight decrease in male deaths in the zero to four age group between 2005 and 2006, and a substantial reduction in female deaths in this age group. There is an increase in deaths in females aged 75 to 79 in 2006 compared to other years.

Figures 4 and 5 show the proportion of deaths attributed to HIV/AIDS for males and females of different age groups from 2003 to 2006. For both males and females, the majority of deaths between the ages of 20 and 49 years were attributed to HIV/AIDS. Only about 30% of deaths in the zero to four age group were attributed to HIV/AIDS.

**Average age at death:**

Table IV shows the average age at death from all causes, and from HIV/AIDS, for males and females aged older than nine years. There is no statistically significant change in average age at death from all causes for males for the years 2003 to 2006. There is, however, a significant lowering of the average age at death for females from all causes between 2003 and 2005 (48.5 years to 44.1 years), followed by a significant increase in 2006 (44.1 years to 47.9 years). The average age of death from HIV/AIDS is lower in women than in men for all the periods. This difference is statistically significant ( $p < 0.05$ ) for the years 2003, 2004 and 2006, but not for 2005. There does not appear to be any significant change in the age at death from HIV/AIDS for males or females between 2003 and 2006.

Table V shows the average age at death from all causes for males and females of all ages, excluding stillbirths, for the years 2003 to 2006. The average age at death decreased for both males and females between the years 2003 and 2005, with the reduction being statistically significant ( $p < 0.05$ ) when comparing the years 2003 and 2005. There is an increase in average age at death in females between 2005 (38.7 years) and 2006 (41.7 years), although this is not statistically significant.

Figure 4:

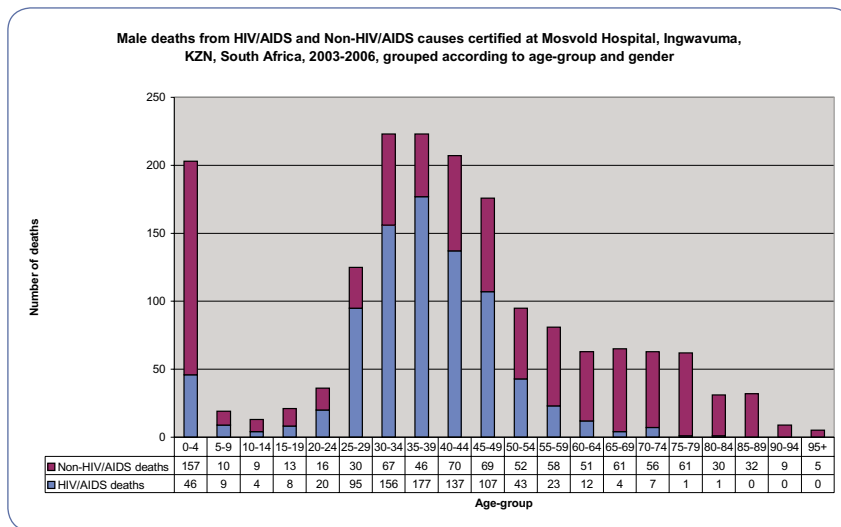


Figure 5:

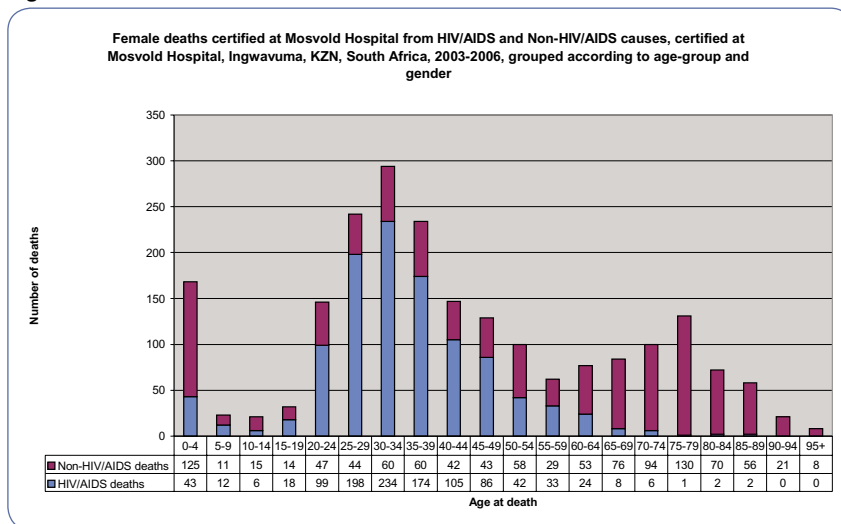


Table IV: Average age at death in persons aged older than nine years. Deaths certified at Mosvold Hospital, Ingwavuma, KwaZulu-Natal, South Africa Jan 2003 to Dec 2006

		Males		Females	
		Average age at death	95% confidence interval	Average age at death	95% confidence interval
2003	All causes	47.5	45.8–49.2	48.5	46.6–50.4
	HIV/AIDS	39.4	38.0–40.8	35.1	33.7–36.5
2004	All causes	45.6	43.9–47.3	45.3	43.5–47.1
	HIV/AIDS	38.8	37.5–40.1	36.2	34.9–37.5
2005	All causes	45.9	44.2–47.6	44.1	42.4–45.7
	HIV/AIDS	37.9	36.5–39.3	35.9	34.6–37.2
2006	All causes	45.5	43.8–47.2	47.9	46.0–49.8
	HIV/AIDS	38.7	37.2–40.1	35.4	33.9–36.8

Table V: Average age at death considering all deaths and all causes, excluding stillbirths. Deaths certified at Mosvold Hospital, Ingwavuma South Africa; Jan 2003 to Dec 2006

	Males	95% C.I.	Females	95% C.I.
2003	44.9	42.9–46.8	46.6	44.7–48.6
2004	40.8	38.8–42.9	41.8	39.9–43.8
2005	39.0	36.9–41.0	38.7	36.9–40.6
2006	39.1	37.1–41.2	41.7	39.6–43.8

Discussion

Comparing the statistics in this study to those available from Statistics South Africa,<sup>9</sup> the following comparisons may be made:

Statistics South Africa, in the publication 'Mortality and causes of death in South Africa, 2003 and 2004: Findings from death notification', states that total deaths in most provinces, including KwaZulu-Natal, increased from 2003 to 2004, which is consistent with the finding in this study that the average age at death decreased between 2003 and 2004. Statistics South Africa also found the commonest cause of death, nationally and in most provinces, including KwaZulu-Natal, to be tuberculosis, accounting for 16% of deaths in KwaZulu-Natal. This differs from the finding of this study, namely that HIV/AIDS was responsible for more than half of all deaths from 2003 to 2005. Statistics South Africa did not find HIV/AIDS to be among the top 10 causes of death for 2003, but to be the ninth commonest cause of death in 2004, attributed as causing 2.3% of deaths nationally, and 2.0% in KwaZulu-Natal. As the National HIV and Syphilis Sero-Prevalence Survey of women attending public antenatal clinics in South Africa in 2005 found 39.1% of antenatal attendees in KwaZulu-Natal to be HIV positive,<sup>6</sup> it seems reasonable to suspect that a figure of 2% of deaths caused by HIV/AIDS in KwaZulu-Natal is an underestimate.

The dramatic increase in mortality in the zero to four age group from 2003 to 2005 is a cause for concern. It is possible that most of the deaths were due to underlying AIDS. HIV/AIDS was the single commonest cause of death in children under 10 years, accounting for 29% of deaths, followed by pneumonia and gastroenteritis, accounting together for a further 27% of deaths, which in many cases may have been HIV/AIDS related. Children have often not been tested for HIV at the time of death, and the polymerase chain reaction (PCR) test for HIV in children under 18 months of age has only been available at Mosvold Hospital since February 2005. If due to HIV/AIDS, the increase in childhood mortality would raise questions about the efficacy of the Prevention of Maternal to Child Transmission (PMTCT) programme in northern KwaZulu-Natal. However, this increase in child mortality deserves further study.



Since the beginning of the ARV programme at Mosvold in September 2004, and following a deterioration in life expectancy between 2003 and 2005, there is evidence of an improvement in life expectancy for women in 2006 compared to 2005. At present it is not possible to attribute this increase to the ARV programme, as there is only a modest decrease in the proportion of deaths from HIV/AIDS between 2005 and 2006 (54% to 52%; see Table II) and there is no increase in average age at death from HIV/AIDS (see Table IV).

It should be noted that the data is from early in the ARV programme. Most of the patients started on ARVs would have lived a year or more even without ARVs, and the numbers of patients taking ARVs increased steadily throughout 2005 and 2006. As more patients enter the programme, and more patients have taken ARVs for longer, it is still possible that the effect of the programme on life expectancy will become more demonstrable.

This study shows that HIV/AIDS remains the dominant public health concern in the sub-district, being responsible for most deaths and leading to a low average life expectancy of about 40 years. It is important to continue to monitor trends in mortality to assess the continuing impact of HIV/AIDS and the efficacy of public health measures to counter the disease.

### Acknowledgements

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### Conflict of interest

The author has no financial or personal relationship which may have inappropriately influenced him in writing this paper.

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