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THE IMPACT OF HIV/AIDS ON MATERNAL MORTALITY IN LUSAKA

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DISSERTATION SUBMITTED IN PARTIAL FULFILMENT

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DEDICATION

TO MY SON AND DAUGHTER, KAMBOLE AND MAGGIE WHO ARE A SOURCE OF ENERGY AND COURAGE TO SOLDIER AHEAD IN PURSUING THIS MASTERS PROGRAMME. ALSO TO MY WIFE CLARA FOR BEING WITH ME THROUGH AND THROUGH.

" THE LORD IS MY SHEPHERD I SHALL NOT WANT" (PSALM 23:1)

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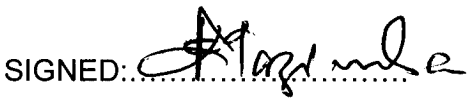
STATEMENT

I HEREBY STATE THAT THIS DISSERTATION IS ENTIRELY THE RESULT OF MY OWN PERSONAL EFFORT. THE VARIOUS SOURCES TO WHICH I AM INDEBTED HAVE BEEN CLEARLY INDICATED IN THIS BIBLIOGRAPHY AND ACKNOWLEDGEMENTS.

SIGNED: 

DR CHRISTOPHER MAZIMBA

DECLARATION

I HEREBY DECLARE THAT THIS DISSERTATION HEREIN PRESENTED FOR THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY HAS NOT BEEN PREVIOUSLY SUBMITTED EITHER WHOLLY OR IN PART FOR ANY OTHER DEGREE AT THIS OR ANY OTHER UNIVERSITY NOR IS IT BEING CURRENTLY SUBMITTED FOR ANY OTHER DEGREE.

SIGNED: .....

DR CHRISTOPHER MAZIMBA

APPROVED BY: .....

DR YUSUF AHMED (SUPERVISOR)

APPROVAL

THIS DISSERTATION OF DR CHRISTOPHER MAZIMBA IS APPROVED AS FULFILLING PART OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF MASTER OF MEDICINE IN OBSTETRICS AND GYNAECOLOGY BY THE UNIVERSITY OF ZAMBIA.

SIGNATURES

ABSTRACT

The increasing number of women infected with HIV as demonstrated by the sentinel antenatal surveillance system is believed to be an important factor in the worsening maternal mortality being witnessed in Lusaka. By 1989, HIV/AIDS was already believed to have been the cause of a few maternal deaths in Lusaka. Through the 1990s the seroprevalence of HIV in antenatal attendees in Lusaka had approached 30% in some centers. Records of maternal mortalities are kept in the Department of Obstetrics and Gynaecology. This study was undertaken to review trends in maternal mortality over the 1990s in Lusaka and particularly to highlight the impact of HIV/AIDS.

Cases for 1993, 1996 and 1999 were reviewed to determine the medical cause of death. In a proportion of cases, there was no direct or indirect cause noted. These cases had stigmata of HIV/AIDS and were classified as presumptive HIV/AIDS. The only other variables collected were age and parity. Direct causes of maternal mortality were noted to have declined over the three time periods (1993,6,9) from 55.8%, 38.2% to 37.7% respectively. Correspondingly, those cases classified as presumptive HIV/AIDS (HIV/AIDS) increased from 22.4% to 25.7% and finally 39.6% in 1999. Direct causes were the commonest cause of maternal mortalities in 1993, although in 1999 the commonest cause was presumptive HIV/AIDS.

Most cases of maternal mortality due to HIV/AIDS were in the age range 25-34 years illustrating the demography of women affected by HIV. Also, 5.1% of all cases of maternal mortality due to HIV/AIDS were in those aged 10-19 years. The mean age of cases due to HIV/AIDS was 26.5 years. This was statistically less than those who had died of haemorrhage (mean age 30.3 years) but greater than those who had died of puerperal sepsis (mean age 22.2 years).

Information on parity was mainly available in 1999 due to missing data for the other two years. The parity of those who died due to HIV/AIDS was spread over all parities. Nevertheless 11.8% were para 0, 27.9% and 26.5% were para 1 and 2 respectively while 8.1% were of parity 6 or more. The percentage of cases of maternal mortality over the three- year periods that died and were para 0 decreased from 24.2% in 1993 to 11.1% in 1999. Correspondingly, those who were para 3 increased from 6.3% to 16.8%.

Maternal mortality due to HIV/AIDS is now the commonest cause of maternal mortality in Lusaka. Efforts need to be directed to preventative strategies to prevent unwanted pregnancy, particularly in those who are HIV infected. For those women who embark on pregnancy, case management would have to be strengthened to avoid morbidity and mortality associated with HIV/AIDS.

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ABBREVIATIONS

AIDS – ACQUIRED IMMUNODEFIENCY SYNDROME

APH – ANTEPARTUM HAEMORRHAGE

ARF – ACUTE RENAL FAILURE

DIC – DISSEMINATED INTRAVASCULAR COAGULOPATHY

FSB – FRESH STILL BIRTH/BORN

HB – HAEMOGLOBIN

HIV – HUMAN IMMUNODEFICIENCY VIRUS

ICU – INTENSIVE CARE UNIT

MVA – MANUAL VACUUM ASPIRATION

POCS – PRODUCTS OF CONCEPTION

PPH – POST PARTUM HAEMORRHAGE

RTI – RESPIRATORY TRACT INFECTION

TAH – TOTAL ABDOMINAL HYSTERECTOMY

TB – *TUBERCULOSIS*

UTH – UNIVERSITY TEACHING HOSPITAL

WHO – WORLD HEALTH ORGANISATION

BACKGROUND

Approximately 600 000 women worldwide die each year of complications related to or associated with pregnancy and childbirth (WHO, 1996). Ninety nine percent of all maternal mortalities occur in the developing world. The common causes include, ruptured uterus, haemorrhage, eclampsia, sepsis, unsafe abortion and obstructed labour. In countries where the prevalence of HIV in women of reproductive age has been on the increase, more maternal deaths are being attributed to HIV/AIDS.

Even though up to 15% of pregnant women in developed countries experience complications, good access to care and rapid intervention minimizes maternal mortalities. For many women in sub-Saharan Africa the nearest obstetric care may be several days travel away from home and may be lacking in resources. This results in up to 200 times greater maternal mortality ratios. Maternal mortality remains high in Zambia and is estimated at 649 per 100,000 live births according to the 1996 Zambia Demographic and Health Survey (ZDHS 1996). A Zambian woman would have a 1in 14 risk of dying from pregnancy related causes in her lifetime, compared to 1 in 3,500 for a woman in USA.

Furthermore the causes of maternal mortality are markedly different worldwide and over time periods. Studies in Lusaka over the last 25 years have shown a marked variation in trends of medical causes of maternal mortality. In the mid 1970's, the ranking of causes was as follows: hypertensive disorders of pregnancy (eclampsia, pre-eclampsia), haemorrhage, puerperal sepsis and abortion - there were no cases recorded due to malaria or AIDS. By 1989 the ranking of causes was as follows: abortion, puerperal sepsis, malaria, hypertensive disorders of pregnancy, haemorrhage and some causes attributed to HIV/AIDS. With the sentinel surveillance reports of HIV prevalence in antenatal attendees in the 1990s showing figures over 20%, it is not surprising that larger numbers of maternal deaths are now related to HIV/AIDS.

The implications of this apparent increases in causes of maternal mortality is important with respect to planning of services, review of public health preventative efforts, strategies for reducing maternal mortality, and also for staff safety. In addition, the presentation and natural history of pregnant patients with HIV in pregnancy would have a bearing on obstetric management.

LITERATURE REVIEW

Definition of maternal mortality

The Tenth Revision of the International Classification of Diseases (ICD-10) defines a maternal death as: *the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes* (WHO 1992).

Maternal deaths are divided into two groups:

Direct obstetric deaths - those resulting from obstetric complications of the pregnant state (pregnancy, labour, and the puerperium), from interventions, omissions, or incorrect treatment, or from a chain of events resulting from any of the above.

Indirect obstetric deaths - those resulting from previous existing disease or disease that developed during pregnancy and that was not due to direct obstetric causes but was aggravated by the physiological effects of pregnancy.

ICD-10 also includes a category for "late maternal death", which is defined as*: the death of a woman from direct or indirect obstetric causes more than 42 days but less than one year after termination of pregnancy.*

To facilitate the identification of maternal deaths in circumstances in which cause of death attribution is inadequate, ICD-10 introduced a new category, that of "pregnancy-related death", which is defined as: *the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death.* This category allows inclusion of maternal deaths due to suicide, homicide and road traffic accidents

Measures of maternal mortality

There are three main measures of maternal mortality - the maternal mortality ratio, the maternal mortality rate, and the lifetime risk of maternal death.

Maternal mortality ratio represents the risk associated with each pregnancy, i.e. the obstetric risk. It is calculated as the number of maternal deaths during a given year per 100 000 live births during the same period. Although the measure has traditionally been referred to as a rate it is actually a ratio and is now usually called as such by researchers.

Note: The appropriate denominator for the maternal mortality ratio would be the total number of pregnancies (live births, fetal deaths [stillbirths], induced and spontaneous abortions, ectopic and molar pregnancies). However, this figure is seldom available, either in developing countries where most births take place or in developed countries, and so the number of live births is generally used as the denominator.

Maternal mortality rate measures both the obstetric risk and the frequency with which women are exposed to this risk. It is calculated as the number of maternal deaths in a given period per 100 000 women of reproductive age (usually 15-49 years).

Lifetime risk of maternal death takes into account both the probability of becoming pregnant and the probability of dying as a result of the pregnancy cumulated across a woman's reproductive years.

Note: Lifetime risk can be estimated by multiplying the maternal mortality rate by the length of the reproductive period (around 35 years). The lifetime risk can also be approximated by the product of the total fertility rate and the maternal mortality ratio.

Where do maternal deaths occur?

The first global estimates of the extent of maternal mortality around the world were published for 1990. They indicated that some 500 000 women die each year from pregnancy-related causes. In 1996, WHO and UNICEF revised the estimates for 1990 on the basis of the growing volume of information that had become available in recent years. These new estimates showed that the scale of the problem was significantly greater than had originally been suspected and that closer to 600 000 maternal deaths occur each year, with the overwhelming majority of them in developing countries. In developed countries, the maternal mortality ratio averages around 27 maternal deaths per 100 000 live births; in

developing countries the ratio is nearly 20 times higher, at 480 per 100 000, and may be as high as 1000 per 100 000 in some regions.

Causes of maternal mortality

The medical causes of maternal deaths are similar throughout the world.

Globally, around 80% of all maternal deaths are the direct result of complications arising during pregnancy, delivery, or the puerperium. The single most common cause - accounting for a quarter of all maternal deaths - is severe bleeding, generally occurring postpartum.

Haemorrhage, especially postpartum haemorrhage, is unpredictable, sudden in onset, and more dangerous when a woman is anaemic. Globally, some 25% of all maternal deaths are due to haemorrhage. Blood loss can very rapidly lead to death in the absence of prompt and appropriate life-saving care which includes the administration of drugs to control bleeding, massage of the uterus to stimulate contractions, and blood transfusion if necessary.

Sepsis, which is often a consequence of poor hygiene during delivery or of untreated sexually transmitted diseases (STDs), accounts for some 15% of maternal deaths. Such infections can be effectively prevented by careful attention to clean delivery and by detection and management of STDs during pregnancy. Systematic postpartum care will ensure rapid detection of infection and its management by appropriate antibiotics.

Hypertensive disorders of pregnancy, particularly eclampsia (convulsions), is the cause of approximately 12% of all maternal deaths. Deaths from hypertensive disorders can be prevented by careful monitoring during pregnancy and by treatment with relatively simple anticonvulsant drugs (e.g. magnesium sulphate) in cases of eclampsia.

Prolonged or obstructed labour accounts for about 8% of maternal deaths. This is often caused by cephalopelvic disproportion (when the infant's head cannot pass through the maternal pelvis) or by abnormal lie (when the infant is incorrectly positioned for passage through the birth canal). Disproportion is more common where malnutrition is endemic, especially among populations with various traditions and taboos regarding the diets of girls and women. It is worse

where girls marry young and are expected to prove their fertility, often before they are fully-grown.

Complications of unsafe abortion are responsible for a substantial proportion (13%) of maternal deaths. In some parts of the world, one-third or more of all maternal deaths are associated with unsafe abortions. These deaths can be prevented if women have access to family planning information and services, care for abortion-related complications, and, where abortion is not prohibited by law, safe abortion care.

Approximately 20% of maternal deaths are the result of pre-existing conditions that are exacerbated by pregnancy or its management. One of the most significant of these indirect causes of death is anaemia which, as well as causing death through cardiovascular arrest, is thought also to underlie a substantial proportion of direct deaths (particularly those due to haemorrhage and sepsis). Other important indirect causes of death include malaria, hepatitis, heart diseases, and, increasingly in some settings, HIV/AIDS. Many of these conditions are also relative or absolute contraindications for pregnancy.

Maternal mortality: country estimates and focus on Zambia

Selected country estimates of maternal mortality ratio and lifetime risk of maternal death. (1990 estimates, revised 1996. WHO, 1996).

Country	Maternal Mortality Ratio (Deaths per 100,000 Live Births)	Life time risk of Maternal deaths (1 in:)
Angola	1500	8
Yemen	1400	8
Mozambique	1500	9
Ethiopia	1400	9
Uganda	1200	10
Zaire	870	14
Zambia	**940**	**14**
Tanzania	770	18
Malawi	560	20
Kenya	650	20
Bangladesh	850	21
Zimbabwe	540	28
India	570	37
Botswana	250	65
South Africa	230	85
Egypt	170	120
Thailand	200	180
China	95	400
Cuba	95	440
Russia (Federation)	75	620
U.S.A.	12	3500
U.K	9	5100

Impact of the HIV/AIDS epidemic on pregnancy related mortality

Effect of pregnancy on the natural history of HIV Infection

In general, although pregnancy appears to have little effect on the progress of infection in asymptomatic HIV-positive women or in those with early infection, there may be a rapid progression in women with late stage HIV infection

(Johnstone 1993). Tennerman et al (1995) based on observations in Nairobi, Kenya, report that African women, with additional factors of poor nutrition and repeated pregnancies do not appear to experience more rapid progression of HIV infection during their pregnancies. Nevertheless, in some African countries AIDS has become a common cause of maternal mortality (Taha et al 1996). This appears to be due to more women with advanced disease becoming pregnant.

Effect of HIV on pregnancy

HIV infection has been reported to have little effect on pregnancy in developed countries (Brockelhurst and French, 1998). However, adverse outcomes including complications of early and late pregnancy have been reported more commonly in a number of African studies. HIV may be the direct cause of complications, or a marker of interaction of related medical and social conditions that affect pregnancy. HIV-1 has been linked to a higher rate of spontaneous abortion, preterm labour, preterm rupture of membranes, abruptio placenta and low birthweight. Although increased stillbirth rates have been reported in HIV-positive women, the risk appears to be lower in asymptomatic women and is independent for the presence of other sexually transmitted infections (STIs), including syphilis (Tennerman et al, 1990). Postnatal infectious complications are commoner in HIV-positive women particularly after caesarean section (Bergstrom et al, 1995).

Mother-to-Child Transmission of HIV

This is not the focus of the dissertation but mentioned for completeness sake as it has implications for maternal health as well. Mother-to-child HIV transmission of HIV may occur in the intrauterine or intrapartum periods, or postnatally through breast milk. In the absence of breastfeeding, about 30% of infant HIV infections occur in-utero and 70% during labour and delivery (Mock et al, 1999). One-third to a half of perinatal HIV infections in African settings may be due to breastfeeding (Wiktor et al, 1997). Risk factors for transmission, include high maternal viral load, advanced maternal immune deficiency and prolonged

rupture of membranes (>4 hours) (UNAIDS, WHO, 1999). Risk factors for breast milk transmission include high viral load and sub-clinical mastitis (Semba et al, 1999; UNAIDS, UNICEF, WHO, 1998).

The use of the antiretroviral drugs in pregnancy has been shown to reduce perinatal HIV transmission to the infant. A simple single-dose treatment with the antiretroviral nevirapine is commonly used in resource poor settings, including Zambia. Nevirapine has a prolonged half-life, rapidly crosses the placenta, crosses into breast milk and is administered as a single dose to the mother at onset of labour and then to the neonate within 72 hours of birth (Guay et al, 1999). This has shown to reduce transmission by as much as 50% and is commonly referred to as the HIVNET 012 regimen.

A randomised controlled trial of mode of delivery in Europe showed a dramatic decrease in transmission to the infant when delivered by caesarean section as opposed to a vaginal birth (European Mode of Delivery Collaboration, 1999). However, caesarean section in HIV-infected women must also take into account the possibility of maternal morbidity and mortality. Other considerations, particularly in developing countries include the availability of safe operating facilities, increased service commitments by overworked staff and the potential risks to future pregnancies due to ruptured uterus or repeat caesarean (Bulterys et al, 1996).

The combination of antiretroviral use, caesarean section and the avoidance of breastfeeding with replacement feeding in developed countries has led to dramatic decreases in the rate of MTCT, in some cases to less than 2%. However, these are not currently feasible in developing countries.

Trends in causes of maternal mortality

There is marked variation in causes of maternal mortality between developed and developing countries and over the years.

Similarly, published and unpublished institutional causes of maternal mortality in a developing country such as in Zambia show variations in clinical causes of as illustrated in the table below. Of note is the record occurrence of maternal mortalities due to HIV/AIDS noted in 1989.

HISTORICAL TRENDS IN MATERNAL MORTALITY IN LUSAKA (1974-1993)

	1974-76 [1]			1982-83 [2]			1989 [3]	
Diagnosis	**n**	**%**		**n**	**%**		**n**	**%**
Abortion	7	13		14	23		24	24
Haemorrhage	13	24		10	17		10	10
Toxaemia	20	37		12	20		12	12
Puerperal Sepsis	8	15		9	15		15	15
Malaria	0	0		0	0		13	13
Meningitis	0	0		0	0		3	3
HIV/AIDS	0	0		0	0		8	8
Other	6	11		15	25		16	15
TOTALS	**54**	**100**		**60**	**100**		**101**	**100**

1. Grech ES, 1978. UTH, Lusaka. (MMR 160) (MMR – Maternal mortality ratio)
2. Mhango et al, 1986. UTH, Lusaka. (MMR 118)
3. Cerne A and Odeback A. 1990/91. UTH, Lusaka. (MMR 299)

HIV/AIDS and maternal mortality

De Cock et al (1990) reported in a post-mortem study that AIDS was the second commonest cause of death in adult women (after deaths related to pregnancy and abortion). Ryder et al (1994) reported an increased maternal mortality in women who had HIV/AIDS in Kinshasa, Zaire. Taha et al (1996), in studies of women in Blantyre, Malawi had similarly shown an increased maternal mortality due to HIV/AIDS.

A more thorough review of maternal mortality and the role of HIV/AIDS can be found in the Reports on Confidential Enquiries into Maternal Deaths in South Africa. The full report is available for 1998 as is the interim report for 1999 (DOH, Gov RSA). A Total of 676 maternal deaths were reported in 1998 and 774 in 1999. Case review was available for 565 and 584 cases respectively in

the two years. The direct causes accounted for 63.4% of maternal deaths in 1998 and 59.1% in 1999. There were 82 (14.5% of all maternal deaths) cases attributed to AIDS in 1998 and 93 (15.9%) in 1999. Only 24.2% cases of maternal deaths in 1998 had their HIV status documented while in 1999 the figure was 35.5%. A number of cases of maternal mortality were in women who were HIV infected (e.g. cases of puerperal sepsis and abortion). These by themselves are not AIDS defining conditions (CDC 1993, WHO 1993, WHO 1994).

This dissertation aims to similarly explore the trends in maternal mortality in Lusaka in the 1990s to explore the impact of the HIV epidemic.

OBJECTIVES

To describe the contribution of HIV/AIDS to maternal mortality in Lusaka.

Specific Objectives:

1. To classify all maternal mortalities at the University Teaching Hospital (UTH) in 1993, 1996 and 1999 by medical cause.
2. To describe the age and parity of cases of maternal mortality.
3. To compare trends in causes and demographics of maternal mortality cases over the three-year periods.
4. To describe the disease presentation in those mortalities due to HIV/AIDS.

METHODS

The study was conducted at the University Teaching Hospital, Lusaka, in the Department of Obstetrics and Gynaecology.

Description of the Lusaka Maternity Services

The University Teaching Hospital (UTH) is the only referral hospital for mortality care in Lusaka. Lusaka is believed to have a population of approximately 1.5 million. Maternity care is provided at the UTH and at 23 clinics in Lusaka urban managed by the Lusaka District Health Management Board. Of these 23 clinics, 9 also perform deliveries and are staffed exclusively by midwives. All complications at any stage of pregnancy, labour or puerperium are referred to UTH from all the clinics. An ambulance service operates 24hrs a day for transfer of cases. In addition, Chainama Clinic provides maternity care, including deliveries and is managed by a separate Management Board. The number of deliveries, stillbirths and livebirths are presented in the table below for the years 1993, 1996 and 1999.

	1993	1996	1999
Deliveries at UTH	11,213	13,065	11,034
Deliveries at Clinics	22,498	25,944	28,335
Deliveries at Chainama	1,133	950	673
Total deliveries	**34,844**	**39,959**	**40,042**
MSB UTH	336	490	377
FSB UTH	176	296	320
MSB Clinics	160 (estimate)	173	188
FSB Clinics	110 (estimate)	117	119
MSB Chainama	6	4	0
FSB Chainama	1	2	4
Total stillbirths	**789**	**1082**	**1008**
Total live-births	**34,055**	**38,877**	**39,034**

Maternal mortality review

Maternal mortalities were identified on a daily basis through a number of channels including review of the death certificate books, registers and reports from the district. A senior resident doctor was responsible for regularly collecting the case files from the relevant wards. In the event that a case file went missing, details from the death certificate book and admission or ward registers were used to obtain vital information and cause of death. Every week, 2 or 3 cases were presented at a Maternal Mortality Review Meeting in the Department of Obstetrics and Gynaecology. Where appropriate, a medical cause of death was identified as well as factors in the health system that may have affected the maternal mortality. Community factors (or patient factors where relevant) were noted. The Head of Department also reviewed all cases. Feedback and remedial steps were taken where appropriate.

The case files were kept in a central place and there was a vigorous attempt to collect all case files of maternal mortalities from 1993 onwards. This was chosen as the first year of the review as case files for 1990, 91 and 92 were not available, although a review had been conducted in1989. The other two years were chosen to give an estimation of trends. Therefore 1996 and 1999 were chosen as the other two years for review.

Medical cause

For purposes of this study all cases were classified according to medical condition that may have contributed to death by the author and the supervisor (Head of Department). A primary cause of death was identified. This was in keeping with other reviews e.g. the Confidential Enquiries into Maternal Mortality in Report on Confidential Enquiries into Maternal Deaths in the United Kingdom and the National Committee on Confidential Enquiries into Maternal Deaths in South Africa.

The following categories of medical causes were recognized and used for classification and are presented overleaf:

Classification of medical causes of maternal deaths

Direct		Indirect	
Cause	**Comments**	**Cause**	**Comments**
Abortion	Postabortal sepsis, Haemorrhage postabortal, Herbal intoxication in early pregnancy, Pelvic abscess post MVA.	**Malaria**	Severe malaria (and anaemia). Cerebral malaria.
Haemorrhage	Postpartum haemorrhage, Antepartum haemorrhage, Abruptio placentae, Antepartum haemorrhage, Ruptured uterus.	**Meningitis**	Bacterial meningitis. (excludes cryptococcal meningitis)
Eclampsia	Eclampsia. Renal failure or CVA post eclampsia, Severe pre-eclampsia and CVA, renal failure.	**Other Indirect**	Unknown, Undetermined, Diabetes, Sickle cell disease, Cancer, Traffic accident, Miscellaneous.
Puerperal Sepsis	After vaginal delivery, After caesarean section.		
Other Direct	Ectopic pregnancy, Amniotic fluid embolism.	**Presumptive HIV/AIDS**	Excluding Direct or Indirect causes as determined above **and** stigmata of HIV/AIDS including: chronic illness, Pulmonary TB, Herpes Zoster, chronic diarrhoea, chronic weight loss.

Presumptive HIV/AIDS

Only a few cases of maternal mortality had their HIV status recorded. As such the classification 'presumptive HIV/AIDS' was used. All the cases classified in

this category did not have a direct or indirect cause of death that had been outlined earlier. Furthermore they had various stigmata suggesting that HIV/AIDS may have been the main cause of death. Appendix 1A outlines the CDC classification system for HIV and case definition for AIDS among Adolescents and Adults. Similarly in Appendix 1B the WHO Clinical Disease Stages of HIV Disease is presented. In both, beyond the asymptomatic category and stage, the various clinical conditions were noted for use in this study. During case review, after excluding all other direct and indirect causes of maternal mortality (including other) if the cases had the various symptom and sign constellations present suggesting HIV/AIDS (and regardless of the result available in the few) they were classified as presumptive HIV/AIDS. This strict classification ensured that it was exclusive of other recognizable causes but also inclusive of signs and symptoms suggesting HIV/AIDS. In the dissertation the term presumptive is assumed when describing HIV/AIDS cases.

Age and parity

The age was available in early all cases. Although the parity was only available for 57.6% of cases in 1993, it was recorded for 79.2% in 1996 and 98.1% in 1999.

Variables and categories

The following variables and categories were available for analysis:

- Date of death
- Age
- Parity
- Medical cause of death
  - Direct
    - Abortion related
    - Haemorrhage
    - Eclampsia
    - Puerperal sepsis
    - Other Direct
  - Indirect
    - Malaria
    - Meningitis
    - Other indirect
  - Presumptive HIV/AIDS

Collapsing of variables within categories

Date. Although day, month and year of maternal mortality was available, all presentation and analysis is presented by year only.

Age (years). The following categories are used: 10-19, 20-24, 25-29, 30-34, 35+, and missing. For the main presentation of results, the categories 25-29 and 30-34 were collapsed into one category of 25-34.

Parity. The whole range of parity was used. For presentation of the main results the categories used were as follows: 0,1,2,3,4,5,6 or more, and missing.

Medical cause of maternal death

Broad categories were as follows: **Direct, Indirect, HIV/AIDS**

The full range of categories and collapsed categories are as follows:

	All categories		**Collapsed categories**
1	Abortion	1	Abortion
2	Haemorrhage	2	Haemorrhage
3	Eclampsia	3	Eclampsia
4	Puerperal Sepsis	4	Puerperal Sepsis
5	Other direct		
6	Malaria	6	Malaria
7	Meningitis		
8	Other indirect	8*	(All) Other (including other direct, meningitis and other indirect)
9	AIDS	9	AIDS

Data presentation

Where appropriate, either the full list of categories within a variable was presented or the collapsed list. If a collapsed list had been used the full disaggregated data is presented in the Appendix section. Mean, median, standard deviation and error and range were presented as necessary.

Tables and figures were predominantly bi-variables: (cause and year; age and year; age and cause; parity and year; parity and cause; age and parity).

Data analysis

Differences in age were analysed using the students 't' test. Significance was set at 5%.

Ethics

Ethics approval for the study was obtained from the Research Ethics Committee of the University of Zambia. No identifiers were used in the analysis or presentation of the maternal mortality cases. Furthermore, since only a few variables are used and data is presented only in bi-variate form, this minimizes the risk of potential identification of cases.

RESULTS

Tabulated in table 1 is the breakdown of types of maternal mortalities in the three years reviewed (1993,6,9). Direct causes decreased from 55.8% of all causes of maternal mortality to 38.2% in 1996 and 37.7% in 1999. Concurrently, those due to presumptive HIV/AIDS increased from 22.4% to 25.7% and 39.6%. This is also reflected in figure 1a.

In figure 1b, the same information is presented showing which type of maternal mortality predominated in each year. In 1993 it was direct type, in 1996 it was still direct but there was increasing contribution by indirect and HIV/AIDS. In 1999, HIV/AIDS predominated as a cause of maternal mortality.

Table 1. Maternal Deaths in Lusaka by type – 1993/6/9

	1993		1996		1999		all	
	n	%	n	%	n	%	n	%
Direct	92	55.8	55	38.2	80	37.7	227	43.6
Indirect	36	21.8	52	36.1	48	22.6	136	26.1
HIV/AIDS (indirect)	37	22.4	37	25.7	84	39.6	158	30.3
Total	165	100.0	144	100.0	212	100.0	521	100.0

Figure 1a. Trends in types of maternal mortality (1993/6/9)

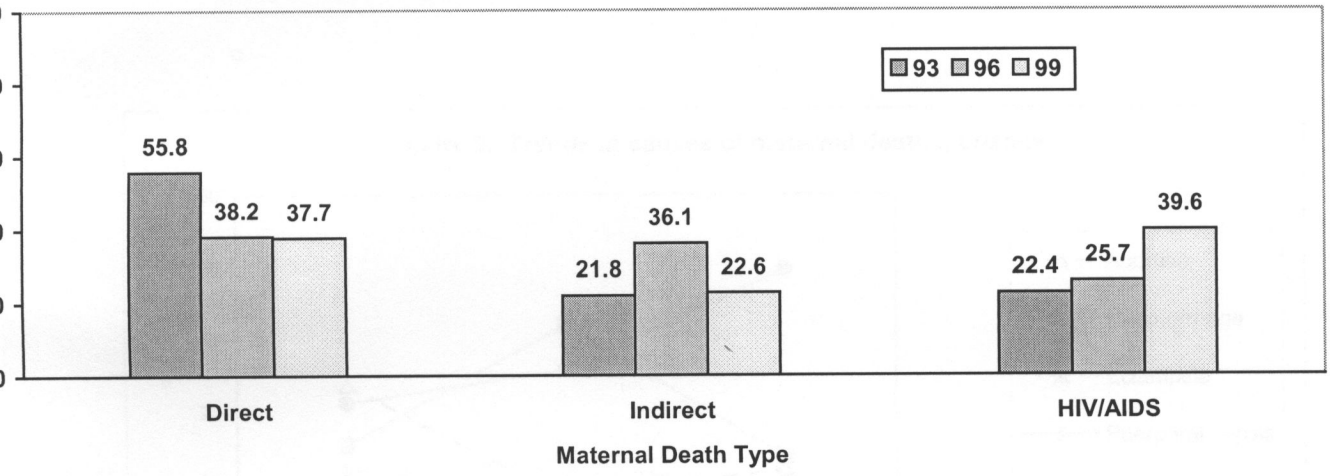


Figure 1b. Trends in maternal deaths (by type)

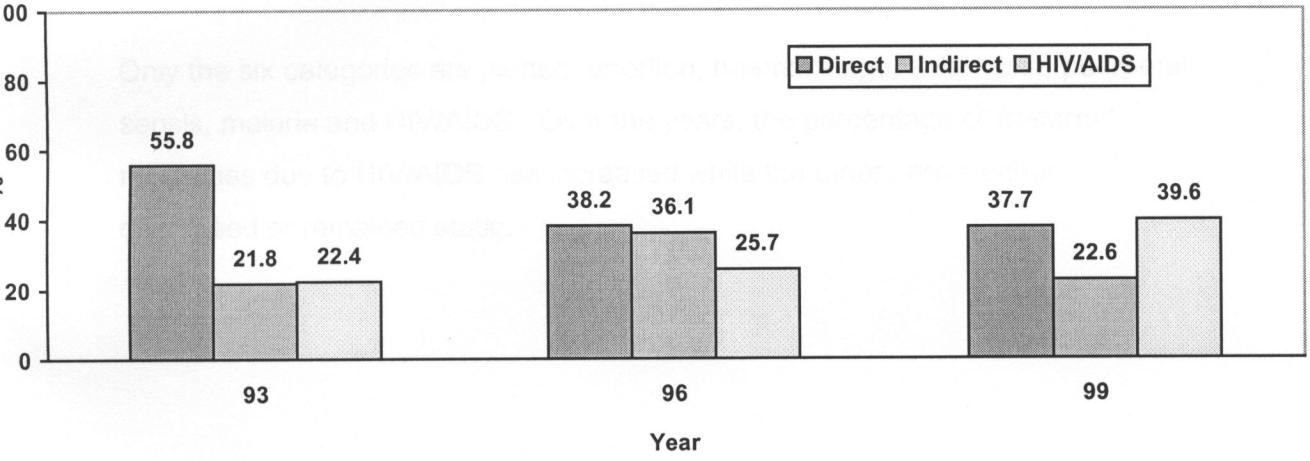
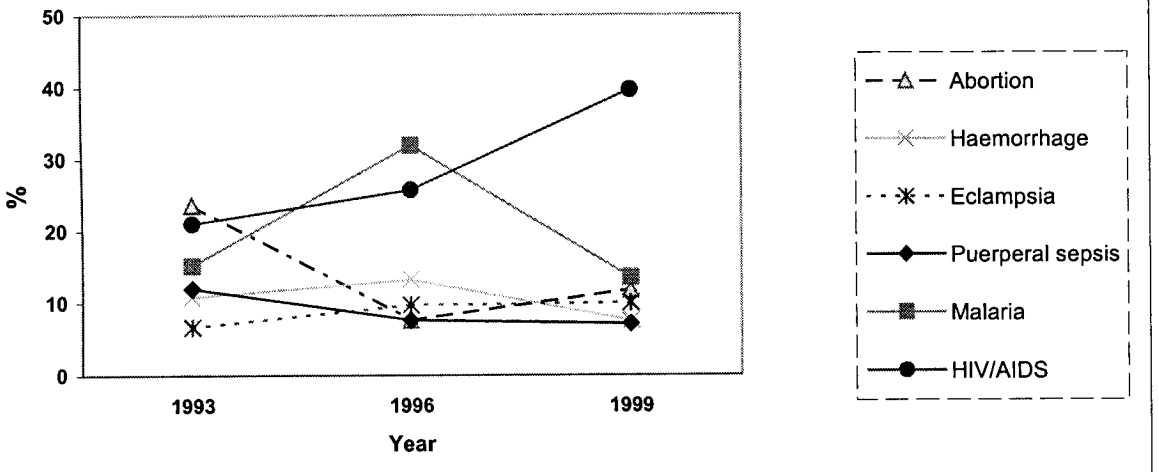


Table 2. Maternal Deaths in Lusaka by cause – 1993/6/9

		93	%	96	%	99	%
Direct	abortion	39	23.6	11	7.6	25	11.8
	haem	19	11.5	19	13.2	16	7.5
	eclampsia	11	6.7	14	9.7	22	10.4
	puerperal sepsis	19	11.5	11	7.6	15	7.1
	other direct	4	2.4	0	0.0	2	0.9
Indirect	malaria	25	15.2	46	31.9	27	12.7
	meningitis	4	2.4	1	0.7	9	4.2
	other indirect	7	4.2	5	3.5	12	5.7
HIV/AIDS	Indirect	37	22.4	37	25.7	84	39.6
Total		**165**	100.0	**144**	100.0	**212**	100.0

Figure 2. Trends in causes of maternal deaths, Lusaka



Only the six categories are plotted: abortion, haemorrhage, eclampsia, puerperal sepsis, malaria and HIV/AIDS. Over the years, the percentage of maternal mortalities due to HIV/AIDS has increased while the others have either decreased or remained static.

Table 3. Maternal Deaths in Lusaka by age categories – 1993/6/9

Age distribution all causes

	93		96		99		all	
	n	%	N	%	n	%	n	%
10-19yrs	31	19.4	23	16.0	19	9.0	74	14.2
20-24	54	32.7	39	27.1	65	30.7	158	30.3
25-34	61	37.0	62	43.1	105	49.5	228	43.8
35+	19	10.9	18	12.5	22	10.4	58	11.1
missing	0	0.0	2	1.4	1	0.5	3	0.6
total	**165**	**100.0**	**144**	**100.0**	**212**	**100.0**	**521**	**100.0**
mean	25.3		26.3		26.6		26.1	
median	24		26		26		25	
SD/SEM	6.7/0.52		6.1/0.51		6.0/0.41		6.3/0.27	
Range	34 (14-48)		27 (15-42)		29 (15-44)		34 (14-48)	

Looking at all years, the majority of maternal deaths were in the age category 25-34 years (43.8%) (Table 3 and figure 3). Observing trends over the years (see figure 3), in the age category 10-19 years there was a gradual decrease in the percentage contributing to maternal deaths from 19.4% in 1993 to 9.0% in 1999. In the age category 25-34 years there was a gradual increase from 37.0% to 49.5%.

Figure 3. Trends in age categories of maternal deaths (by year)

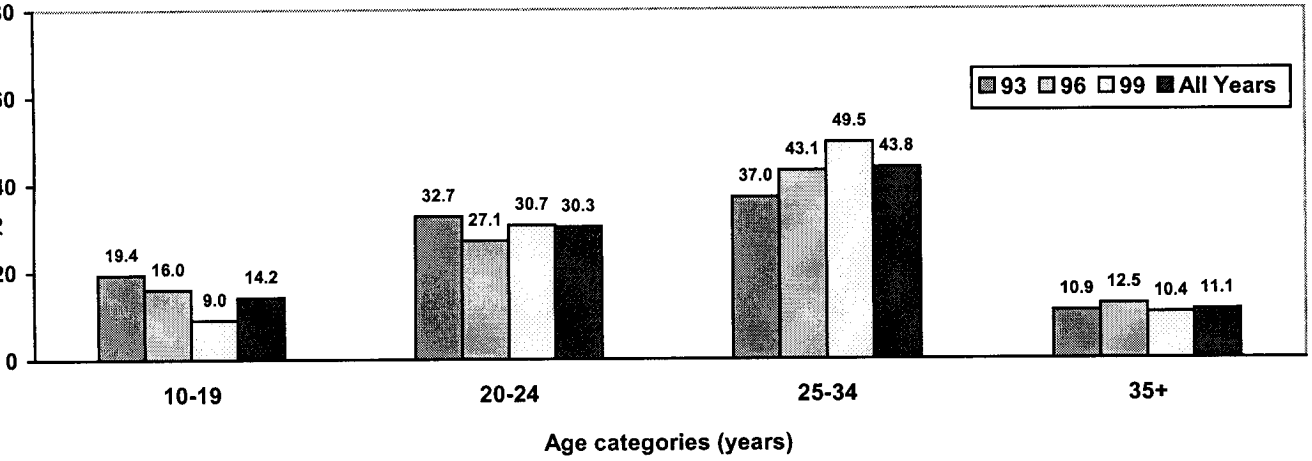


Table 4. Maternal Deaths in Lusaka (distribution and mean age by cause, all years)

	Ab		Haem		Ecl		P sep		Mal		All other		AIDS		All	
10-19 yrs	13	17.3	0	0.0	10	21.3	16	35.6	19	19.4	6	13.6	8	5.1	73	14.0
20-24	23	30.7	14	25.9	16	34.0	16	35.6	27	27.6	11	25.0	51	32.3	158	30.3
25-34	32	42.7	22	40.7	13	27.7	12	26.7	47	48.0	22	50.0	80	50.6	228	43.8
35+	7	9.3	17	31.5	8	17.0	1	2.2	3	3.1	5	11.4	19	12.0	59	11.3
missing	0	0.0	1	1.9	0	0.0	0	0.0	2	2.0	0	0.0	0	0.0	3	0.6
total	75	100.0	54	100.0	47	100.0	45	100.0	98	100.0	44	100.0	158	100.0	**521**	100.0
mean age	25.7		30.3		25.4		22.2		24.9		26.5		26.8		26.1	

Within each cause of maternal mortality, there was a different age profile. Abortion, eclampsia and malaria had younger cases although the category 25-34 years predominated. Haemorrhage had no cases between 10-19 years but a larger percentage of those 35 and over. Puerperal sepsis and malaria was not common in the older. There were a few cases of young women (10-19 years) in the HIV/AIDS category.

Figure 4. Age distribution by cause of maternal mortality (all years)

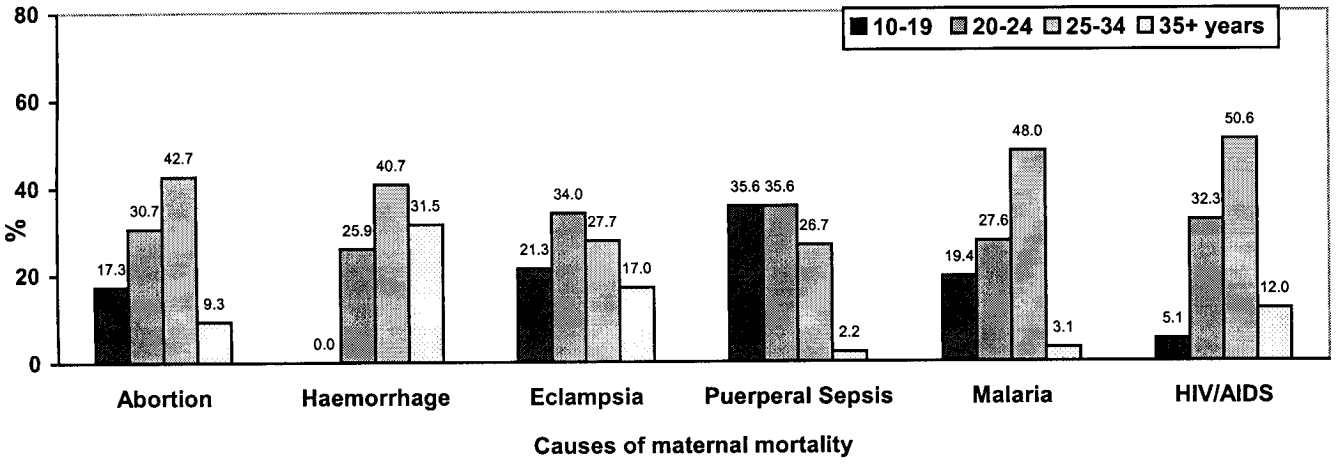


Table 5. Maternal Deaths in Lusaka (mean age by cause) – 1993/6/9

		Abortion	Haem	Ecl	P Seps	Mal	All Other	AIDS	All	
	N	39	19	11	19	25	15	37	**165**	
1993	Mean age	25.3	29.7	24.6	22.3	25.1	25.5	25.2	**25.3**	
	Compare*	0.4	0.01	0.27	0.03	0.85	0.87	**ref**		
	N	11	18	14	11	45	6	37	**142**	2 missing
1996	Mean age	24	30.4	24.9	22.3	24.7	24.7	28.6	**26.3**	
	Compare*	0.01	0.25	0.08	<0.01	0.01	0.09	**ref**		
	N	25	16	22	15	26	23	84	**211**	1 missing
1999	Mean age	27	31	26.1	22	25.1	27.7	26.7	**26.6**	
	Compare*	0.66	0.1	0.49	<0.01	0.22	0.51	**ref**		
	N	75	53	47	45	96	44	158	**518**	3 missing
All yrs	**Mean age**	**25.7**	**30.3**	**25.4**	**22.2**	**24.9**	**26.5**	**26.8**	**26.1**	
	Compare*	**0.07**	**<0.01**	0.06	**<0.01**	**0.02**	0.71	**ref**		

* comparing mean age for maternal mortality categories to AIDS (all)

The mean ages in each year by cause are tabulated. Taking the mean age of those cases of maternal mortality due to HIV/AIDS, it is noted that the mean ages of cases due to haemorrhage were significantly older, but cases due to puerperal sepsis were younger (Table 5 and figure 5). There does not appear to have been a significant change in mean ages of cases in each cause category in the three years studied.

Figure 5. Mean ages within each cause of maternal mortality

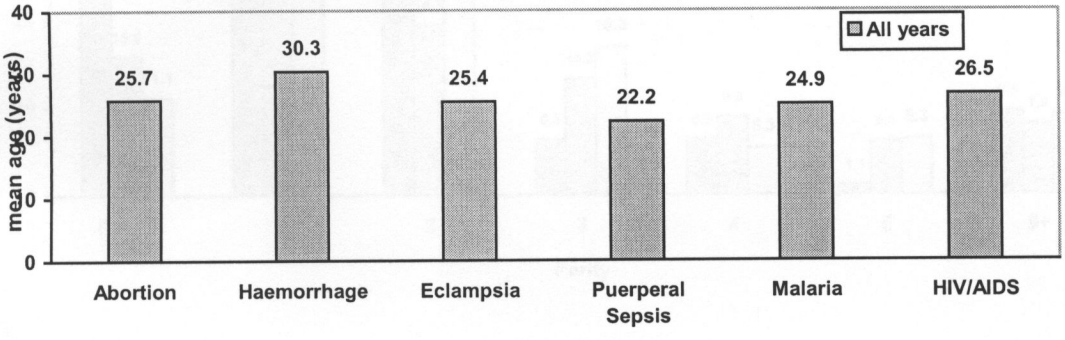


Table 6. Parity of cases of maternal mortality, by year

	93	%	96	%	99	%	all	%
Para 0	23	24.2	18	15.8	23	11.1	64	15.3
1	29	30.5	33	28.9	57	27.4	119	28.5
2	21	22.1	22	19.3	50	24.0	93	22.3
3	6	6.3	15	13.2	35	16.8	56	13.4
4	6	6.3	10	8.8	11	5.3	27	6.5
5	1	1.1	7	6.1	13	6.3	21	5.0
6 or more	9	9.5	9	7.9	19	9.1	37	8.9
sub-total	**95**	100.0	**114**	100.0	**208**	100.0	**417**	100.0
missing	**70**		**30**		**4**		**104**	
all	**165**		**144**		**212**		**521**	
Ascertainment* (%)	**57.6**		**79.2**		**98.1**		**80.0**	

*Ascertainment= [(all – missing)/all]

As noted in table 6, in 1999 most cases of maternal mortality had their parity recorded. The ascertainment was 98.1% with only 4 of the 212 cases missing the parity. Most cases in 1999 were of parity 1 or 2. Grand multiparas (parity of 6 or more) are still a sizeable minority of the cases – 9.1% in 1999.

Figure 6. Trends in parity of maternal mortalities

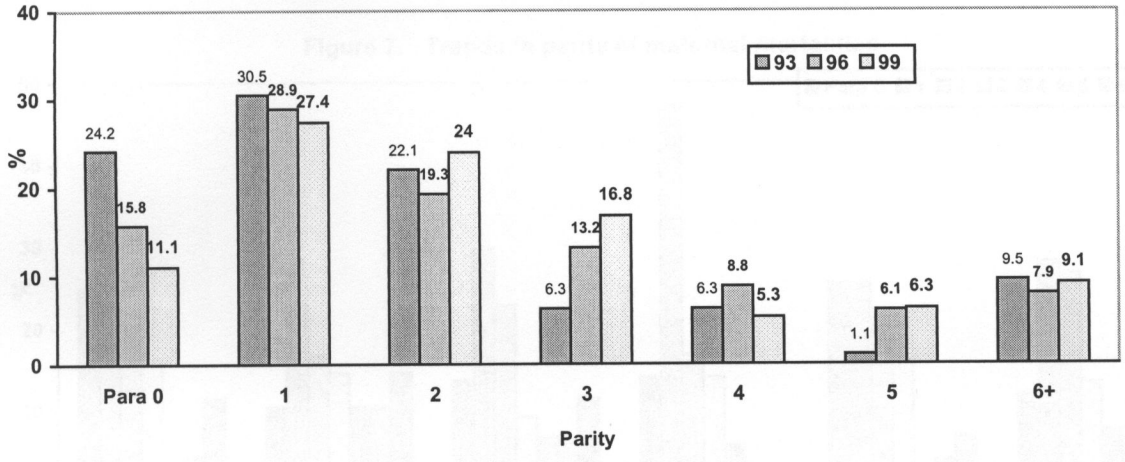


Table 7. Parity and causes of maternal mortality -1993,96,99

	Ab	%	Haem	%	Ecl	%	P Sep	%	Mal	%	Other	%	AIDS	%	All	%
Para 0	11	25.0	5	10.4	6	13.6	5	13.9	19	25.3	2	5.9	16	11.8	64	15.3
1	10	22.7	11	22.9	13	29.5	17	47.2	19	25.3	11	32.4	38	27.9	118	28.3
2	9	20.5	8	16.7	10	22.7	6	16.7	15	20.0	9	26.5	36	26.5	93	22.3
3	7	15.9	7	14.6	4	9.1	5	13.9	12	16.0	3	8.8	18	13.2	56	13.4
4	-	-	5	10.4	3	6.8	2	5.6	2	2.7	4	11.8	10	7.4	26	6.2
5	2	4.5	5	10.4	3	6.8	1	2.8	3	4.0	1	2.9	7	5.1	22	5.3
6 or more	5	11.4	7	14.6	5	11.4			5	6.7	4	11.8	11	8.1	38	3.8
																100.0
sub-total	**44**	100.0	**48**	100.0	**44**	100.0	**36**	100.0	**75**	100.0	**34**	100.0	**136**	100.0	**417**	
missing	**31**		**6**		**3**		**9**		**23**		**10**		**22**		**104**	
all	**75**		**54**		**47**		**45**		**98**		**44**		**158**		**521**	
Ascertain (%)	**58.7**		**88.9**		**93.6**		**80.0**		**76.5**		**77.3**		**86.1**		**80.0**	
Mean parity	**2.1**		**3.0**		**2.4**		**1.6**		**1.9**		**2.5**		**2.3**		**2.3**	

Cases of maternal mortality due to abortion, malaria and 'other' had the worst ascertainment of parity though it was better in the other categories. The profile in the figure below (and the tabulation in table 7) shows the distribution of parities within each cause of maternal death. Those with less parity are heavily represented in causes of abortion, eclampsia, puerperal sepsis and malaria. Cases due to HIV AIDS were spread across all the parities.

Figure 7. Trends in parity of maternal mortalities

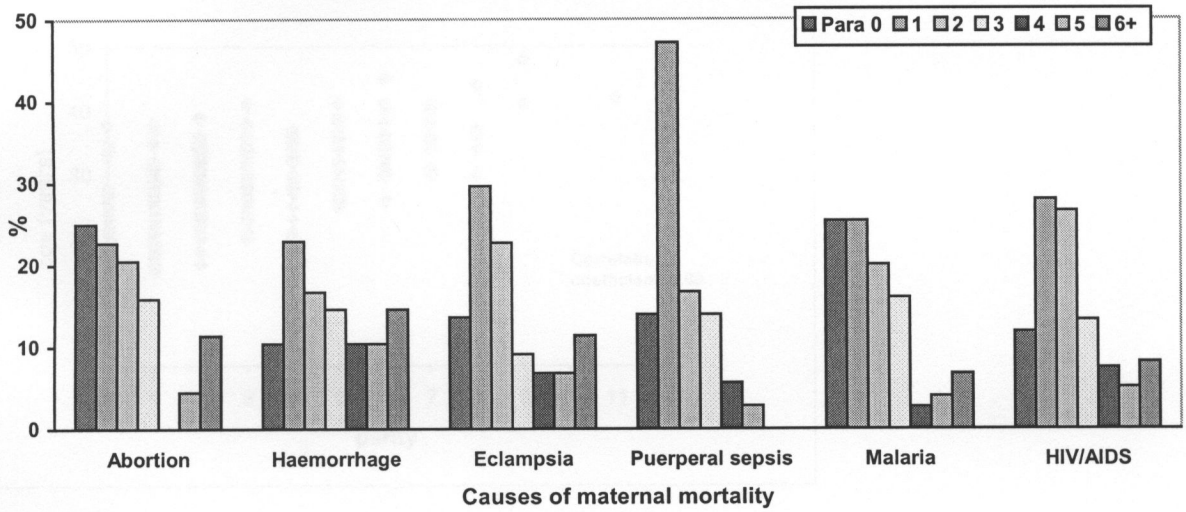
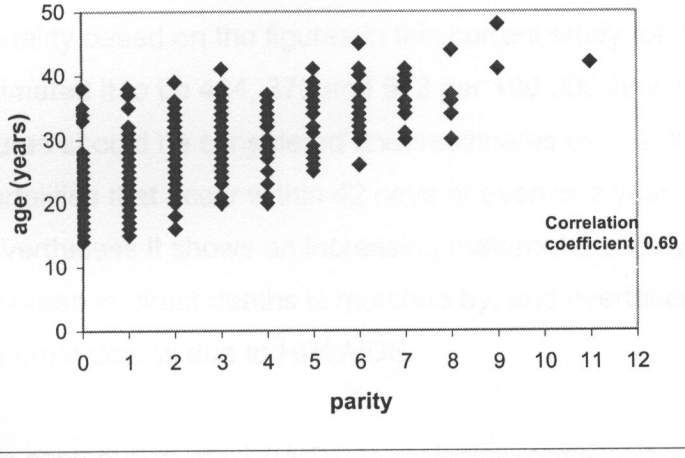


Table 8. Parity and mean age (all causes, all years)

Parity	Average Age (years)	n
0	21.3	63
1	23.1	119
2	25.6	93
3	28.7	56
4	29.5	26
5	32.4	22
6	34.4	16
7	36.7	11
8	36.2	6
9	44.5	2
10	-	-
11	42.0	1
All	**26.2**	**415**

There is a positive correlation (coefficient 0.69) between parity and age (tabulated in table 8 and shown in figure 8). The average age also increases with parity. It was 21.3 years for those maternal mortality cases who were para 0, to 36.2 for those cases of para 8.

Figure 8. Age distribution at different parites (93,96,99)



DISCUSSION

Reviews of maternal mortalities

The high levels of maternal mortality in developing countries are a result of a complex array of factors. They include the inadequacy of health services, social, cultural, economic and logistic problems coupled with the very high fertility rates. The Confidential Enquiries into Maternal Deaths in South Africa reviews each case with respect to avoidable factors, missed opportunities and sub-standard care. Patient orientated and administrative factors were identified where possible to plan interventions. The scope of this dissertation was not to delve into all the complex interactions that contribute to maternal mortality. The data collected in this study does not enable such a formal review to be conducted. However, when the cases had occurred, the Maternal Mortality Meeting and also review by the Head of Department had identified various factors that were acted upon as necessary.

Maternal mortality due to HIV/AIDS

There has been a rationalised and improved maternity service in Lusaka since the early 1980s. UTH deals with high-risk pregnancies and the urban maternity clinics with the majority of normal pregnancies. Maternal mortality ratios, however, have increased from 118 in 1982 to 299 in 1989. The crude maternal mortality based on the figures in this current study for 1993, 1996 and 1999 is estimated it to be 484, 370 and 543 per 100 000 livebirths, respectively. These figures should be considered underestimates as it is unclear how many maternal mortalities that occur within 42 days or even one year, are accounted for. Nevertheless it shows an increasing maternal mortality over the decade. The decrease in direct deaths is matched by, and overtaken by an increase in maternal deaths due to HIV/AIDS.

The contribution of HIV/AIDS to maternal mortality has been described by Sewenkambo et al (2000) based on a community study in Rakai, rural Uganda. They showed that the maternal mortality was increased five-fold in HIV infected

women compared to uninfected women. Kilpatrick et al (2002) compared maternal deaths at a US hospital to those at Kabwe General Hospital. The Kabwe review was for the years 1998 and 1999. Of the 108 maternal deaths recorded in Kabwe, 45 (41.7%) were direct causes, 18 were due to malaria (16.7%) while 22 (20.4%) could have been due to HIV/AIDS. Of these 22, 4 were diagnosed as AIDS, 3 with TB and 15 with chronic illness.

Bicego et al (2002) compared the maternal mortality trends in Malawi and Zimbabwe based on Demographic Health Survey data. In both countries there were dramatic increases in maternal mortality ratios in the 1990s as reported in the respective DHSs. The authors suggest that this increase was due in large part to an increase in HIV prevalence in the antenatal population. The 1992 Zambian DHS had not collected information on maternal mortality. However, it was collected in 1996 and is also expected to be reported in the forthcoming 2001-2 DHS. This will allow trends countrywide to be assessed in Zambia.

Country	DHS	Maternal Mortality per 100 000 livebirths (MMR)
Malawi	1992	620
	2000	1120
Zimbabwe	1994	283
	1999	695
Zambia	1992	n/a
	1996	649
	2001-2	awaited

Antenatal HIV surveillance in urban areas in Lusaka and elsewhere in Zambia

There has been antenatal surveillance of HIV in selected antenatal populations since the 1980s – the so-called 'sentinel surveillance'. In Lusaka and major urban areas, antenatal seroprevalence data is available from 1987 and described in the table below. In rural areas, the corresponding figures are generally lower.

Year	Number of urban sites in Lusaka	HIV Seroprevalence (%) (minimum and maximum, where available)
1987	1	11.6
1990	1	24.5
1992	4	22 - 27.5
1994	4	21.7 - 35.3
1996	1	26.1
1998	5	25.9 - 29.1
1999	1	32
2001	1	30.7

By the 1990's seroprevalence of HIV in the antenatal population in Lusaka had exceeded over 20%. It was not surprising that more and more maternal deaths are being recorded as being due to 'presumptive HIV/AIDS'.

Survival with HIV infection

Longini et al (1989) had, in the early years of the HIV epidemic, modeled survival based on stage of disease. They predicted an incubation period of 9.8 years from infection to clinical AIDS. In the absence of antiretroviral medications, the general consensus is that it takes 5-10 years. Once clinical AIDS has developed the time to death ranges from a few months in some AIDS defining conditions to a few years. French and Brocklehurst (1998) had reviewed a number of studies to determine the effect of pregnancy on HIV disease progression. Although not conclusive, the results seem to show, especially in developing country settings that there was disease progression.

Cryptococcal meningitis occurred in a few cases in the cases reviewed at UTH. In patients who are HIV-positive, it is an AIDS defining condition. Mwaba et al (2001) had shown at UTH that there was a 100% mortality in adults with the condition. Those who were treated with fluconazole had a mean survival of 6 months compared to 7 weeks in the palliative group. Wasting and TB were commonly seen in this series at UTH. Post et al (2001) had shown that in HIV infected patients in Cape Town, median survival for patients ranged from 3

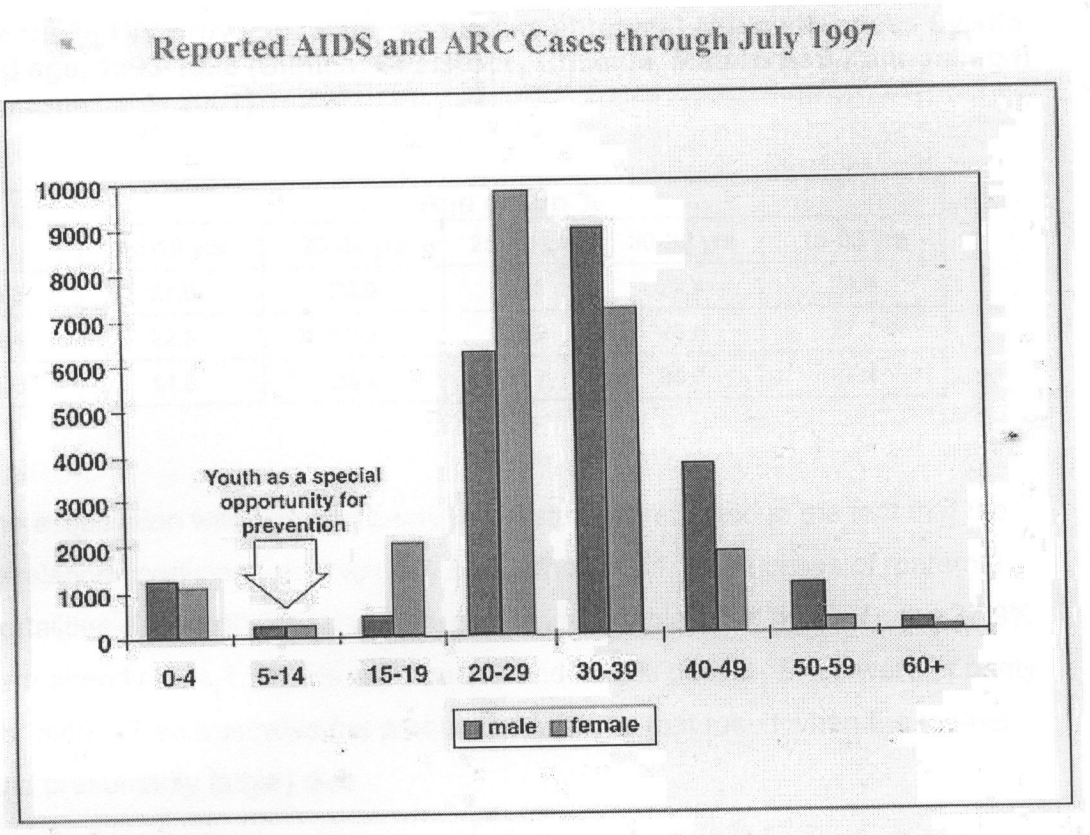
months for patients with encephalopathy and wasting, to over 2 years in patients with extrapumonary TB. Similarly, Morgan et al (2000) had reported a median survival in a rural Uganda cohort with AIDS defining condition to be 9.3 months.

Maternal mortalities and age

Most of the reported cases of maternal mortality in as outlined occurred in those between 25-34 years of age (Table 3 and Figure 3). In Table 4 and Figure 4, most cases of maternal mortality due to (presumptive) HIV/AIDS were in the 25-34 year age category. This implies that if they had progressed and died as a terminal event associated with AIDS (perhaps accelerated by pregnancy), they would have been infected between 5-10 years earlier. Interestingly, of those who died of AIDS, 32.3% were between 20-24 years of age and 5.1% were below 19 years of age. The last group would have acquired HIV infection very early in their teenage lives and probably progressed rapidly to AIDS.

Fylkesnes and Sichone had previously reported AIDS and AIDS-related complex (ARC) cases through July 1997 and this is shown in the figure overleaf. The peak ages for AIDS cases are 20-29 years for females and 30-39 years for males. Young women in the 15-19 year age group are five times as likely to be infected as males in the same age group. Some of the difference may be due to transmission from older men to younger women, but young women may physiologically be more prone to HIV infection.

The small number of AIDS cases in the 5-14 year old age group emphasizes the point that the main modes of transmission are through sexual contact (in adolescence and later) or mother-to-child transmission (for infants).



Seroprevalence of antenatal HIV and age in Lusaka

Although there appears to be a trend of decreasing HIV seroprevalance in the younger age (15-19 years), the other age categories are still high. This is summarized in the table overleaf, from Fylkesnes et al (2001). These are women in the reproductive age group and they may get pregnant even as their disease progresses. As such HIV/AIDS will remain an important cause of maternal mortality in the near future in Lusaka.

Trends in HIV prevalence among Lusaka antenatal clinic attendees by site and age, 1993-1998 (Clinics: Chelstone, Chilenje, Matero and Kalingalinga) (Fykesnes et al 2001)

	Age group %				
	15-19 yrs	20-24 yrs	25-29 yrs	30-39 yrs	15-39 yrs
1993	27.6	23.9	26.0	22.4	24.9
1994	22.5	30.0	32.2	25.6	27.7
1998	14.8	28.4	36.7	30.7	27.4

The association with age and parity in the study is reflected in the fact that the correlation coefficient was high at 0.69. Although 11.8% of cases of maternal mortalities due to HIV/AIDS were in primiparas (Table7 and figure 7), the 27.9% were already para 1, 26.5% were para 2 and 13.2% para 3. 8.1% were of parity 6 or more. This illustrates the problem of orphans that result when the mother (and presumably father) dies.

Strategies to mitigate against maternal mortality due to HIV/AIDS

One option for those women who may already have children is to consider avoiding pregnancy to prevent any further risk of disease progression due to pregnancy. For this they would need to know their HIV status. For those identified to be HIV infected during pregnancy, their antenatal care can be optimised to provide multivitamins, antimalarials, and also maternal antiretrovirals in labour to prevent MTCT (together with a dose for the infant). In case of surgical interventions, prophylactic antibiotic should be used. This should be aggressive in those pregnant women who already have AIDS compared to someone who is asymptomatic. In developing countries, with greater use of antiretroviral use, the incidence of maternal mortality due to HIV/AIDS is markedly less. This is not currently feasible in a setting like Zambia, but with initiatives to introduce it in the country the pregnant population could be an important group to include early on.

LIMITATIONS OF THE STUDY

The main limitation in the study was that not all maternal mortalities could be accounted for. Although every effort was made to obtain details of all maternal mortalities as they occurred at UTH (or in the district), some case files were still unavailable. This made a definite diagnosis harder to be able to add to the basic information available on the identified case. Furthermore, any maternal mortalities that may have occurred in other wards (e.g. surgical or medical wards) within the 42 days post delivery or termination would have been missed.

Every effort was made to obtain as much clinical information about maternal mortalities. This was sometimes lacking. Being a retrospective case review certain information could then not be retrieved. Furthermore, patient and community factors, as well as inadequacy of the health system could not be accounted for in all cases.

A decision on whether the cases were due to HIV/AIDS was made on clinical grounds (even though all other causes had been ruled out). HIV status was only available in a limited number of cases.

CONCLUSIONS

HIV/AIDS impacts in a large way on maternal mortality in Lusaka. The direct causes of maternal mortality had decreased over the 1990s from 55.8% of all causes in 1993 to 37.7% in 1999. Correspondingly maternal mortalities due to presumptive HIV/AIDS increased from 22.4% to 39.5%. Other causes had remained steady or declined as a percentage. Although the majority of cases of maternal mortality due to HIV/AIDS were in older women (25-34 years of age), even younger women (younger than 19 years) and much older women (older than 35 years) died of HIV/AIDS. This is in keeping with the prevalence of HIV in the female population in general and the antenatal attendees in particular. In order to decrease maternal mortality due to HIV/AIDS improved public health interventions to prevent primary HIV infection in women of reproductive age and case management in preventing maternal mortality will be needed.

RECOMMENDATIONS

Regarding the study, based on the limitations presented earlier, improved maternal mortality surveillance is needed to capture details of all maternal mortalities, particularly those that occur after the immediate puerperium and in other non obstetrics and gynaeclogy wards. Note keeping should be improved to be able to capture as much information as possible. The importance of HIV/AIDS as a major cause of maternal mortality should spur effort to enhance resources for prevention of HIV in all, including women of reproductive age and improve case management for those who are pregnant.

REFERENCES

Bergstrom S, Sonnerborg A, Osman NB, Libombo A. HIV infection and maternal outcome of pregnancy in Mozambican women: a case-control study. Genitourinary Medicine. 1995; 71(5):323-4.

Bicego G, Ties Boerma T, Ronsmans C. The effect of AIDS on maternal mortality in Malawi and Zimbabwe. AIDS, 2002;16:1078-1084.

Brocklehurst P and French R. The association between maternal HIV infection and perinatal outcome: a systematic review of the literature and meta-analysis. British Journal of Obstetrics and Gynaecology, 1998;105:839-848.

Bulterys M, Chao A, Dushimimana A, Saah A. Fatal complications after Cesarian section in HIV-infected women. AIDS, 1996;10(8):923-4.

CDC. 1993 Revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. MMWR 1992;41(no. RR-17).

Cerne A and Odeback A. Maternal Deaths at the University Teaching Hospital, Lusaka, Zambia, 1989. Minor Field Study Report no 1/90-91, IHCAR, Karolinska Institute, Stockholm, Sweden.

DOH, Government of RSA. Saving Mothers. Report on Confidential Enquiries into Maternal Deaths in South Africa 1998.
Accessed on web: http://www.doh.gov.za/department/index.html
Also reported as: National Committee on Confidential Enquiries into Maternal Deaths. A Review of maternal deaths in South Africa during 1998. South African Medical Journal. 2000, 90:367-373.

DOH, Government of RSA. Second Interim Report on Confidential Enquiries into Maternal Deaths in South Africa. Maternal Deaths for 1999.
Accessed on web: http://www.doh.gov.za/department/index.html

The European Mode of Delivery Collaboration. Elective Caesarean section versus vaginal delivery in prevention of vertical HIV-1 transmission: a randomised clinical trial. Lancet, 1999; 353:1035-1039.

French R and Brocklehurst P. The effect of pregnancy on survival in women infected with HIV: a systematic review of the literature and meta-analysis. British Journal of Obstetrics and Gynaecology. 1998, 105(8):827-835.

Fylkesnes K, Musonda R, Sichone M et al. Declining HIV prevalence and rsik behavious in Zambia: evidence form surveillance and population-based surveys. AIDS. 2001;15(7):907-916.

Grech ES. Obstetric Deaths in Lusaka. Medical Journal of Zambia, 1978;12(2):45-53.

Guay LA, Musoke P, Fleming T, et al. Intrapartum and neonatal single-dose nevirapine compared with zidovudine for prevention of mother-to-child transmission of HIV-1 in Kampala, Uganda: HIVNET 012 randomised trial. Lancet, 1999;354:795-802.

Hickey M U and Kasonde J.M. Maternal Mortality at University Teaching Hospital Lusaka. Medical Journal of Zambia, 1977;11(3):74-78.

Johnstone FD. Pregnancy outcome and pregnancy management in HIV-infected women. In: Johnson MA, Johnstone FD (eds). HIV Infection in women. Edinburgh, Churchill Livingstone, 1993:187-198.

Kilpatrick SJ, Crabtree KE, Kemp A, Geller S. Preventability of maternal deaths: comparison between Zambian and American referral hospitals. Obstetrics and Gynecology. 2002;100 (2):321-6.

Longini IM Jr, Clark WS Byers RH, et al. Statistical analysis of the stages of HIV infection using a Markov model. Statistics in Medicine. 1989, 8(7):831-843.

Mhango C, Rahat R and Arkutu A. Reproductive Mortality in Lusaka, Zambia,1982-83. Studies in Family Planning, 1986;17(5): 243-251.

Mock PA, Shaffer N, Bhadrakom C, et al. Maternal viral load and timing of mother-to-child HIV transmission, Bangkok, Thailand. AIDS, 1999;13:407-414.

Morgan D, Malamba SS, Orem J et al. Survival by AIDS defining condition in rural Uganda. Sexually Transmitted Infections. 2000; 76(3):193-197.

Mwaba P, Mwansa J, Chintu C et al. Clinical presentation, natural history and cumulative death rates of 230 adults with primary cryptococcal meningitis in Zambian AIDS patients treated under local conditions. Postgraduate Medical Journal. 2001; 77(914):769-773.

Post FA, Badri M, Wood R, Maartens G. Aids in Africa – survival according to AIDS-defining illness. South African Medical Journal. 2001; 91(7):583-586.

Semba RD, Kumwenda N, Hoover DR, et al. Human immunodeficiency virus load in breast milk, mastitis, and mother-to-child transmission of human immunodeficiency virus type 1. Journal of Infectious Diseases, 1999;180:93-98.

Sewakambo NK, Geay RH, Ahmed S et al. Mortality associated with HIV infection in rural Rakai district, Uganda. AIDS, 2000; 14:2391-2400.

Taha TE, Miotti P, Liomba G, et al. HIV, maternal death and child survival in Africa. AIDS, 1996; 10(1):111-112.

Temmerman M, Plummer FA, Mirza NB, et al. Infection with HIV as a risk factor for adverse obstetrical outcome. AIDS,1990;4(11):1087-1093.

Temmerman M, Nagelkerke N, Bwayo J, et al. HIV-1 and immunological changes during pregnancy: a comparison between HIV-1-seropositive and HIV-1-seronegative women in Nairobi, Kenya. AIDS, 1995; 9(9):1057-1060.

UNAIDS,WHO. HIV in Pregnancy: A Review. WHO, Geneva, 1999. (UNAIDS/99.35E, WHO/CHS/RHR/99.15).

UNAIDS, UNICEF, WHO. A review of HIV transmission through breastfeeding. (WHO/FRH/NUT/CHD/98.3/UNAIDS 98.5)/UNICEF/PD/NUT/(J)98.1. 1998.

UNAIDS/WHO Epidemiological Fact Sheet. 2002 update. Accessed 8/2002. http://www.unaids.org/hivaidsinfo/statistics/fact_sheets/pdfs/Zambia_en.pdf

WHO. ICD-10: International Statistical Classification of Diseases and Related Health Problems. Tenth Revision. Geneva, World Health Organization. Vol. 1: Tabular list. 1992.

World Health Organization Collaborating Group for the Study of the WHO Staging System. Proposed World Health Organization Staging System for HIV Infection and Disease: preliminary testing by an international collaborative cross-sectional study. AIDS 1993; 7:711-717

WHO. WHO case definitions for AIDS surveillance in adults and adolescents. Weekly Epidemiological Record, 1994;69:273-5.

Wiktor SZ, Ekpini E, Nduati RW. Prevention of mother-to-child transmission of HIV-1 in Africa. AIDS, 1997;11(suppl B):S79-S87.

ZDHS 1996. Central Statistical Office [Zambia] and Ministry of Health and Macro International Inc. 1997. *Zambia Demographic and Health Survey, 1996.* Calverton, Maryland: Central Statistical Office and Macro International Inc.

APPENDIX 1A

1993 CDC Revised Classification System for HIV Infection and Expanded Surveillance Case Definition for AIDS Among Adolescents and Adults

Clinical Categories

The clinical categories of HIV infection are defined as follows:

Category A

Category A consists of one or more of the conditions listed below in an adolescent or adult (greater than or equal to 13 years) with documented HIV infection. Conditions listed in Categories B and C must not have occurred.

- Asymptomatic HIV infection
- Persistent generalized lymphadenopathy
- Acute (primary) HIV infection with accompanying illness or history of acute HIV infection (29,30)

Category B

Category B consists of symptomatic conditions in an HIV-infected adolescent or adult that are not included among conditions listed in clinical Category C and that meet at least one of the following criteria: a) the conditions are attributed to HIV infection or are indicative of a defect in cell-mediated immunity; or b) the conditions are considered by physicians to have a clinical course or to require management that is complicated by HIV infection. Examples of conditions in clinical Category B include, but are not limited to:

- Bacillary angiomatosis
- Candidiasis, oropharyngeal (thrush)
- Candidiasis, vulvovaginal; persistent, frequent, or poorly responsive to therapy
- Cervical dysplasia (moderate or severe)/cervical carcinoma in situ
- Constitutional symptoms, such as fever (38.5 C) or diarrhea lasting greater than 1 month

- Hairy leukoplakia, oral
- Herpes zoster (shingles), involving at least two distinct episodes or more than one dermatome
- Idiopathic thrombocytopenic purpura
- Listeriosis
- Pelvic inflammatory disease, particularly if complicated by tubo-ovarian abscess
- Peripheral neuropathy

For classification purposes, Category B conditions take precedence over those in Category A. For example, someone previously treated for oral or persistent vaginal candidiasis (and who has not developed a Category C disease) but who is now asymptomatic should be classified in clinical Category B.

Category C

Category C includes the clinical conditions listed in the AIDS surveillance case definition (Appendix B). For classification purposes, once a Category C condition has occurred, the person will remain in Category C.

EXPANSION OF THE CDC SURVEILLANCE CASE DEFINITION FOR AIDS

In 1991, CDC, in collaboration with the Council of State and Territorial Epidemiologists (CSTE), proposed an expansion of the AIDS surveillance case definition. This proposal was made available for public comment in November 1991 and was discussed at an open meeting on September 2, 1992. Based on information presented and reviewed during the public comment period and at the open meeting, CDC, in collaboration with CSTE, has expanded the AIDS surveillance case definition to include all HIV-infected persons with CD4+ T-lymphocyte counts of less than 200 cells/uL or a CD4+ percentage of less than 14. In addition to retaining the 23 clinical conditions in the previous AIDS surveillance definition, the expanded definition includes pulmonary tuberculosis (TB), recurrent pneumonia, and invasive cervical cancer. * This expanded definition requires laboratory confirmation of HIV infection in persons with a CD4+ T-lymphocyte count of less than 200 cells/uL or with one of the added clinical conditions. This expanded definition for reporting cases to CDC becomes effective January 1, 1993.

Diagnostic criteria for AIDS-defining conditions included in the expanded surveillance case definition are presented in Appendix C and Appendix D.

In the revised HIV classification system, persons in subcategories A3, B3, and C3 meet the immunologic criteria of the surveillance case definition, and those persons with conditions in subcategories C1, C2, and C3 meet the clinical criteria for surveillance purposes (Table 1).

CONCLUSION

The revised HIV classification system provides uniform and simple criteria for categorizing conditions among adolescents and adults with HIV infection and should facilitate efforts to evaluate current and future health-care and referral needs for persons with HIV infection. The addition of a measure of severe immunosuppression, as defined by a CD4+ T-lymphocyte count of less than 200 cells/uL or a CD4+ percentage of less than 14, reflects the standard of immunologic monitoring for HIV-infected persons and will enable AIDS surveillance data to more accurately represent those who are recognized as being immunosuppressed, who are in greatest need of close medical follow-up, and who are at greatest risk for the full spectrum of severe HIV-related morbidity. The addition of three clinical conditions -- pulmonary TB, recurrent pneumonia, and invasive cervical cancer -- to AIDS surveillance criteria reflects the documented or potential importance of these diseases in the HIV epidemic. Two of these conditions (pulmonary TB and cervical cancer) are preventable if appropriate screening tests are linked with proper follow-up. The third, recurrent pneumonia, reflects the importance of pulmonary infections not included in the 1987 definition as leading causes of HIV-related morbidity and mortality. Successful implementation of expanded surveillance criteria will require the extension of existing safeguards to protect the security and confidentiality of AIDS surveillance information.

APPENDIX A. Equivalences for CD4+ T-lymphocyte count and percentage of total lymphocytes

Compared with the absolute CD4+ T-lymphocyte count, the percentage of CD4+ T-cells of total lymphocytes (or CD4+ percentage) is less subject to variation on

repeated measurements (18,74). However, data correlating natural history of HIV infection with the CD4+ percentage have not been as consistently available as data on absolute CD4+ T-lymphocyte counts (14-16,18,19,21,31). Therefore, the revised classification system emphasizes the use of CD4+ T-lymphocyte counts but allows for the use of CD4+ percentages.

Equivalences (Table A1) were derived from analyses of more than 15,500 lymphocyte subset determinations from seven different sources: one multistate study of diseases in HIV-infected adolescents and adults (59) and six laboratories (two commercial, one research, and three university-based). The six laboratories are involved in proficiency testing programs for lymphocyte subset determinations. In the analyses, concordance was defined as the proportion of patients classified as having CD4+ T-lymphocyte counts in a particular range among patients with a given CD4+ percentage. A threshold value of the CD4+ percentage was calculated to obtain optimal concordance with each stratifying value of the CD4+ T-lymphocyte counts (i.e., less than 200/uL and greater than or equal to 500/uL). The thresholds for the CD4+ percentages that best correlated with a CD4+ T-lymphocyte count of less than 200/uL varied minimally among the seven data sources (range, 13%-14%; median, 13%; mean, 13.4%). The average concordance for a CD4+ percentage of less than 14 and a CD4+ T-lymphocyte count of less than 200/uL was 90.2%. The threshold for the CD4+ percentages most concordant with CD4+ T-lymphocyte counts of greater than or equal to 500/uL varied more widely among the seven data sources (range, 22.5%-35%; median, 29%; mean, 29.1%). This wide range of percentages optimally concordant with greater than or equal to 500/uL CD4+ T-lymphocytes makes the concordance at this stratifying value less certain. The average concordance for a CD4+ percentage of greater than or equal to 29 and a CD4+ T-lymphocyte count of greater than or equal to 500/uL was 85% (CDC, unpublished data). Clinicians and other practitioners must recognize that these suggested equivalences may not always correspond with values observed in individual patients.

APPENDIX B. Conditions included in the 1993 AIDS surveillance case definition

- Candidiasis of bronchi, trachea, or lungs

- Candidiasis, esophageal
- Cervical cancer, invasive *
- Coccidioidomycosis, disseminated or extrapulmonary
- Cryptococcosis, extrapulmonary
- Cryptosporidiosis, chronic intestinal (greater than 1 month's duration)
- Cytomegalovirus disease (other than liver, spleen, or nodes)
- Cytomegalovirus retinitis (with loss of vision)
- Encephalopathy, HIV-related
- Herpes simplex: chronic ulcer(s) (greater than 1 month's duration); or bronchitis, pneumonitis, or esophagitis
- Histoplasmosis, disseminated or extrapulmonary
- Isosporiasis, chronic intestinal (greater than 1 month's duration)
- Kaposi's sarcoma
- Lymphoma, Burkitt's (or equivalent term)
- Lymphoma, immunoblastic (or equivalent term)
- Lymphoma, primary, of brain
- Mycobacterium avium complex or M. kansasii, disseminated or extrapulmonary
- Mycobacterium tuberculosis, any site (pulmonary * or extrapulmonary)
- Mycobacterium, other species or unidentified species, disseminated or extrapulmonary
- Pneumocystis carinii pneumonia
- Pneumonia, recurrent *
- Progressive multifocal leukoencephalopathy
- Salmonella septicemia, recurrent
- Toxoplasmosis of brain
- Wasting syndrome due to HIV

*Added in the 1993 expansion of the AIDS surveillance case definition.

APPENDIX C. Definitive diagnostic methods for diseases indicative of AIDS Cryptosporidiosis, Isosporiasis, Kaposi's sarcoma, Lymphoma, Pneumocystis carinii pneumonia, Progressive multifocal leukoencephalopathy, Toxoplasmosis, Cervical cancer Microscopy (histology or cytology)

Candidiasis Gross inspection by endoscopy or autopsy or by microscopy (histology or cytology) on a specimen obtained directly from the tissues affected (including scrapings from the mucosal surface), not from a culture
Coccidioidomycosis, Cryptococcosis, Cytomegalovirus, Herpes simplex virus, Histoplasmosis Microscopy (histology or cytology), culture, or detection of antigen in a specimen obtained directly from the tissues affected or a fluid from those tissues
Tuberculosis, Other mycobacteriosis, Salmonellosis Culture
HIV encephalopathy (dementia) Clinical findings of disabling cognitive or motor dysfunction interfering with occupation or activities of daily living, progressing over weeks to months, in the absence of a concurrent illness or condition other than HIV infection that could explain the findings. Methods to rule out such concurrent illness and conditions must include cerebrospinal fluid examination and either brain imaging (computed tomography or magnetic resonance) or autopsy.
HIV wasting syndrome Findings of profound involuntary weight loss of greater than 10% of baseline body weight plus either chronic diarrhea (at least two loose stools per day for greater than or equal to 30 days), or chronic weakness and documented fever (for greater than or equal to 30 days, intermittent or constant) in the absence of a concurrent illness or condition other than HIV infection that could explain the findings (e.g., cancer, tuberculosis, cryptosporidiosis, or other specific enteritis).
Pneumonia, recurrent Recurrent (more than one episode in a 1-year period), acute (new x-ray evidence not present earlier) pneumonia diagnosed by both: a) culture (or other organism-specific diagnostic method) obtained from a clinically reliable specimen of a pathogen that typically causes pneumonia (other than Pneumocystis carinii or Mycobacterium tuberculosis), and b) radiologic evidence of pneumonia; cases that do not have laboratory confirmation of a causative organism for one of the episodes of pneumonia will be considered to be presumptively diagnosed.

APPENDIX D. Suggested guidelines for presumptive diagnosis of diseases indicative of AIDS

Candidiasis of esophagus

a. Recent onset of retrosternal pain on swallowing; AND

b. Oral candidiasis diagnosed by the gross appearance of white patches or plaques on an erythematous base or by the microscopic appearance of fungal mycelial filaments from a noncultured specimen scraped from the oral mucosa.

Cytomegalovirus retinitis A characteristic appearance on serial ophthalmo-scopic examinations (e.g., discrete patches of retinal whitening with distinct borders, spreading in a centrifugal manner along the paths of blood vessels, progressing over several months, and frequently associated with retinal vasculitis, hemorrhage, and necrosis). Resolution of active disease leaves retinal scarring and atrophy with retinal pigment epithelial mottling.

Mycobacteriosis Microscopy of a specimen from stool or normally sterile body fluids or tissue from a site other than lungs, skin, or cervical or hilar lymph nodes that shows acid-fast bacilli of a species not identified by culture.

Kaposi's sarcoma A characteristic gross appearance of an erythematous or violaceous plaque-like lesion on skin or mucous membrane. (Note: Presumptive diagnosis of Kaposi's sarcoma should not be made by clinicians who have seen few cases of it.)

Pneumocystis carinii pneumonia

a. A history of dyspnea on exertion or nonproductive cough of recent onset (within the past 3 months); AND

b. Chest x-ray evidence of diffuse bilateral interstitial infiltrates or evidence by gallium scan of diffuse bilateral pulmonary disease; AND

c. Arterial blood gas analysis showing an arterial pO((2)) of less than 70 mm Hg or a low respiratory diffusing capacity (less than 80% of predicted values) or an increase in the alveolar-arterial oxygen tension gradient; AND

d. No evidence of a bacterial pneumonia.

Pneumonia, recurrent Recurrent (more than one episode in a 1-year period), acute (new symptoms, signs, or x-ray evidence not present earlier) pneumonia diagnosed on clinical or radiologic grounds by the patient's physician.

Toxoplasmosis of brain

a. Recent onset of a focal neurologic abnormality consistent with intracranial disease or a reduced level of consciousness; AND

b. Evidence by brain imaging (computed tomography or nuclear magnetic resonance) of a lesion having a mass effect or the radiographic appearance of which is enhanced by injection of contrast medium; AND

c. Serum antibody to toxoplasmosis or successful response to therapy for toxoplasmosis.

Tuberculosis, pulmonary When bacteriologic confirmation is not available, other reports may be considered to be verified cases of pulmonary tuberculosis if the criteria of the Division of Tuberculosis Elimination, National Center for Prevention Services, CDC, are used. The criteria in use as of January 1, 1993, are available in MMWR 1990;39(No. RR-13):39- 40.

APPENDIX 1B

WHO CLINICAL DISEASE STAGES OF HIV DISEASE

The four stages of WHO clinical staging system are as follows:

Clinical stage 1: Asymptomatic or Generalized Lymphadenopathy (PGL)
Asymptomatic infection
Persistent generalized lymphadenopathy
Acute retroviral infection

Performance score: asymptomatic, normal activity;

Clinical stage 2: Early (mild) Disease
Unintentional weight loss, <10% of body weight
Minor mucocutaneous manifestations
Herpes zoster within the previous 5 years
Recurrent upper respiratory tract infections

And/or performance score: symptoms but nearly fully ambulatory;

Clinical stage 3: Intermediate (moderate) Disease
Unintentional weight loss, >10%of body weight
Chronic diarrhea, >1 month
Prolonged fever, (intermittent or constant) > 1 month
Oral candidiasis
Oral hairy leukoplakia
Pulmonary tuberculosis (typical or atypical) with the past year
Severe bacterial infections
Vulvovaginal candidiasis, chronic or poorly responsive to therapy

And/or performance score: bed-ridden <50% of normal daytime but > normal during the previous month;

Clinical stage 4: Late (severe) Disease (basically equivalent to AIDS)

HIV wasting syndrome

Pneumocystis carinii pneumonia

Toxoplasmosis of the brain

Cryptosporidiosis with diarrhea

Isosporiasis with diarrhea

Cryptococcus, extra pulmonary

Cytomegalovirus of an organ other than the liver, spleen of lymph node

Herpes simplex virus, mucutaneous (>1 month) or visceral

Progressive multifocal leukoencephalopathy

Any disseminated endemic mycosis

Candidiasis of the esophagus, trachea, bronchi, or lungs

Atypical mycobacteriosis, disseminated

Non-typhoid *Salmonella* septicemia

Extra pulmonary tuberculosis

Lymphoma

Kaposi=s sarcoma

HIV encephalopathy

And/or performance score: bed-ridden, >50% of normal daytime during the past month

World Health Organization Collaborating Group for the Study of the WHO Staging System. Proposed World Health Organization Staging System for HIV Infection and Disease: preliminary testing by an international collaborative cross-sectional study. AIDS 1993; 7:711-717

APPENDIX 2 – DISAGGREGATED RESULTS

MATERNAL DEATHS BY CLASSIFICATION AND CAUSE (1993/96/99)

	1993		1996		1999		All	
	n	%	n	%	n	%	n	%
MATERNAL DEATHS BY TYPE								
Direct	92	55.8	55	38.2	80	37.7	227	43.8
Indirect	36	21.8	52	36.1	48	22.6	136	26.3
AIDS (indirect)	37	22.4	37	25.7	84	39.6	158	30.5
Total	**165**	100.0	**144**	100.0	**212**	100.0	**521**	100.6
DIRECT MATERNAL DEATHS								
Abortion	39	42.4	11	20.0	25	31.3	75	33.0
Haemorrhage	19	20.7	19	34.5	16	20.0	54	23.8
Eclampsia	11	12.0	14	25.5	22	27.5	47	20.7
Puerperal sepsis	19	20.7	11	20.0	15	18.8	45	19.8
Direct other	4	4.3	0	0.0	2	2.5	6	2.6
Total	**92**	100.0	**55**	100.0	**80**	100.0	**227**	100.0
INDIRECT MATERNAL DEATHS (EXCLUDING AIDS)								
Malaria	25	69.4	46	88.5	27	56.3	98	72.1
Meningitis	4	11.1	1	1.9	9	18.8	14	10.3
Indirect other	7	19.4	5	9.6	12	25.0	24	17.6
Total	**36**	100.0	**52**	100.0	**48**	100.0	136	100.0
DIRECT AND INDIRECT (INCLUDING AIDS)								
Abortion	39	23.6	11	7.6	25	11.8	75	14.4
Haemorrhage	19	11.5	19	13.2	16	7.5	54	10.4
Eclampsia	11	6.7	14	9.7	22	10.4	47	9.0
Puerperal sepsis	19	11.5	11	7.6	15	7.1	45	8.6
Other direct	4	2.4	0	0.0	2	0.9	6	1.2
Malaria	25	15.2	46	31.9	27	12.7	98	18.8
Meningitis	4	2.4	1	0.7	9	4.2	14	2.7
Other indirect	7	4.2	5	3.5	12	5.7	24	4.6
AIDS (indirect)	37	22.4	37	25.7	84	39.6	158	30.3
Total	**165**	100.0	**144**	100.0	**212**	100.0	**521**	100.0
ALL CAUSES (COLLAPSING CAUSE CATEGORIES)								
Abortion	39	23.6	11	7.6	25	11.8	75	14.4
Haemorrhage	19	11.5	19	13.2	16	7.5	54	10.4
Eclampsia	11	6.7	14	9.7	22	10.4	47	9.0
Puerperal sepsis	19	11.5	11	7.6	15	7.1	45	8.6
Malaria	25	15.2	46	31.9	27	12.7	98	18.8
All other	15	9.1	6	4.2	23	10.8	44	8.4
AIDS indirect	37	22.4	37	25.7	84	39.6	158	30.3
Total	**165**	100.0	**144**	100.0	**212**	100.0	**521**	100.0

Age Distribution All Causes

	93		96		99		all	
	n	%	n	%	n	%	n	%
10-15yrs	4	2.4	1	0.7	1	0.5	6	1.2
16-19	27	16.4	22	15.3	18	8.5	67	12.9
20-24	54	32.7	39	27.1	65	30.7	158	30.3
25-29	38	23.0	37	25.7	65	30.7	140	26.9
30-34	23	13.9	25	17.4	40	18.9	88	16.9
35-39	15	9.1	16	11.1	14	6.6	45	8.6
40+	4	2.4	2	1.4	8	3.8	14	2.7
missing	0	0.0	2	1.4	1	0.5	3	0.6
total	**165**	100.0	**144**	100.0	**212**	100.0	**521**	100.0
mean	25.3		26.2		26.6		26.1	
median	24		26		26		25	
SD/SEM	6.7/0.52		6.1/0.51		6.0/0.41		6.3/0.27	
Range	34 (14-48)		27 (15-42)		29 (15-44)		34 (14-48)	

Age Distribution All Causes (age categories collapsed)

	93		96		99		all	
	n	%	n	%	n	%	n	%
10-19yrs	31	19.4	23	16.0	19	9.0	74	14.2
20-24	54	32.7	39	27.1	65	30.7	158	30.3
25-34	61	37.0	62	43.1	105	49.5	228	43.8
35+	19	10.9	18	12.5	22	10.4	58	11.1
missing	0	0.0	2	1.4	1	0.5	3	0.6
total	**165**	**100.0**	**144**	**100.0**	**212**	**100.0**	**521**	**100.0**

MEAN AGES BY YEAR AND CAUSE (ALL CAUSES)

	Ab	Haem	Ecl	P Seps	Other direct	Mal	Mening	Other indir	AIDS	All	
93 (n)	39	19	11	19	4	25	4	7	37	**165**	
93 (age)	25.3	29.7	24.6	22.3	25.5	25.1	25.8	25.4	25.2	**25.3**	
96 (n)	11	18	14	11	-	45	1	5	37	**142**	2 missing
96 (age)	24	30.4	24.9	22.3	-	24.7	23	25	28.6	**26.3**	
99 (n)	25	16	22	15	2	26	9	12	84	**211**	1 missing
99 (age)	27	31	26.1	22	27.5	25.1	28.2	27.3	26.7	**26.6**	
all yrs (n)	75	53	47	45	6	96	14	24	158	**518**	3 missing
All yrs (mean)	25.7	30.3	25.4	22.2	26.2	24.9	27.1	26.3	26.7	**26.1**	
compare*	**0.09**	**<0.01**	0.08	**<0.01**	0.99	**0.03**	0.54	0.42	**ref**		

* comapring mean age for maternal mortality categories to AIDS (all)

MEAN AGES BY YEAR AND CAUSE (CAUSES COLLAPSED)

	Ab	Haem	Ecl	P Seps	Mal	All other	AIDS	All	
93 (n)	39	19	11	19	25	15	37	**165**	
93 (age)	25.3	29.7	24.6	22.3	25.1	25.5	25.2	**25.3**	
compare*	0.4	0.01	0.27	0.03	0.85	0.87	**ref**		
96 (n)	11	18	14	11	45	6	37	**142**	2 missing
96 (age)	24	30.4	24.9	22.3	24.7	24.7	28.6	**26.3**	
compare*	0.01	0.25	0.08	<0.01	0.01	0.09	**ref**		
99 (n)	25	16	22	15	26	23	84	**211**	1 missing
99 (age)	27	31	26.1	22	25.1	27.7	26.7	**26.6**	
compare*	0.66	0.1	0.49	<0.01	0.22	0.51	**ref**		
all yrs (n)	75	53	47	45	96	44	158	**518**	3 missing
All yrs (mean)	25.7	30.3	25.4	22.2	24.9	26.5	26.8	**26.1**	
compare*	**0.07**	**<0.01**	0.06	**<0.01**	**0.02**	0.71	**ref**		

* comapring mean age for maternal mortality categories to AIDS (all)

DISTRIBUTION OF CAUSES BY AGE AND YEAR

1993 - causes collapsed (ages collapsed)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	11	28.2	0	0.0	1	9.1	8	42.1	4	16.0	4	26.7	4	10.8	32	19.4
20-24	10	25.6	5	26.3	6	54.5	5	26.3	8	32.0	3	20.0	17	45.9	54	32.7
25-34	12	30.8	9	47.4	2	18.2	5	26.3	12	48.0	7	46.7	14	37.8	61	37.0
35+	6	15.4	5	26.3	2	18.2	1	5.3	1	4.0	1	6.7	2	5.4	18	10.9
missing																
total	39	100.0	19	100.0	11	100.0	19	100.0	25	100.0	15	100.0	37	100.0	**165**	100.0
mean age	**25.3**		**29.7**		**24.6**		**22.3**		**25.1**		**25.5**		**24.8**		**25.3**	

1993 - causes collapsed (full age range)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	11	28.2	0	0.0	1	9.1	8	42.1	4	16.0	4	26.7	4	10.8	32	19.4
20-24	10	25.6	5	26.3	6	54.5	5	26.3	8	32.0	3	20.0	17	45.9	54	32.7
25-29	7	17.9	4	21.1	2	18.2	3	15.8	8	32.0	4	26.7	10	27.0	38	23.1
30-34	5	12.8	5	26.3	0	0.0	2	10.5	4	16.0	3	20.0	4	10.8	23	13.9
35+	6	15.4	5	26.3	2	18.2	1	5.3	1	4.0	1	6.7	2	5.4	18	10.9
missing																
total	39	100.0	19	100.0	11	100.0	19	100.0	25	100.0	15	100.0	37	100.0	**165**	100.0
mean age	**25.3**		**29.7**		**24.6**		**22.3**		**25.1**		**25.5**		**24.8**		**25.3**	

1996 - causes collapsed (ages collapsed)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	1	9.1	0	0	5	35.7	4	36.4	11	23.9	0	0.0	2	5.4	23	16.0
20-24	6	54.5	3	15.8	3	21.4	3	27.3	12	26.1	4	66.7	8	21.6	39	27.1
25-34	4	36.4	9	47.4	3	21.4	4	36.4	21	45.7	1	16.7	20	54.1	62	43.1
35+	0	0.0	6	31.6	3	21.4	0	0.0	1	2.2	1	16.7	7	18.9	18	12.5
missing			1	5.3					1	2.2					2	1.4
total	11	100.0	19	100.0	14	100	11	100.0	46	100.0	6	100.0	37	100.0	**144**	100.0
mean age	**24.0**		**30.4**		**24.9**		**22.3**		**24.7**		**24.7**		**28.6**		**26.3**	

1996 - causes collapsed (full age range)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	1	9.1	0	0.0	5	35.7	4	36.4	11	23.9	0	0.0	2	5.4	23	16.0
20-24	6	54.5	3	15.8	3	21.4	3	27.3	12	26.1	4	66.7	8	21.6	39	27.1
25-29	3	27.3	4	21.1	3	21.4	4	36.4	11	23.9	1	16.7	11	29.7	37	25.7
30-34	1	9.1	5	26.3	0	0.0	0	0.0	10	21.7	0	0.0	9	24.3	25	17.4
35+	0	0.0	6	31.6	3	21.4	0	0.0	1	2.2	1	16.7	7	18.9	18	12.5
missing			1	5.3					1	2.2					2	1.4
total	11	100.0	19	100.0	14	100.0	11	100.0	46	100.0	6	100.0	37	100.0	**144**	100.0
mean age	**24.0**		**30.4**		**24.9**		**22.3**		**24.7**		**24.7**		**28.6**		**26.3**	

DISTRIBUTION OF CAUSES BY AGE AND YEAR

1999 - causes collapsed (ages collapsed)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	1	4.0	0	0.0	4	18.2	4	26.7	4	14.8	2	8.7	4	4.8	19	9.0
20-24	7	28.0	6	37.5	7	31.8	8	53.3	7	25.9	4	17.4	26	31.0	65	30.7
25-34	16	64.0	4	25.0	8	36.4	3	20.0	14	51.9	14	60.9	46	54.8	105	49.5
35+	1	4.0	6	37.5	3	13.6	0	0.0	1	3.7	3	13.0	8	9.5	22	10.4
missing									1	3.7					1	0.5
total	25	100.0	16	100.0	22	100.0	15	100.0	27	100.0	23	100.0	84	100.0	**212**	100.0
mean age	27.0		31.0		26.1		22.0		25.1		27.7		26.7		26.6	

1999 - causes collapsed (full age range)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	1	4.0	0	0.0	4	18.2	4	26.7	4	14.8	2	8.7	4	4.8	19	9.0
20-24	7	28.0	6	37.5	7	31.8	8	53.3	7	25.9	4	17.4	26	31.0	65	30.7
25-29	8	32.0	1	6.3	3	13.6	1	6.7	11	40.7	8	34.8	33	39.3	65	30.7
30-34	8	32.0	3	18.8	5	22.7	2	13.3	3	11.1	6	26.1	13	15.5	40	18.9
35+	1	4.0	6	37.5	3	13.6	0	0.0	1	3.7	3	13.0	8	9.5	22	10.4
missing									1	3.7					1	0.5
total	25	100.0	16	100.0	22	100.0	15	100.0	27	100.0	23	100.0	84	100.0	**212**	100.0
mean age	27.0		31.0		26.1		22.0		25.1		27.7		26.7		26.6	

1993/6/9 - causes collapsed (ages collapsed)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	13	17.3	0	0.0	10	21.3	16	35.6	19	19.4	6	13.6	10	6.3	74	14.2
20-24	23	30.7	14	25.9	16	34.0	16	35.6	27	27.6	11	25.0	51	32.3	158	30.3
25-34	32	42.7	22	40.7	13	27.7	12	26.7	47	48.0	22	50.0	80	50.6	228	43.8
35+	7	9.3	17	31.5	8	17.0	1	2.2	3	3.1	5	11.4	17	10.8	58	11.1
missing	0	0.0	1	1.9	0	0.0	0	0.0	2	2.0	0	0.0	0	0.0	3	0.6
total	75	100.0	54	100.0	47	100.0	45	100.0	98	100.0	44	100.0	158	100.0	**521**	100.0
mean age	25.7		30.3		25.4		22.2		24.9		26.5		26.7		26.1	

1993/6/9 - causes collapsed (full age range)

	Ab	%	Haem	%	Ecl	%	P Seps	%	Mal	%	All other	%	AIDS	%	All	%
10-19yrs	13	17.3	0	0.0	10	21.3	16	35.6	19	19.4	6	13.6	10	6.3	74	14.2
20-24	23	30.7	14	25.9	16	34.0	16	35.6	27	27.6	11	25.0	51	32.3	158	30.3
25-29	18	24.0	9	16.7	8	17.0	8	17.8	30	30.6	13	29.5	54	34.2	140	26.9
30-34	14	18.7	13	24.1	5	10.6	4	8.9	17	17.3	9	20.5	26	16.5	88	16.9
35+	7	9.3	17	31.5	8	17.0	1	2.2	3	3.1	5	11.4	17	10.8	58	11.1
missing	0	0.0	1	1.9	0	0.0	0	0.0	2	2.0	0	0.0	0	0.0	3	0.6
total	75	100.0	54	100.0	47	100.0	45	100.0	98	100.0	44	100.0	158	100.0	**521**	100.0
mean age	25.7		30.3		25.4		22.2		24.9		26.5		26.7		26.1	

PARITIES AND ASCERTAINMENT (ALL YEARS)

	1993		1996		1999		all	
	n	%	n	%	n	%	n	%
Para 0	23	24.2	18	15.8	23	11.1	64	15.3
1	29	30.5	33	28.9	57	27.4	119	28.5
2	21	22.1	22	19.3	50	24.0	93	22.3
3	6	6.3	15	13.2	35	16.8	56	13.4
4	6	6.3	10	8.8	11	5.3	27	6.5
5	1	1.1	7	6.1	13	6.3	21	5.0
6	4	4.2	4	3.5	8	3.8	16	3.8
7	2	2.1	2	1.8	7	3.4	11	2.6
8	2	2.1	2	1.8	3	1.4	7	1.7
9	1	1.1	0	0.0	1	0.5	2	0.5
10	0	0.0	0	0.0	0	0.0	0	0.0
11	0	0.0	1	0.9	0	0.0	1	0.2
sub-total	**95**	100.0	**114**	100.0	**208**	100.0	**417**	100.0
missing	**70**		**30**		**4**		**104**	
all	**165**		**144**		**212**		**521**	
Ascertainment (%)	**57.6**		**79.2**		**98.1**		**80.0**	

PARITIES AND ASCERTAINMENT (ALL YEARS) (Parities collapsed)

	1993		1996		1999		all	
Para 0	23	24.2	18	15.8	23	11.1	64	15.3
1	29	30.5	33	28.9	57	27.4	119	28.5
2	21	22.1	22	19.3	50	24.0	93	22.3
3	6	6.3	15	13.2	35	16.8	56	13.4
4	6	6.3	10	8.8	11	5.3	27	6.5
5	1	1.1	7	6.1	13	6.3	21	5.0
6 or more	9	9.5	9	7.9	19	9.1	37	8.9
sub-total	**95**	100.0	**114**	100.0	**208**	100.0	**417**	100.0
missing	**70**		**30**		**4**		**104**	
all	**165**		**144**		**212**		**521**	
Ascertainment (%)	**57.6**		**79.2**		**98.1**		**80.0**	

PARITY BY ALL CAUSES (1993)

	Causes										
	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All	%
Para 0	4	2	2	3	-	7	1	-	4	23	24.2
1	2	5	3	5	-	2	2	2	8	29	30.5
2	3	3	1	1	-	5	-	-	8	21	22.1
3	1	-	1	1	-	2	-	-	1	6	6.3
4	-	2	-	-	-	1	1	-	2	6	6.3
5	-	-	-	-	-	1	-	-	-	1	1.1
6	1	1	1	-	-	1	-	-	-	4	4.2
7	-	1	-	-	-	1	-	-	-	2	2.1
8	-	-	-	-	-	-	-	-	2	2	2.1
9	1	-	-	-	-	-	-	-	-	1	1.1
10	-	-	-	-	-	-	-	-	-	0	0.0
11	-	-	-	-	-	-	-	-	-	0	0.0
											100.0
sub-total	12	14	8	10	0	20	4	2	25	95	
missing	27	5	3	9	4	5	0	5	12	70	
all	39	19	11	19	4	25	4	7	37	165	
Ascertain (%)	30.8	73.7	72.7	52.6	0.0	80.0	100.0	28.6	67.6	57.6	

PARITY AND CAUSES - 1993 (causes collapsed, parities collapsed)

	CAUSES								
	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All	%
Para 0	4	2	2	3	7	1	4	23	24.2
1	2	5	3	5	2	4	8	28	29.5
2	3	3	1	1	5	-	8	21	22.1
3	1	-	1	1	2	-	1	6	6.3
4	-	2	-	-	1	1	2	6	6.3
5	-	-	-	-	1	-	-	1	1.1
6 or more	2	2	1	-	2	-	2	10	10.5
									100.0
sub-total	12	14	8	10	20	6	25	95	
missing	27	5	3	9	5	9	12	70	
all	39	19	11	19	25	15	37	165	
Ascertain (%)	30.8	73.7	72.7	52.6	80.0	40.0	67.6	57.6	

PARITY BY ALL CAUSES (1996)

	CAUSES										
	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All	%
	1	2	3	4	5	6	7	8	9	all	%
Para 0	3	1	4	2	-	6	-	-	2	18	15.8
1	3	4	3	6	-	12	1	-	4	33	28.9
2	-	3	2	1	-	5	-	2	9	22	19.3
3	-	3	1	1	-	4	-	1	5	15	13.2
4	-	3	2	1	-	1	-	1	2	10	8.8
5	1	2	2	-	-	-	-	-	2	7	6.1
6	1	-	-	-	-	-	-	-	3	4	3.5
7	-	1	-	-	-	-	-	-	1	2	1.8
8	-	1	-	-	-	1	-	-	-	2	1.8
9	-	-	-	-	-	-	-	-	-	0	0.0
10	-	-	-	-	-	-	-	-	-	0	0.0
11	-	-	-	-	-	-	-	-	1	1	0.9
											100.0
sub-total	8	18	14	11	0	29	1	4	29	114	
missing	3	1	0	0	0	17	0	1	8	30	
all	11	19	14	11	0	46	1	5	37	144	
Ascertain (%)	72.7	94.7	100.0	100.0	n/a	63.0	100.0	80.0	78.4	79.2	

PARITY AND CAUSES - 1996 (causes collapsed, parities collapsed)

	CAUSES								
	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All	%
Para 0	3	1	4	2	6	-	2	18	15.8
1	3	4	3	6	12	1	4	33	28.9
2	-	3	2	1	5	2	9	22	19.3
3	-	3	1	1	4	1	5	15	13.2
4	-	3	2	1	1	1	2	10	8.8
5	1	2	2	-	-	-	2	7	6.1
6 or more	1	2	-	-	1	-	5	9	7.9
									100.0
sub-total	8	18	14	11	29	5	29	114	
missing	3	1	0	0	17	1	8	30	
all	11	19	14	11	46	6	37	144	
Ascertain (%)	72.7	94.7	100.0	100.0	63.0	83.3	78.4	79.2	

PARITY BY ALL CAUSES (1999)

	CAUSES										
	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All	%
Para 0	4	2	-	-	-	6	-	1	10	23	11.1
1	5	2	7	6	-	5	4	2	26	57	27.4
2	6	2	7	4	1	5	2	4	19	50	24.0
3	6	4	2	3	-	6	2	-	12	35	16.8
4	-	-	1	1	-	1	1	1	6	11	5.3
5	1	3	1	1	-	1	-	1	5	13	6.3
6	2	-	1	-	1	1	-	2	1	8	3.8
7	-	2	2	-	-	1	-	1	1	7	3.4
8	-	1	1	-	-	-	-	-	1	3	1.4
9	-	-	-	-	-	-	-	-	1	1	0.5
10	-	-	-	-	-	-	-	-	-	0	0.0
11	-	-	-	-	-	-	-	-	-	0	0.0
											100.0
sub-total	24	16	22	15	2	26	9	12	82	208	
missing	1	0	0	0	0	1	0	0	2	4	
all	25	16	22	15	2	27	9	12	84	212	
Ascertain (%)	96.0	100.0	100.0	100.0	100.0	96.3	100.0	100.0	97.6	98.1	

PARITY AND CAUSES - 1999 (causes collapsed, parities collapsed)

	CAUSES								
	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All	%
Para 0	4	2	-	-	6	1	10	23	11.1
1	5	2	7	6	5	6	26	57	27.4
2	6	2	7	4	5	7	19	50	24.0
3	6	4	2	3	6	2	12	35	16.8
4	-	-	1	1	1	2	6	11	5.3
5	1	3	1	1	1	1	5	13	6.3
6 or more	2	3	4	-	2	4	4	19	9.1
									100.0
sub-total	24	16	22	15	26	23	82	208	
missing	1	0	0	0	1	0	2	4	
all	25	16	22	15	27	23	84	212	
Ascertain (%)	96.0	100.0	100.0	100.0	96.3	100.0	97.6	98.1	

PARITY BY ALL CAUSES (1993/6/9)

	CAUSES										
	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All	%
Para 0	11	5	6	5	-	19	1	1	16	64	15.3
1	10	11	13	17	-	19	7	4	38	119	28.5
2	9	8	10	6	1	15	2	6	36	93	22.3
3	7	7	4	5	-	12	2	1	18	56	13.4
4	0	5	3	2	-	2	2	2	10	26	6.2
5	2	5	3	1	-	3	-	1	7	22	5.3
6	4	1	2	-	1	2	-	2	4	16	3.8
7	-	4	2	-	-	2	-	1	2	11	2.6
8	-	2	1	-	-	1	-	-	3	7	1.7
9	1	-	-	-	-	-	-	-	1	2	0.5
10	-	-	-	-	-	-	-	-	-	0	0.0
11	-	-	-	-	-	-	-	-	1	1	0.2
											100.0
sub-total	44	48	44	36	2	75	14	18	136	417	
missing	31	6	3	9	4	23	0	6	22	104	
all	75	54	47	45	6	98	14	24	158	521	
Ascertain (%)	58.7	88.9	93.6	80.0	33.3	76.5	100.0	75.0	86.1	80.0	

PARITY AND CAUSES – 1993/6/9 (causes collapsed, parities collapsed)

	CAUSES								
	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All	%
Para 0	11	5	6	5	19	2	16	64	15.3
1	10	11	13	17	19	11	38	119	28.5
2	9	8	10	6	15	9	36	93	22.3
3	7	7	4	5	12	3	18	56	13.4
4	0	5	3	2	2	4	10	26	6.2
5	2	5	3	1	3	1	7	22	5.3
6 or more	5	7	5	-	5	4	11	37	8.9
									100.0
sub-total	44	48	44	36	75	34	136	417	
missing	31	6	3	9	23	10	22	104	
all	75	54	47	45	98	44	158	521	
Ascertain (%)	58.7	88.9	93.6	80.0	76.5	77.3	86.1	80.0	

PARITY AND CAUSES – 1993/6/9
(causes collapsed, parities collapsed) (with percentages)

	Causes															
	Abortion		Haem		Eclamp		P Seps		Malaria		All other		AIDS		All	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Para 0	11	25.0	5	10.4	6	13.6	5	13.9	19	25.3	2	5.9	16	11.8	64	15.3
1	10	22.7	11	22.9	13	29.5	17	47.2	19	25.3	11	32.4	38	27.9	118	28.3
2	9	20.5	8	16.7	10	22.7	6	16.7	15	20.0	9	26.5	36	26.5	93	22.3
3	7	15.9	7	14.6	4	9.1	5	13.9	12	16.0	3	8.8	18	13.2	56	13.4
4			5	10.4	3	6.8	2	5.6	2	2.7	4	11.8	10	7.4	26	6.2
5	2	4.5	5	10.4	3	6.8	1	2.8	3	4.0	1	2.9	7	5.1	22	5.3
6 or more	5	11.4	7	14.6	5	11.4			5	6.7	4	11.8	11	8.1	38	3.8
																100.0
sub-total	**44**	100.0	**48**	100.0	**44**	100.0	**36**	100.0	**75**	100.0	**34**	100.0	**136**	100.0	**417**	100.0
missing	**31**		**6**		**3**		**9**		**23**		**10**		**22**		**104**	
all	**75**		**54**		**47**		**45**		**98**		**44**		**158**		**521**	
Ascertain (%)	**58.7**		**88.9**		**93.6**		**80.0**		**76.5**		**77.3**		**86.1**		**80.0**	

ASCERTAINMENT OF PARITY BY (DIFFERENT CAUSES AND DIFFERENT YEARS)

	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All
1993 Ascertainment (%)	30.8	73.7	72.7	52.6	-	80.0	100.0	28.6	67.6	57.6
1996 Ascertainment (%)	72.7	94.7	100.0	100.0	-	63.0	100.0	80.0	78.4	79.2
1999 Ascertainment (%)	96.0	100.0	100.0	100.0	100.0	96.3	100.0	100.0	97.6	98.1
all Ascertainment (%)	58.7	88.9	93.6	80.0	33.3	76.5	100.0	75.0	86.1	80.0

Causes collapsed

	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All
1993 Ascertainment (%)	30.8	73.7	72.7	52.6	80.0	40.0	67.6	57.6
1996 Ascertainment (%)	72.7	94.7	100.0	100.0	63.0	83.3	78.4	79.2
1999 Ascertainment (%)	96.0	100.0	100.0	100.0	96.3	100.0	97.6	98.1
all Ascertainment (%)	58.7	88.9	93.6	80.0	76.5	77.3	86.1	80.0

MEAN PARITY BY CAUSE AND YEAR

	Ab	Haem	Ecl	P Seps	Other Direct	Malaria	Mening	Other Indirect	AIDS	All
1993 Mean parity	2.2	2.3	1.8	1.0	-	2.0	1.5	1.0	1.8	1.9
1996 Mean parity	1.8	3.1	2.0	1.4	-	1.6	1.0	2.8	3.1	2.3
1999 Mean parity	2.2	3.4	2.9	2.1	4.0	2.1	2.0	3.2	2.2	2.4
all Mean parity	2.1	3.0	2.4	1.6	4.0	1.9	1.8	2.8	2.3	2.3

Causes collapsed

	Ab	Haem	Ecl	P Seps	Malaria	All other	AIDS	All
1993 Mean parity	2.2	2.3	1.8	1.0	2.0	1.3	1.8	2.0
1996 Mean parity	1.8	3.1	2.0	1.4	1.6	2.4	3.1	2.3
1999 Mean parity	2.2	3.4	2.9	2.1	2.1	2.8	2.2	2.4
all Mean parity	2.1	3.0	2.4	1.6	1.9	2.5	2.3	2.3