THE DETERMINANTS OF PERINATAL MORTALITY IN A TEACHING GROUP OF HOSPITALS IN SOUTHERN AFRICA

By

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A Thesis

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To Helen, Kari and Lise

Acknowledgments

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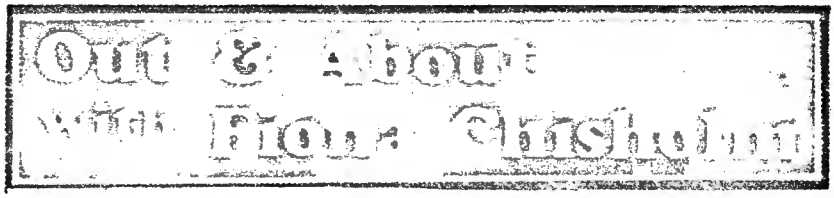
To Agmat Kahn and Patrick Rapher - two young Coloured boys, who found my thesis under a fig tree after it had been stolen on May 23rd, 1974. Without their help this thesis would not have survived.

The following is an extract that appeared in the local morning newspaper on Saturday, May 25th, 1974.



Thesis trouble

Cape Times, Saturday, May 25, 1974

WITHIN a couple of hours on Wednesday, a young Cape Town doctor saw more than a year's work vanish before his eyes — and then miraculously reappear.

Supper was barely over on Wednesday when a distraught wife phoned to tell me of her husband's predicament. His car, parked at the Peninsula Maternity Hospital, had been broken into and an airways bag stolen. Nothing else.

In that bag was something of tremendous value to her husband, but worthless to the thief, or anybody else — the handwritten notes for his medical thesis. This was all ready for typing and presentation in June. All being well he'd have graduated in December.

No, she said, he'd made no copy. If the thief chose to dump the book into the nearest river or fire, that would be the end of that. His labours and his Ph.D. would go overboard.

Less than an hour later the 'phone rang again. A joyous voice this time.

"It sounds like a fairy tale — we've found the thesis. Police discovered it, thrown over a wall".

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CHAPTER 1

Introduction:

Maternal Mortality

Perinatal Mortality

Objectives of the Thesis

CHAPTER 1

INTRODUCTION

Icebergs - Why start a thesis thinking about icebergs? Death from medical conditions represents the tip of an iceberg. What causes death in some, will maim, injure or leave damaged in others. Death remains a parameter with which to measure part of the effect of a disorder on the mother or fetus (Russell, 1969). What will prevent mortality will prevent morbidity and it is largely towards the prevention of the latter that modern medicine is aimed (Potter, 1959; Nixon, 1963; Clifford, 1964; Wallace, 1970).

"No death in childhood or old age can approach in poignancy the death of a young woman in childbirth" (Hayden, 1970). This is certainly true and until the turn of this century, mortality was measured in mothers, not fetuses. The prevention of maternal mortality was the foremost aspect of obstetric care, and standards of obstetric care were measured by the level of maternal mortality. The necessity of Murdoch Cameron in Glasgow (1878) to consult the senior obstetricians of the city and discuss the possibility of performing a Caesarian Section on a girl with a true conjugate of 1½ inches, clearly did not have the interests of the fetus at heart! (Donald, 1969).

Maternal mortality

Maternal mortality has fallen progressively during this century (Potter, 1959; Lewis, 1964; Menon, 1968; Aubrey and Nesbitt 1969; Browne, 1973; Osofsky and Kendall, 1973). From figures such as 4,10 per cent in Paris, 3,35 per cent in Vienna and 1,4 per

cent at the Rotunda in Dublin in the early nineteenth century (Hayden, 1970), the mortality rate has fallen to between 20,0 - 33,6 per 100,000 (Vital and Health Statistics, 1967; Hellman, 1969; Llewellyn-Jones, 1969; Browne, 1973).

Many factors in maternal mortality are preventable but this does not form the subject of this thesis.

Perinatal mortality

With the improvement of maternal mortality, more attention was paid to fetal, neonatal and infant mortality and the concepts of stillbirth rate, neonatal death rate, and infant mortality rate were formed. These rates were compared throughout the world as a means of assessing standards of medical care. Infant mortality rates are the easiest to record and are the main records of developing countries. These sometimes form the only sensitive means of assessing standards of medical care (Llewellyn-Jones, 1969; Langerman, 1972). With better record systems, stillbirth rates, neonatal death rates and perinatal mortality rates are available for comparison. "What kills a baby ten minutes before birth is probably the same factor that kills at ten minutes after birth" (Clifford, 1964). Perinatal mortality is concerned with the stillborn fetus and the first week deaths (Clairveaux, 1962). The more sophisticated the recording methods, the more data is available for comparative studies.

Perinatal mortality rates vary from decade to decade, from country to country, from region to region, and from hospital to hospital within the same regions, because the factors influencing perinatal mortality are so numerous (Potter, 1959).

In the U.S.A. geographical variations in P.N.M. rates have disappeared for Whites. However, large variations occur in Non-Whites, (Shapiro et al, 1960). Much of this latter variation geographically is dependent on socio-economic variations (Jacobziner et al, 1961).

The trend in perinatal mortality rates throughout the world has been downward over the past decades (Duncan et al, 1952; Lewis, 1964; Menon, 1968; Baird and Thomson, 1969; Wallace, 1970; Macnaughton, 1974) but not to the same satisfactory level that maternal mortality has fallen (Jacobziner et al, 1961; Tesauro, 1968; Caldito et al, 1970). Perinatal mortality has been very difficult to reduce below approximately 25 - 30 deaths per 1000 over the past 10 to 15 years (Butler and Bonham, 1963; Goodwin et al, 1967; Llewellyn-Jones, 1969; Osofsky and Kendall, 1973). This has been partly due to the failure to realise the significance of various environmental and biological influences on human reproduction and thus predict the fetus that is at high risk. Reduction in the number of pre-term births with their inherent dangers of functional immaturity would be one of the most important single steps in reducing perinatal mortality (Goodwin et al, 1969; Gruenwald, 1969; Steer and Moore, 1969) and it is to the solving of this type of problem that modern obstetrics is to be aimed. There are two basic approaches to the problems of perinatal mortality. The first is the environmental approach where one looks at the factors influencing the perinatal mortality, such as age of mother, parity, height and weight of the mother, social class, past obstetric history, antenatal complications etc. as was done in the British Perinatal

Mortality Survey (Butler and Bonham, 1963). Here one is looking for preventable factors, high risk predictors or treatable problems, which will lead to a reduction in perinatal mortality. The second approach is the biological approach, where one looks at the physiological and pathological problems that occur in various conditions in obstetrics and aims to treat these factors, for example, the use of betamethazone to stress fetuses to produce surfactant to prevent hyaline membrane disease in cases of advanced premature labour (Liggins and Howie, 1972); or better still, the use of beta adrenergic stimulators (Baillie, 1972) or alcohol (Fuchs et al, 1967) to stop premature labour once it has begun. Clearly both approaches are necessary to lower perinatal mortality. Often the environmental or epidemiological approach points to the problems that need to be solved by the biological approach. It is the former approach that has been utilised in this thesis.

The common goal in modern obstetrics and paediatrics is to maximise the quality of fetal, newborn, and infant life in such a manner as to give every individual conceived the greatest opportunity for optimal physical, mental, and emotional development. There is overwhelming evidence that the quality of human reproduction is not as good as it should be, particularly with regard to late fetal and neonatal mortality and morbidity (Aubrey and Pennington, 1973).

Perinatal mortality throughout the world

Perinatal mortality varies tremendously throughout the world from sophisticated countries such as Sweden, Switzerland, United States and United Kingdom, to underdeveloped countries such

as India, Pakistan, and the African States. The lack of vital statistics is a common feature for all developing countries (Menon, 1968). It is very difficult to directly compare statistics from different parts of the world because the definitions of mortality and quality of data-collection vary among countries and many diverse factors enter into the individual national mortality (Reid, 1970; Chase, 1972). Recorded statistics can be seen in Table 1.

Table 1

Perinatal mortality rates:(a) United States and selected countries. Rate per 1000 total births (live and still), 1959-1961 perinatal period and (b) World Health Statistics Report, 1969.

	* (a)	** (b)
Country	Perinatal Mortality rate/1000 total births	Perinatal Mortality rate/1000 live births
Norway	25,3	21,1
Sweden	26,7	19,0
Switzerland	27,7	21,7
Netherlands	28,1	22,7
Finland	28,3	22,3
New Zealand	28,6	20,6
Australia	29,1	23,6
Denmark	29,2	21,9
United States	30,5	26,5
Canada	31,3	25,6
Luxenborg	35,5	-
United Kingdom	35,6	27,9
Federal Republic of Germany	38,0	27,9
Japan	46,9	-

* Source of date: Fetal Mortality, Vol. II, Sec.4, Public Health Service, Vital Statistics, pp.4-30,31,32, 1961.

** World Health Organisation - World Health Statistics Report, Vol. 22, No.1, p.44, 1969.

It can be seen that the lower P.N.M. rates for countries are around 25 per 1000 and the higher rates are upwards of 50 per 1000 (Chase, 1967). In individual regions and hospitals, perinatal mortality rates may fall below 20 per 1000 (Bonham, 1969).

Current statistics for areas in Sweden show that the perinatal mortality has been reduced to 14,2 per 1000 (Rennard, 1969). These levels are outstanding and would be the aim in any country or region. In Sweden, however, the prematurity rate has been reduced to 4 per cent (Rennard, 1969).

Unfortunately overall statistics for P.N.M. for South Africa as a whole are not available. This is because the record systems in rural hospitals and districts are not adequate.

Perinatal mortality in the Municipality of Cape Town

The City of Cape Town was unified on 8 September 1913 and is responsible in 1972 for upwards of 750,000 people. In 1972 25,866 births and 426 stillbirths were notified (including births to mothers who were not Cape Town residents) as follows:

Attended	Births	Per cent
(a) In private houses:		
By private doctors	17	0,1
By private midwives	6,221	23,6
By institutional midwives	1,309	5,0
No doctor or midwife	1	0,0
	7,548	28,7
(b) In institutions:		
Private nursing homes	4,251	16,2
Public institutions	14,493	55,1
	18,744	71,3

Patients delivered in private nursing homes are 90 per cent Whites, and 10 per cent Coloureds from social class 1 and 2 and are delivered by private gynaecologists and general practitioners.

Thus 21,615 births occur outside private institutions. Of these the Peninsula Maternity Services (P.M.S.) are responsible for 1,309 delivered by institutional midwives and 14,493 delivered by public institutions, i.e. total of 15,802 deliveries. This is 73 per cent of the total number available (excluding private institutions) to deliver under our care. The singletons of the 15,802 for Whites, Coloureds and Bantu i.e. 15,251 patients formed the basis of study for this thesis.

Of the 6,221 patients delivered by private midwives 2,679 were low risk - high income Coloureds (See 2.4) and 3,542 were low risk - low and high income Bantu delivered in the Langa (579) and Guguletu (2,963) Bantu Townships.

For a fuller comprehension of the geography of the Cape Town Municipality, the public institutions under our care and the residential areas of the three ethnic groups under study, see the map in Fig.1.1.

Thus, in 1972, 73 per cent of the deliveries notified as delivering in Cape Town, including non-Cape Town residents (Sungren, 1972), delivered in the municipal hospitals and district services which constitute the Peninsula Maternity Services (P.M.S.) This group of five hospitals and three district services is attached to the University of Cape Town Medical School. (See Map Fig.1.1.)

Hospitals

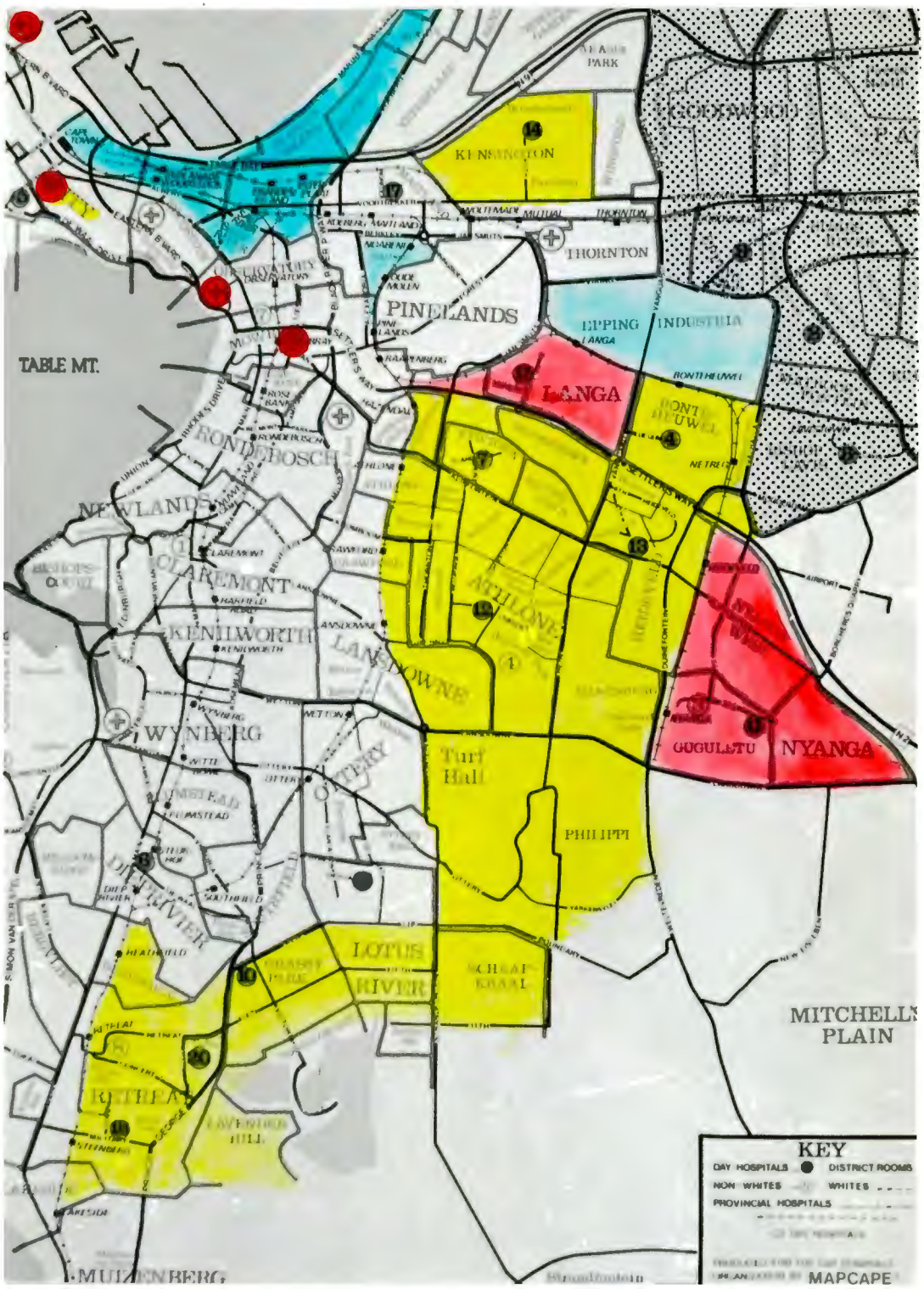
S.H.

P.M.H.

G.S.H.

M.M.H.

Tygerberg Hospital area



Whites = Unshaded area

Bantu = Red

Coloureds = Yellow

Non-Residential = Blue

Figure 1.1.

Map showing the geographical areas covered by the City of Cape Town Municipality, the location of the hospitals in the Peninsula Maternity Services and the main residential areas of the three ethnic groups under study.

The Municipality supplied approximately 95 per cent of the patients delivered in the Peninsula Maternity Services and the remaining 5 per cent were referred from up country or outside the auspices of the Municipality.

Thus although the statistics from the Municipality and P.M.S. are not directly comparable, an idea of perinatal trends can be gained by reviewing the changes in birth rates and perinatal mortality rates over the years in the Municipality of Cape Town.

Figure 1.2. shows the rise in birth rate since 1900 with the Non-European birth rate exceeding the European birth rate around 1915 (Sundgren, 1972).

Figure 1.3. shows the progressive fall in perinatal mortality since 1915. This trend may be flattening out in recent years (Sundgren, 1972). The actual perinatal mortality rates for the three ethnic groups i.e. the Whites, Coloureds and Bantu, can be seen in Figure 1.4. as recorded over the last 10 years (Langerman, 1972). The discrepancy between the three groups is clearly shown and is very similar to the pattern in the United States (Wallace, 1970).

The downward trend in perinatal mortality over the past three decades is similar to other countries (See Fig.1.5. Reproduced from Bonham, 1969).

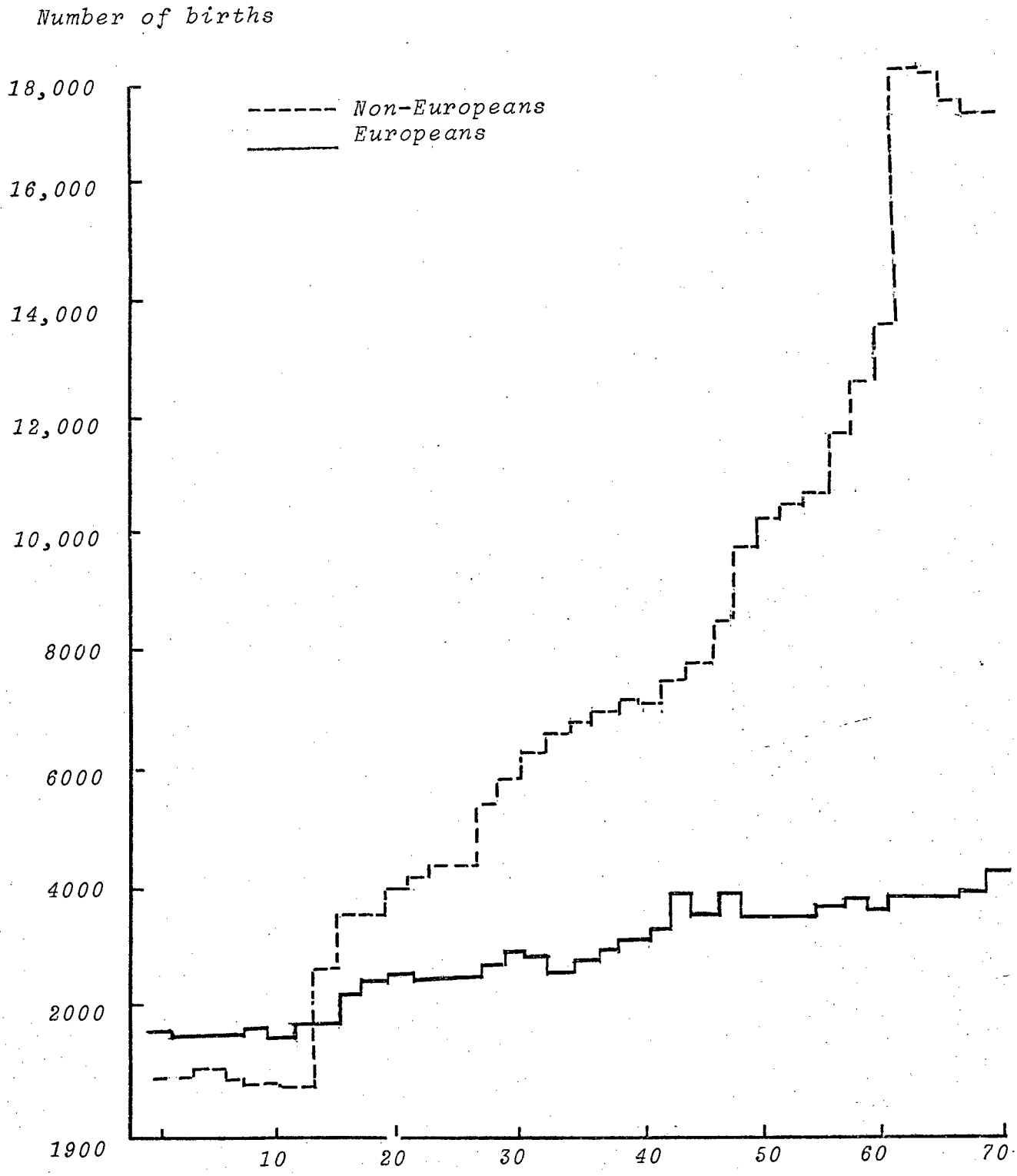


Figure 1.2.

The trend in birth rate since 1900 in the Cape Town Municipality.

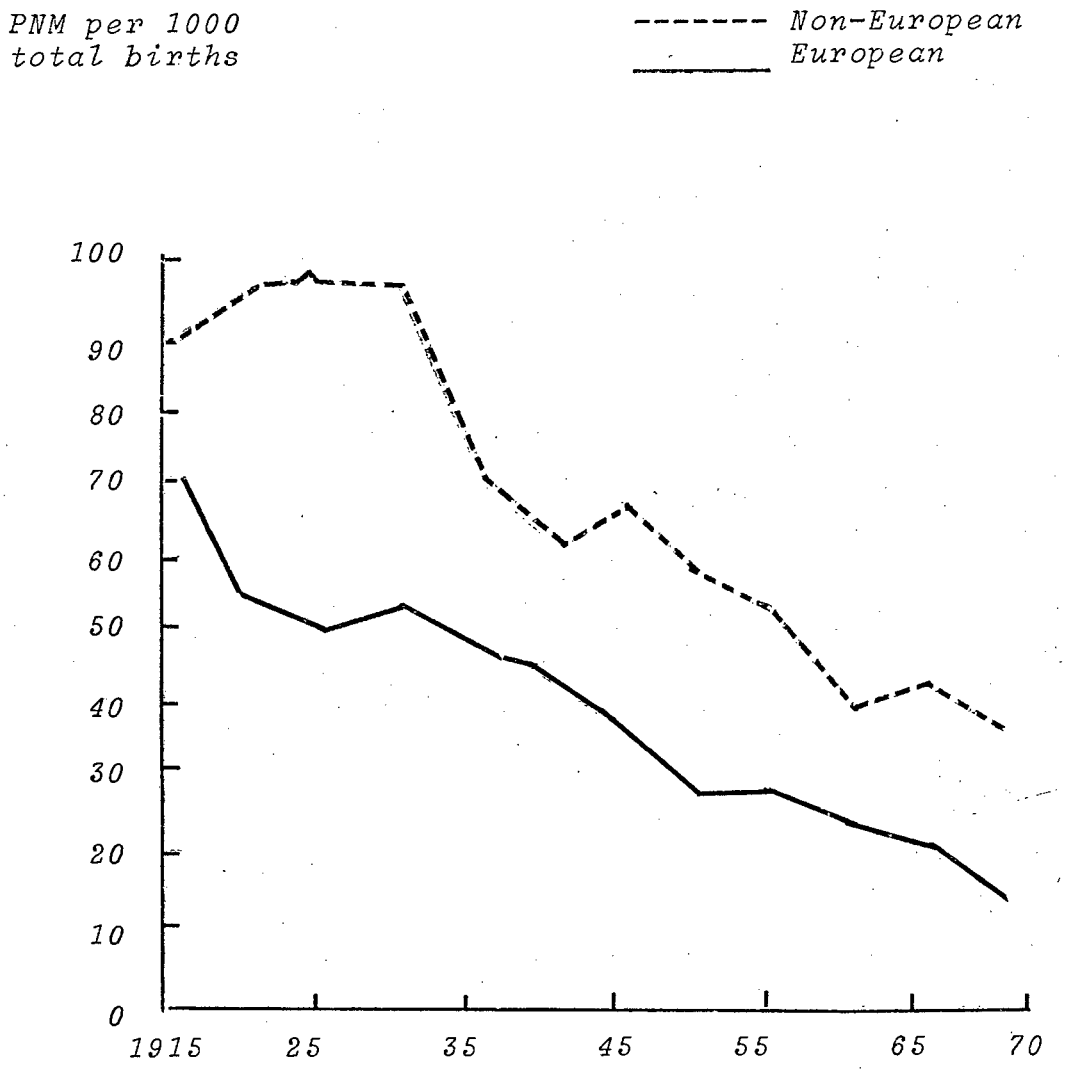


Figure 1.3.

Perinatal mortality since 1915 in Cape Town

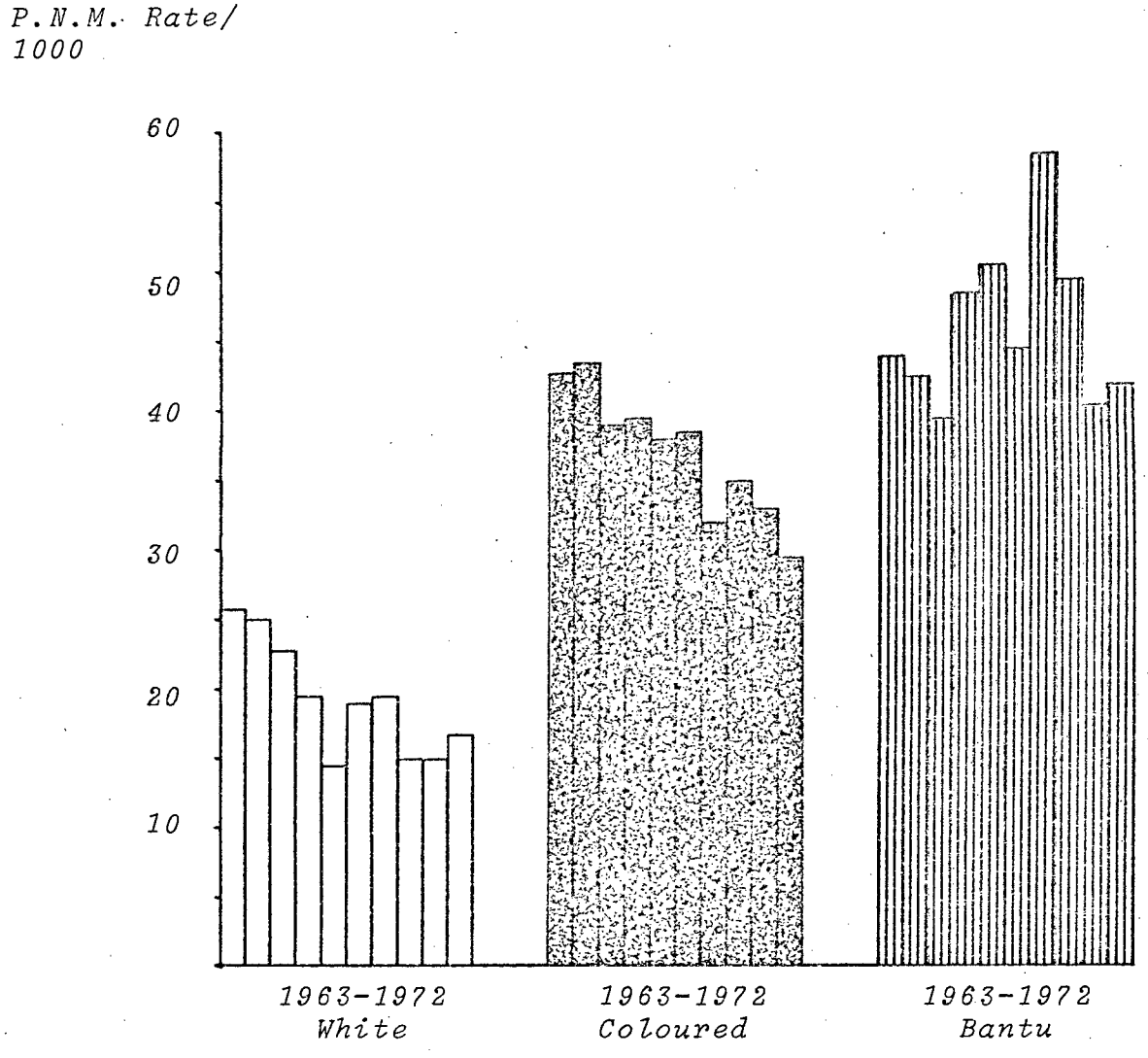


Figure 1.4.

Variations in perinatal mortality rates by ethnic group (1963-1972).
(Reproduced from Langeman, 1972).

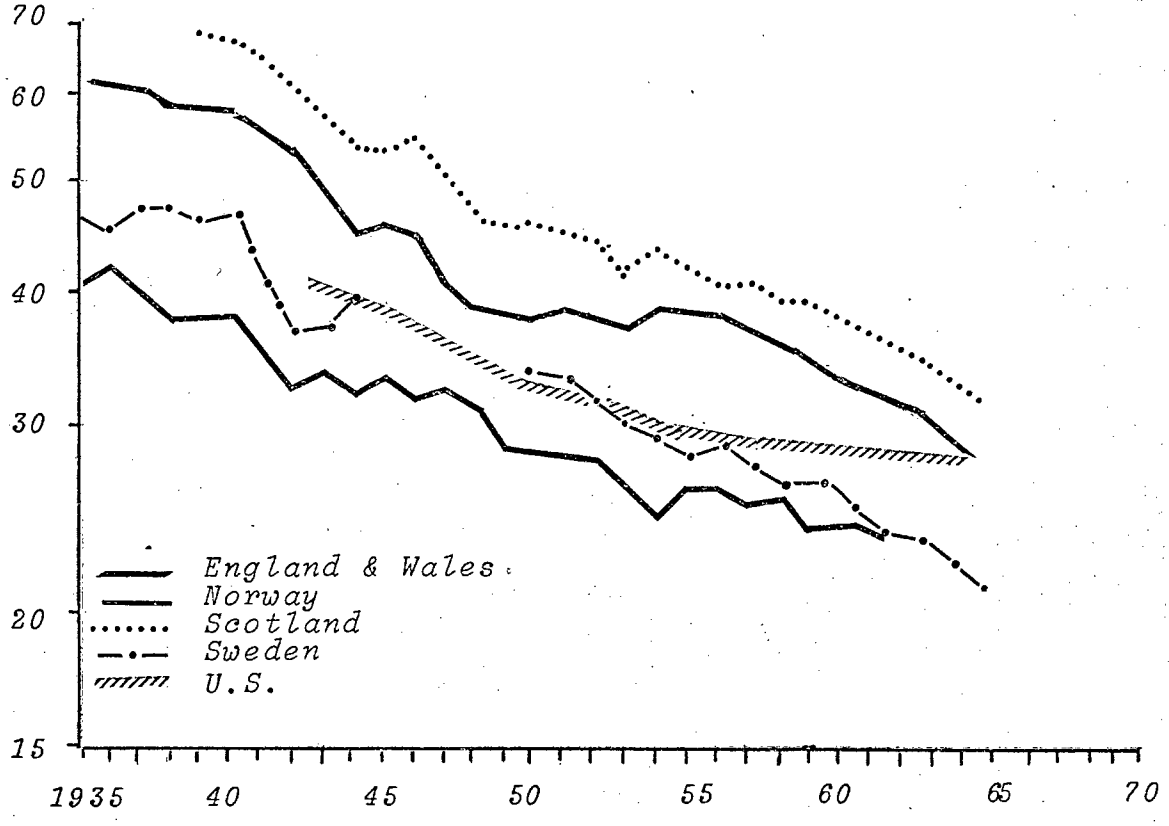


Figure 1.5.

Perinatal Mortality in Some Advanced Countries.

It can be seen from Figure 1.6. that there has been a progressive increase in the institution deliveries over the past decade and this has been associated with a fall in the number of midwife deliveries at home. This figure applies only to the non-European (i.e. Colouredsand Bantu).

The number of beds at the various hospitals in the Peninsula Maternity Services is as follows:

White:	Mowbray Maternity Hospital	99
Coloured/Bantu:	Groote Schuur Hospital	80
	Peninsula Maternity Hospital	76
	Somerset Hospital	50
	St. Monica Home	39

The total number of births in institutions for the three groups under study can be seen in Table 1.2. from Langerman, 1972. Sixty three per cent in-hospital delivery rate is considerably lower than other countries i.e. U.S.A. 97 per cent; U.K. 96 per cent; Norway 96 per cent; Sweden 99 per cent (Chase, 1967; Tesauro, 1968). However, it is higher than Holland 29 per cent; Denmark 46 per cent; and Italy 23 per cent (Tesauro, 1968).

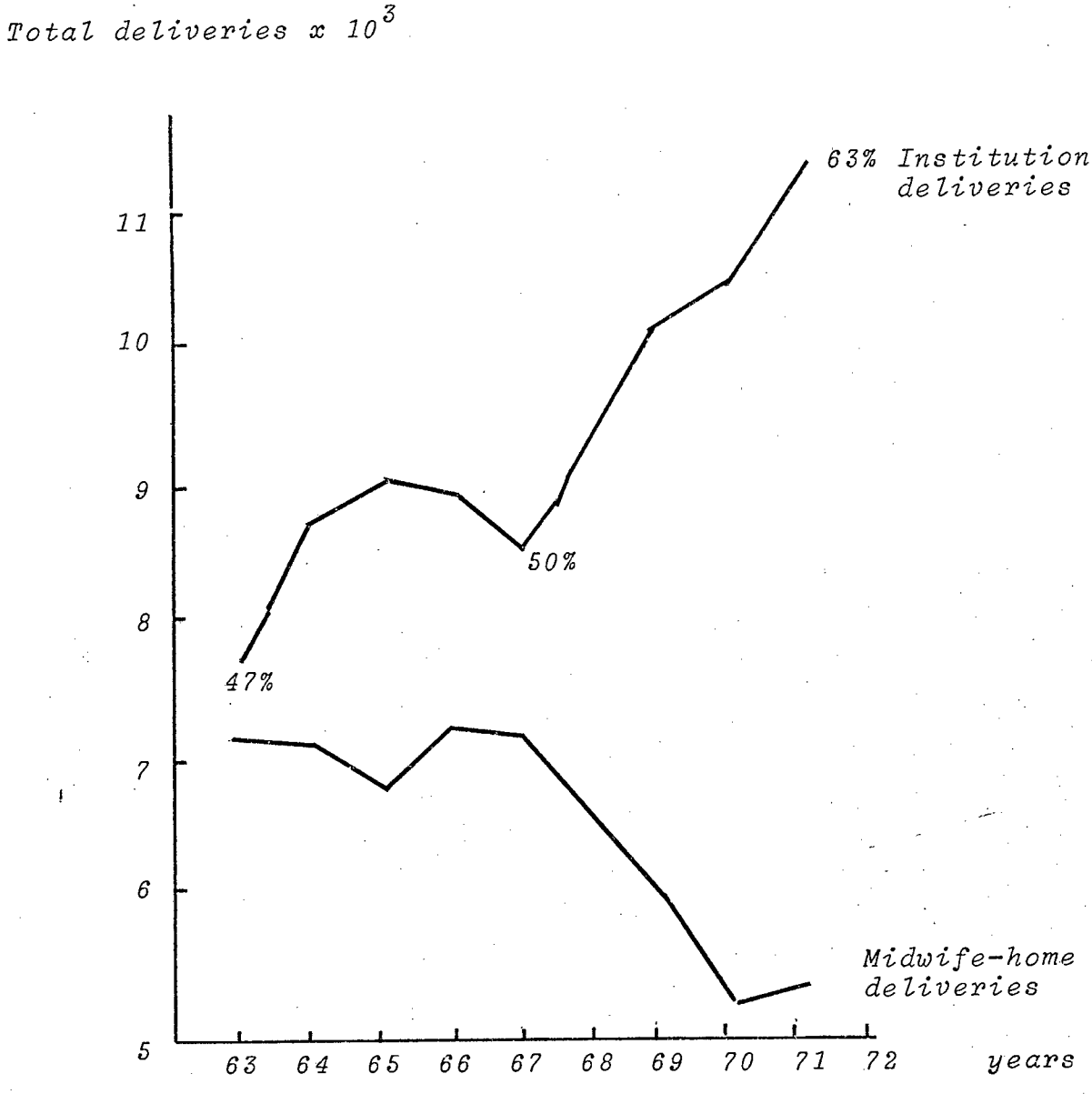


Figure 1. 6.

Institutional and midwife-home delivery trends in Cape Town Municipality

Table 1.2.

Births in Institutions in the Municipality of Cape Town (1971-1972)

Ethnic group	Notifications*			
	Number		% of Total Maternities	
	1971	1972	1971	1972
White	4216	4006	97	97
Coloured	9020	8649	63	60
Bantu	2160	2237	63	57
All groups including Asiatic	15530	14998	70	67

*Include live and stillborn

Perinatal mortality in the Peninsula Maternity Service

The Peninsula Maternity Service consists of a group of five hospitals serving the community of the Municipality of Cape Town (See Map, Fig.1.1) and referred patients from up country and outside the Municipal boundaries. Perinatal mortality rate has fallen over the years (See Fig.1.7. and Appendix Table 11.1).

The downward trend in perinatal mortality is well shown. What is more interesting is the relatively faster fall in the neonatal death rate and the relatively slower fall in the stillbirth rate over the last 3-4 years.

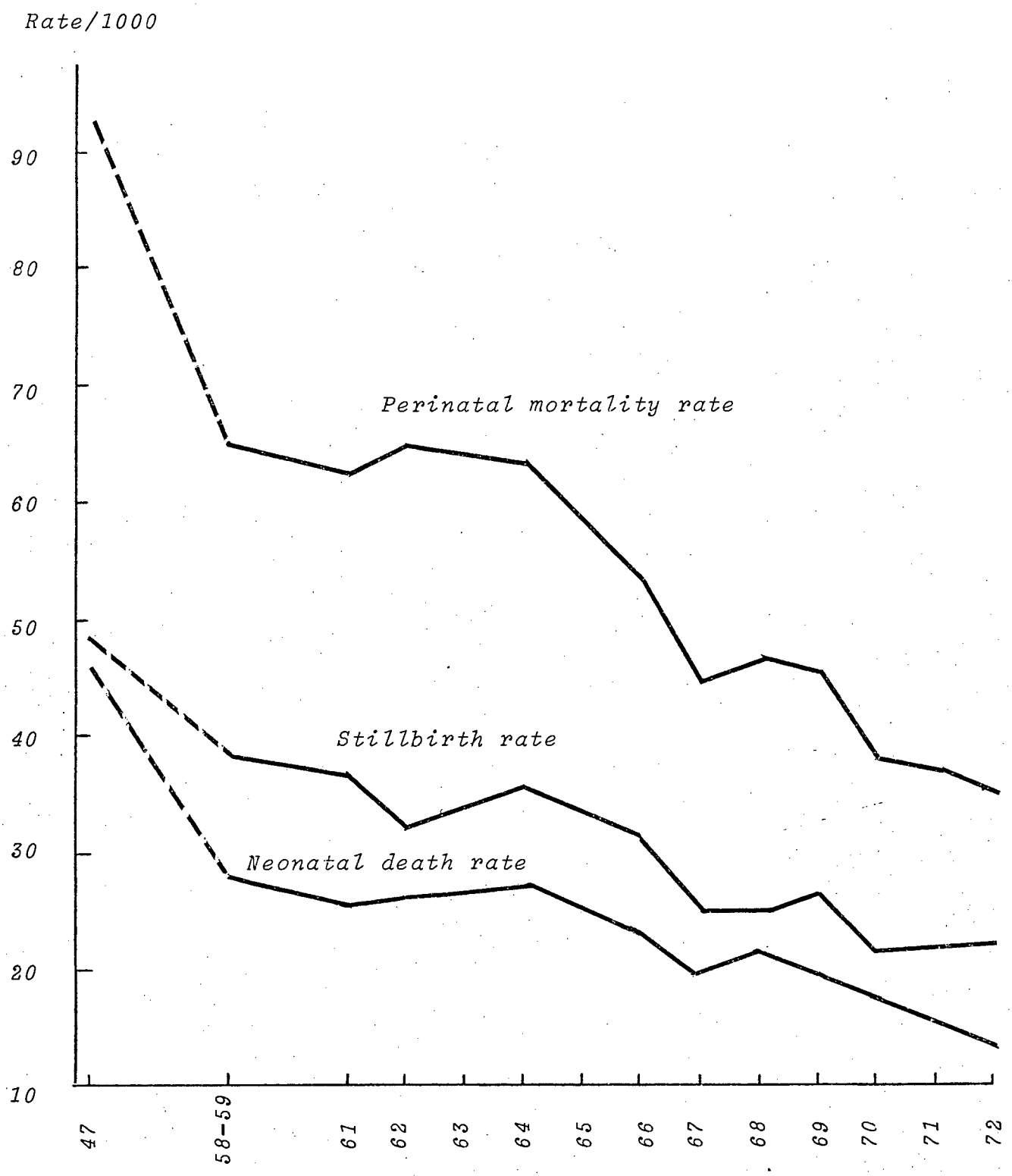


Figure 1.7.

Perinatal mortality, stillbirth and neonatal death rates in the Peninsula Maternity Services (1947-1972).

Summary of patients in Municipality/Peninsula Maternity Services

It can be seen from the previous two sections that there has been an increase in the number of births occurring in the Municipality of Cape Town over the years, that progressively more of the non-Europeans deliver in hospital and that the perinatal mortality trend has been downward over the years. However, both in the Municipality of Cape Town and in the Peninsula Maternity Services, there has been and still is, a major discrepancy in perinatal death rates between the three main ethnic groups - the Whites (Europeans), the Coloureds (Cape Coloured) and the Bantu (African). A description of these three groups is seen in Chapter 2 (2.4). It is the purpose of this thesis to investigate the determinants of perinatal mortality in the P.M.S. and where applicable to show variations between the three ethnic groups.

Objectives of thesis

What sort of mothers lose their infants? Why do fetuses and neonates die? How can these be prevented? These three questions have been asked many times in various parts of the world and the answers all vary. "The successful outcome of a pregnancy depends firstly on the ability of the mother to nourish the fetus in utero and to deliver it easily after 40 weeks gestation and secondly, on the ability of the medical attendant to diagnose and treat successfully any deviations from the normal in pregnancy or labour. These two basic factors are

reflected in the perinatal mortality rate", (Baird, D. 1969).

The Peninsula Maternity Service delivered 15,599 mothers in 1972 and the perinatal mortality rates varied amongst the three main ethnic groups. For the singleton pregnancies, the perinatal mortality rates are as follows:

Europeans	19,4 /1000
Coloureds	34,0 /1000
Bantu	53,4 /1000

If this was subdivided into stillbirth rate and early neonatal death rate, (see Table 1.3.) it was found that there was a major

Table 1.3.

The numbers and rates of stillbirths and neonatal deaths for the three main ethnic groups during 1972 (singletons only)

	Whites (Europeans)	Coloureds	Bantu
Total births	1755	11,194	2302
Stillbirths	16	243	86
Early neonatal deaths	18	138	37
Stillbirth rate/1000	9,1	21,7	37,4
Early neonatal death rate/ 1000 live births	10,4	12,6	16,7

discrepancy in the stillbirth rate amongst the three ethnic groups and a minor (statistically not significant) discrepancy in the neonatal death rates.

Since 1969 all records of the Peninsula Maternity Services have been encoded on to computer magnetic tape. It was

decided to perform an in-depth retrospective study of the determinants of perinatal mortality using the epidemiological data available on the computer sheet. Concurrently, an analysis of perinatal deaths from the obstetric records by clinico-pathological cause was carried out. Thus it was hoped to show the major determinants by factors and by cause, with the object of offering preventive measures where possible.

CHAPTER 2

Materials and Methods:

Peninsula Maternity Service
Booking Criteria
Antenatal Management and Labour
Patient Selection for Study
The Computer Records System
Analysis of Master Tape for 1972 Deliveries
Analysis of Stillbirths and Early Neonatal Deaths
Combined Analysis Table of Perinatal Mortality Determinants by Cause of Death
Statistical Tests Used in Thesis

CHAPTER 2

MATERIALS

1. The Peninsula Maternity Service (P.M.S.)

The Peninsula Maternity Service is a group of hospitals forming the obstetrical teaching unit of the Department of Obstetrics and Gynaecology at the University of Cape Town. This teaching unit is formed from Groote Schuur Hospital (G.S.H.), the Peninsula Maternity Hospital (P.M.H.), the Somerset Hospital (S.H.), St. Monica's Nursing Home (St.M.), (all exclusively for non-European patients) and the Mowbray Maternity Hospital (for White (European) patients). All hospitals have Consultant cover and registrars in training rotating through them.

The non-European hospitals deliver all Coloured, Bantu and Asiatic patients. Groote Schuur Hospital is the main centre and delivers all the diabetics, cardiacs and severe medical complications of pregnancy. It also receives all the emergency Flying Squad patients. Peninsula Maternity Hospital delivers the largest Bantu group in the unit and accepts all unbooked emergency cases in labour not requiring Flying Squad attendance. Somerset Hospital and St. Monica's Nursing Home deliver mainly Coloured, and Bantu patients.
Mowbray Maternity Hospital delivers all the European patients in the unit.

An emergency Flying Squad operates from G.S.H. where a fully equipped four-wheel drive vehicle with two way radio control, and a driver is available. This service undertakes 300 - 400 calls per year for various obstetric emergencies and

is essential for transfer of patients to hospital, particularly as a number of women are unable to be booked for hospital confinement.

The total deliveries for 1972 for the P.M.S. were 15,599; of these 1,245 were delivered on the district services attached to Groote Schuur and Somerset Hospitals. (See Table 2.1)

Table 2.1.

Deliveries at the various P.M.S. Hospitals - 1972

	GSH	MMH	PMH	SH	St.M	Dist.	Total
Total deliveries	3353	1772	5104	2694	1431	1245	15,599
Twins	72	16	88	25	17	8	226
Abortions	14	1	8	10	3	1	37
Total singletons	3267	1755	5008	2659	1411	1236	15,336
Asiatics or other race	6	-	16	1	27	35	85
Total singletons analysed	3261	1755	4992	2658	1384	1201	15,251*

* Total Population Sample Analysed.

All twins, Asiatics, and abortions (babies born weighing less than 500 grams) were excluded from this study. In this study there were a total of 15,251 patients of whom 1,755 were European, 11,194 were Coloured, and 2,301 were Bantu. (See Table 2.2)

Table 2.2.

Deliveries by ethnic group - 1972 (Asiatics excluded)

	White	Coloured	Bantu	Total
Total	1,772	11,357	2,378	15,507
Twins	16	130	73	219
Abortions	1	33	3	37
Total singletons analysed	1,755	11,194	2,302	15,251*

*Total Population Sample Analysed.

2. Booking Criteria

For the European patients who booked at Mowbray Maternity Hospital there were no booking restrictions.

For the non-European patients who booked at the remaining institutions, there were the following booking criteria:

A. Booking criteria for hospital indoor care and delivery

(a) All patients with a significant obstetrical complication of the present pregnancy (eg. antepartum

haemorrhage, pre-eclampsia)

(b) All patients with a significant maternal disease complicating present pregnancy (eg. heart disease, diabetes)

(c) All patients with a previous history of

(i) Caesarian Section

(ii) Stillbirth in either of last two pregnancies

(iii) Early neonatal death in either of last two pregnancies

(iv) Postpartum haemorrhage or retained placenta in two or more pregnancies

(v) Hypertension in two or more pregnancies

(vi) Any other recurrent or serious obstetrical abnormality (eg. eclampsia)

(d) All patients under 17 years of age

(e) All patients over 40 years

(f) All primigravida 30 years and over

(g) All primigravida 155 cm or less in height

(h) All primigravida booking before 20 weeks pregnant

Patients are referred for hospital booking from Cape Town Municipal Clinics, private general practitioners, or the hospital general out-patient department.

B. Booking criteria for P.M.S. District delivery and care

All patients who were not accepted for hospital delivery and care (Group A) would be considered as follows:

(a) Coloureds. Any low risk patient (i.e. not high risk - Group A) whose family income was less than R20.00 per week or who when R10.00 per month for each child had been deducted from the salary was not left with R20.00 per week. (For example, a family earning R20.00 per week with any number of children would be accepted. A family earning R30.00 per week with

two children i.e. R100.00 per month would be referred to a private midwife).

Thus all LOW RISK/LOW INCOME Coloureds were accepted for P.M.S. district delivery.

(b) Bantu. Any low risk patient living in the district area but not in the Langa or Guguletu townships, falling into the low income/low risk group as in (a) for Coloureds was accepted for P.M.S. district delivery.

But low income/low risk patients living in the above two townships were not accepted but were delivered by the Municipality midwives not attached to P.M.S.

Summary

All high risk Coloureds and Bantu, all low risk/low income Coloureds, and non-township low risk/low income Bantu were accepted for hospital or district delivery under P.M.S. care.

3. Antenatal Management and Labour

(a) At the booking or first antenatal visit a full gynaecological, obstetrical, family and general medical history is taken and filled into the obstetric folder (See 8). A full examination follows including maternal height, materal weight and general nutrition. The blood pressure is recorded and the heart and lungs ausculated. The breasts and thyroid gland are palpated and the teeth examined for caries. The abdomen is palpated and any masses or previous scars noted. The height of the fundal uteri is compared to the period of gestation.

A vaginal examination and routine Papanicolaou smear is performed.

Blood is taken for blood grouping, haemoglobin estimates, detection of Rhesus antibodies, Wasserman and Kahn tests.

The urine is tested for proteinuria and sugar, and a midstream specimen is sentto the laboratory for culture and sensitivity.

A routine screening mini-X-ray of the chest is performed to exclude pulmonary tuberculosis.

Patients are given advice and instructed to return in two weeks for their first antenatal visit.

(b) At the antenatal clinic the patients are seen monthly till 28 weeks, bi-monthly till 36 weeks, then weekly till term unless more frequent visits are indicated.

Special referral clinics exist for: cardiacs, diabetics, anaemic patients, Rhesus negative patients and patients with previous reproductive failure (recurrent abortions, previous stillbirth or neonatal deaths - See 6).

At each visit the patient's blood pressure, weight gain and possible presence of ankle oedema is noted and the fundal height and position of the fetus is recorded on the antenatal chart (See 8.2). The urine is tested for protein and sugar and the haemoglobin is checked monthly. Routine oral iron as ferrous sulphate or ferrous gluconate is given to all patients.

(c) In labour the patients are clerked by the resident houseman. The progress of labour, fetal and maternal heart rates are recorded at regular intervals and medication noted (See 8.5 and 8.6).

Normal deliveries are conducted by the medical

students or pupil midwives, in the dorsal position. Intramuscular syntometrine 0.5 mg is given with the birth of the anterior shoulder and an active third stage employing the Brandt-Andrews manoeuvre is used as a routine.

A resident registrar in training is present at each hospital 24 hours a day and consultant cover is available throughout the day and night.

4. Patient Selection for Study

In this study all twin pregnancies, abortions and Asiatics were excluded. Thus three ethnic groups were included:

(a) The Whites or Europeans: These were mainly descendants of immigrants from Europe and Britain (Malan, 1967) and were comprised mainly of non-manual and skilled workers corresponding to social classes 2 and 3 in the British Perinatal Mortality Survey (Illsley and Kincaid, 1963). A few high risk from social class 1 and a few from class 4 and 5 were present. This group constitutes 32 per cent of the total European deliveries in the Municipality of Cape Town (Langerman, 1972). This sample is biased in that social class 1 is largely absent being delivered by private practitioners.

(b) The Coloureds or Cape Coloured people: were largely the descendants of the slaves of earlier days, whose emancipation was completed in 1835. Their ancestors of the 18th Century and earlier were mainly Europeans, Hottentot, Blacks from Mozambique, Madagascar and other parts of Africa, and East Indians from the Dutch East Indies. In more recent years they have received additions from White, Bantu and other

stocks (Langerman, 1972; Malan et al, 1967).

There was one section of the Cape Coloured, Moslem in religion, known as "Malays" who were more immediately descended from the Dutch East Indies. Today they are mixed with other elements present in the Cape Coloured. The social and economic conditions of the Cape Coloured are on the whole unsatisfactory. A section of them are skilled tradesmen and earn good wages but the majority are semi-skilled labourers and many earn less than R20 a week in full employment. This position is aggravated by the large size of their families (Langerman, 1972).

Whereas in the Whites only a small minority belong to the depressed classes, in the Coloured the majority do. This group corresponds to the British Perinatal Mortality Survey social classes 3 and 4. (Illsley and Kincaid, 1963). However, a few would fall into class 2 and a few into class 5 (Illsley and Kincaid, 1963).

(c) The Bantu constitute 18 per cent of the non-Whites. They live in the Municipal townships of Langa and Guguletu, or if in domestic service in their employer's home. They are descended from the people of Central Africa and in Cape Town are largely immigrants from the Transkei homeland belonging to the Xhosa tribe. However, there are an increasing number of detribalised Bantu who are permanently resident in Cape Town and live here with their families.

Their social and economic conditions are on the whole worse than those of the Cape Coloured but their housing in the Municipal townships is better (Langerman, 1972).

This group is comprised mainly of unskilled workers corresponding to social class 5 in the British Perinatal Mortality Survey (Illsley and Kincaid, 1963). A few in number would fall into social class 3 and a fair number into social class 5 (Illsley and Kincaid, 1963).

Summary

Thus, in summary there are three groups of people - the Whites (Europeans), the Coloureds (Cape Coloureds), and the Bantu, all of whom have different standards of living and social categories for the majority of their groups. The majority of the Whites are privileged and earn good wages. The majority of the Coloureds are much less privileged and earn meagre wages and the majority of the Bantu are under-privileged and earn very poor wages.

These groups are nevertheless comparable in many ways as all represented the lowest socio-economic groups in their respective ethnic groups in the Municipal area of Cape Town and outside.

There are very few social class 1 or 2 in this study which gives the study a lower socio-economic bias, which has not been corrected for.

5. The Computerised Record System

In order to obtain accurate information from the computer system of records, the obstetric record system was changed in 1966 (See 8). In 1969, the obstetric records were put on to computer and since that time the system has been modified and the forms changed so as to improve the system (Marais and Strasburg, 1969). (See 8).

The system used during the time of this thesis for the year 1972 was as follows: The obstetric records were completed by the nursing staff, and medical staff throughout booking, antenatal care, labour and the puerperium. When the patient was discharged the folder was sent to the records room where a record clerk completed the numbers marked with an asterisk on the computer coding form (See 9.1). The folder and the obstetric summary sheet (See 9.2) were put out for the obstetric registrar to summarise. The paediatrician then summarised the paediatric summary sheet (see 9.3). The record clerk transferred the summarised data from the two summary sheets on to the computer coding sheet (See 9.1). These three forms were checked by the hospital consultant for summarising and coding errors.

Computer coding sheets were forwarded to the Computer Section of the Cape Provincial Administration Hospitals Department. An encoder operator ENCODED the data on to magnetic tape and the whole process was VERIFIED by a second encoder operator and any errors detected were corrected and re-verified.

The encoded data went through an extensive VALIDATION programme where each field was checked for impossible values; for example - Maternal age = 10 years. There were 94 cross-field tests in the validation programme; for example - delivery was by Caesarian Section and attendant was student midwife OR result was stillbirth and apgar was not 0 - both these would have been rejected as not possible. Correct records were accumulated on to a MASTER TAPE and at the end of each year,

when all records had been recoded, verified and validated, the master tape was used for analysis. The master tape for 1972 was used for the first phase of this present study. All programmes were run on an I.C.L. (International Computers Ltd.) 1900 series computer.

METHODS

For simplicity, all definitions not mentioned in the following text and fuller definitions of those used in the text, are included in a glossary (see 6). Because of the variations of definitions in discussions on perinatal mortality, all definitions that differ from those used in the British Perinatal Mortality Survey (Butler and Bonham, 1963) are included in the text.

This study was undertaken in two phases. Firstly, the analysis of the 1972 master tape of the overall figures for the Department of Obstetrics in the University of Cape Town and secondly, the same data was used and checked in an analysis of stillbirths and neonatal deaths by clinico-pathological cause.

6. Analysis of Master Tape for 1972 of all Deliveries

The total number of deliveries for the Peninsula Maternity Services was analysed by ethnic group and hospitals (See 2.1. and Tables 2.1; 2.2). From these figures, all patients of any other ethnic group than White (European), Coloured and Bantu, were excluded. All patients who had multiple pregnancies were excluded. All patients who had an

abortion - defined as an infant weighing less than 500 grams - were excluded. The sample size for analysis thus consisted of:

	Total number of deliveries	= 15,251
(i)	Whites - singletons	= 1,755
(ii)	Coloureds - singletons	= 11,194
(iii)	Bantu - singletons	= 2,302

This total number of records was analysed for distribution curves, stillbirths - defined as an infant born dead, weighing 500 grams or more, and early neonatal deaths - defined as infants born alive but dying within the first 7 days (See 6) related to various factors: All these remaining records were analysed using the I.C.L. soft-ware package - FIND -2 programme.

Tables extracted in analysis

6.1. Overall Stillbirth, Neonatal, Perinatal Mortality Rates for the 3 ethnic groups. A table and figure showing these rates were extracted for the population sample studied.

2. Time of Stillbirth. A table relating the time of the stillbirth either occurring before labour or during labour by ethnic group - Whites, Coloured and Bantu was extracted.

3. Maternal Age. A distribution curve for maternal age by ethnic group was taken out. Maternal age, measured in years, was grouped into four groups:

(i) less than 20 years
(ii) 20 - 24 years
(iii) 25 - 29 years
(iv) 30 years or over

These groups were used in a table of perinatal mortality rates by maternal age.

4a. Parity. A distribution curve for parity by ethnic group was taken out. Parity was grouped into three groups

(i) Para 0
(ii) Para 1 - 3
(iii) Para 4 and over

These groups were used for the table on perinatal mortality rates by parity.

4b. Combined effect of parity and age on Perinatal Mortality. The effect of parity and age on perinatal mortality was studied in the three ethnic groups and a table on perinatal mortality rates was extracted.

5. Maternal height. A distribution curve for maternal height by ethnic group was taken out. Maternal height was measured in centimetres and grouped as follows:

(i) Less than 140 cms
(ii) 140 - 144 cms
(iii) 145 - 149 cms
(iv) 150 - 154 cms
(v) 155 - 159 cms
(vi) 160 - 164 cms
(vii) 165 - 169 cms
(viii) 170 or more cms

These groups were used for the table on perinatal mortality rates by maternal height.

6a. Maternal weight. Maternal weight was taken as the weight when the patient was first seen by the hospital. In booked cases this was the booking maternal weight (see 4.2.5). In the unbooked emergency this was the weight on admission to hospital. Maternal weight, measured in kilograms, was grouped as follows:

(i) Less than 45 kgs
(ii) 45 - 54 kgs
(iii) 55 - 64 kgs
(iv) 65 - 74 kgs
(v) 75 - 84 kgs
(vi) 85 - 94 kgs
(vii) 95 or more kgs

A distribution curve by ethnic group and a perinatal mortality rate figure were taken for the various weight groups.

6b. Combined effect of maternal height and maternal weight on perinatal mortality.

The combined effect of maternal height and maternal weight was studied in the Coloured only and a table showing the number of deaths, the number of live infants, and the perinatal mortality rates for different combinations, was extracted. This was presented as a grid.

7. Past obstetric history. Three groups were studied.

(a) Previous Caesarian Section: The perinatal mortality rates for patients with previous Caesarian Section were extracted (Item 13 Code 6 - See 9.2).

(b) Previous reproductive failure: This group included all patients who had had a stillbirth, neonatal death, a small for gestational age baby or recurrent abortions (Item 13 Code 2 and 8 - See 9.2). A table of perinatal mortality rates by ethnic group was extracted.

(c) Previous hypertension: This group included all patients who had had previous hypertension and some of the group of reproductive failure patients, who had associated hypertension (Item 13 Code 3 and 4 - See 9.2). A table of perinatal mortality rates was extracted.

8. Maternal disease. Three groups of patients were studied:

(a) Cardiacs - All patients with recognisable heart disease in pregnancy

(b) Diabetics - All patients with proven chemical or overt diabetes mellitus

(c) Renal disease - All patients with known renal disease - either acute glomerular nephritis, recurrent acute pyelonephritis in pregnancy, or chronic nephritis.

The incidence of the conditions and the perinatal mortality by ethnic group was extracted.

9. Prenatal care. Six groups of patients were selected:

(i) Unknown
(ii) Unbooked
(iii) 1 visit
(iv) 2 - 4 visits
(v) 5 - 9 visits
(vi) 10 visits or more

Distribution curves by ethnic group together with stillbirth rates, neonatal death rates and perinatal mortality rates were extracted.

10. Hypertension and proteinuria. Initially the data was extracted for 9 groups as on the obstetric summary sheet (Item 22 Codes 0-9 inclusive, See 9.2). These results were reclassified into seven groups:

(i) No hypertension (Item 22 Code 0)
(ii) Pre-eclampsia without proteinuria and hypertension of late pregnancy without proteinuria (Item 22 Codes 1 and 4)
(iii) Intrapartum hypertension with or without proteinuria (Item 22 Codes 7 and 8)

(iv) All forms of hypertension without proteinuria (Item 22 Codes 1 and 2, 4 and 7)

(v) Essential hypertension (Item 22 Code 2)

(vi) All forms of hypertension and proteinuria (Item 22 Codes 3 and 5, 6 and 8)

(vii) Pre-eclampsia with proteinuria and hypertension of late pregnancy with proteinuria (Item 22 Codes 3 and 6)

These seven groups were extracted by ethnic group for distribution curves and perinatal mortality rates. The effect of maximum diastolic blood pressure as recorded in the notes was studied for three groups:

(i) Essential hypertension (Item 22 Code 2)

(ii) Intrapartum hypertension (Item 22 Codes 7 and 8)

(iii) Pre-eclampsia and hypertension of late pregnancy unclassified with and without proteinuria (Item 22 Codes 1 and 3, 4 and 6)

and a table showing the effect of maximum diastolic blood pressure on the perinatal mortality rate for Coloureds only was extracted.

11. Antenatal complications. Two major antenatal complications were studied:

(a) Antepartum haemorrhage: Three groups were studied:

(i) Unknown cause (Item 23 Code 01)

(ii) Placenta Praevia (Item 23 Code 03)

(iii) Abruptio placenta (Item 23 Code 02)

Tables for incidences and perinatal mortality rates were drawn for all groups and later for the three ethnic groups separately.

(b) Premature rupture of membranes: The effect of premature rupture of membranes on perinatal mortality rates by ethnic group was studied.

12. Labour and delivery. The onset of labour, the duration of labour and the methods of delivery were studied by ethnic groups:

(i) Onset of labour: Here all elective Caesarian Sections and stillbirths before labour were excluded and a table was extracted by ethnic group for patients who underwent induction of labour against the spontaneous labour group.

(ii) Duration of labour: In hours was studied in groups: 1-6 hours, 7-12 hours, 13-18 hours, 19-24 hours and 25 hours and over. Stillbirths before labour were excluded

(iii) Methods of delivery: Here all stillbirths occurring before labour were excluded and a table of the methods of delivery (spontaneous vertex, forceps, breech, Caesarian Section, vacuum extraction and unknown) was extracted by ethnic group for perinatal mortality rates.

(iv) Breech presentation: A small separate study into breech delivery was undertaken. A table of methods of delivery, by time of death, by weight of the baby was extracted for each ethnic group.

7. Analysis of Stillbirths and Neonatal Deaths

Concurrently with the first phase of the study, an analysis of stillbirths and early neonatal deaths by clinico-pathological cause was carried out. The data that was utilised in the first phase was transcribed from a computer print out on to a newly designed code sheet (See 10). In addition, information that was not available from the Master Magnetic tape but was recorded in the patient folders was put on to the code sheet. MICROFILMS of the original folders or

the original folders were scrutinised by the author and a cause of death from the classification used was ascribed to each stillbirth and early neonatal death.

1. Design of the code sheet.

This can be seen in Appendix C (See 10). Numerous factors that have been analysed in the first phase of this study were transcribed from a computer print-out on to these code sheets for each stillbirth and early neonatal death occurring in singleton pregnancies in 1972.

In addition, several other factors, not on the original computer sheet, were extracted from the MICROFILMS or original folders. These are marked with an asterisk (See 10).

The author personally checked every stillbirth and early neonatal death microfilm or folder, and during the assessment of the cause of death by clinico-pathological cause, checked the data that had been transcribed from the computer print-out. This acted as a further check for the validity of the original data for all the perinatal deaths in the total population sample.

Gestational age assessment: All babies born had a gestational age assessment done either by the date of the last menstrual period if this was certain, giving a true gestational age, or by a Dubowitz paediatric score giving a gestational age assessment (Dubowitz et al, 1970). To satisfy himself of the close correlation between these two methods of gestational age assessment, i.e. true gestational age and Dubowitz score, the author did a random comparison by ethnic

group for both assessments on patients who were CERTAIN of the last menstrual period and who had had an independent Dubowitz score done by a member of the paediatric staff. The correlation was found to be very close with correlation coefficients varying from 0,71 for Whites, 0,83 for Coloureds and 0,74 for Bantu (See *12.i*).

The gestational age assessment used in this study represents what in the author's opinion was the best estimate when the true gestational age, the size of the uterus and dates at booking, the onset of fetal movements, the use of ultrasonic biparietal diameters, and the Dubowitz score were all taken into account. When the gestational assessment was certain, it was marked down as CERTAIN; when not, it was marked as ESTIMATED (Item 18, See 10). If a disparity of more than 2 weeks existed between various methods of gestational age assessment, then the Dubowitz score was assigned overiding significance.

Intra-uterine growth: From the gestational age assessment and the neonatal weight, the fetus was classed as appropriate for gestational age, small for gestational age or large for gestational age. The intra-uterine growth chart used was that used by Lubchenco et al (1972) (See 4.2.7).

Placental weight: Placentas were all weighed in grams after the umbilical cord had been cut flush with the placenta. From the fetal weight and the placental weight, a feto-placental weight ratio was calculated.

Accidental haemorrhage: The size of the retro-placental clot, measured in millilitres, was recorded.

From all the information available, the most appropriate cause of death was assigned on the basis of a clinico-pathological classification:

2. The clinico-pathological classification

This classification was a modification of the classification used by Baird (1954) and Baillie and Butler (1974). The author's classification is similar to one devised by Low et al (1970) and is as follows:
All gestational ages are measured in completed weeks.

(a) Congenital malformations
(b) Iso-immunisation
(c) Mechanical problems
(d) Cause of death uncertain - TERM
(e) Cause of death - PRETERM
(f) Fetoplacental inadequacy
(g) Accidental haemorrhage
(h) Maternal disease
(i) Unclassified

Congenital malformation: This was the cause of death when a major congenital abnormality was present. When present, it would override all other causes. It was subdivided into

(i) Central nervous system deformities and
(ii) Other

Iso-immunisation: This cause would override all except congenital abnormalities, and would require evidence of iso-immunisation antibody titres in the liquor amnii of 1 : 32 or over, on one or more occasions and/or postmortem evidence of hepato-splenomegaly in a Rhesus positive fetus from a Rhesus negative mother.

Mechanical problems: These included only neonates who had completed 37 or more weeks of pregnancy (except in the case of placenta praevia), and who showed clear evidence of obstetrical trauma which alone could have accounted for fetal demise.

This group was divided into five sub-groups:

(i) Mechanical vertex: When the fetus was born vaginally by the vertex presentation

(ii) Mechanical breech: When the fetus was born by the breech presentation

(iii) Mechanical cord: This group included both prolapse of the cord after 37 completed weeks or a cord around the fetal neck which was judged by the delivery doctor as sufficient to cause the death of the fetus.

(iv) Mechanical praevia: This group included all patients who had a placenta praevia, which was diagnosed by palpation or vaginal examination or an examination at Caesarian Section, but not if only diagnosed by special investigations (See 6).

(v) Mechanical birth trauma other: This group included patients over 37 weeks pregnant, who had a transverse lie or ruptured uterus or obstructed labour with Caesarian Section.

In groups (i), (ii) and (v) all deaths occurring before labour were excluded from these groups. In group (iii) mechanical cord prolapse of the cord after 37 weeks need not have been in labour. However, cord around the neck deaths had to be either intrapartum still births or neonatal deaths following delivery of a markedly depressed infant.

Cause of death uncertain - TERM

This group included all infants who did not fall into one of the other main groups, where the infant's weight was

appropriate or large for gestational age (Lubchenco et al, 1972), and the pregnancy had gone over 37 completed weeks. In this group there were some infants in whom the cause was known i.e. neonatal infection and there were some who had clear evidence of fetoplacental inadequacy but who had appropriate weight for gestational age.

Cause of death PRETERM: This group included all neonates who did not fall into one of the other groups, who had an appropriate or large birth weight for gestational age (Lubchenco et al, 1972), and who had completed less than 37 weeks.

This group was divided into three sub-groups:

(i) Neonates from 34 - 36 weeks
(ii) Neonates from 31 - 33 weeks
(iii) Neonates from 30 weeks or less

Feto-placental inadequacy: This group included all neonates who were small for gestational age (Lubchenco et al, 1972), and/the cause of death did not fall into one of the other groups. This group was divided into four comparable groups to group 4, i.e.

(i) Neonates from 37 weeks
(ii) Neonates from 34 - 36 weeks
(iii) Neonates from 31 - 33 weeks
(iv) Neonates 30 weeks or less

Accidental haemorrhage:

All patients who had clear evidence of an accidental haemorrhage diagnosed either with a full clinical presentation of a revealed or concealed haemorrhage, shock and a woody hard uterus or with evidence of a retroplacental clot.

This cause of death would override groups *4* or *5* but not groups *1*, *2* and *8*.

Maternal disease: This group included patients with evidence of significant maternal disease, which may or may not have been solely responsible for the death of the fetus. For definitions of the various medical disorders, see glossary (6).

There were the following sub-groups:

(i) All patients with essential hypertension

(ii) All patients with chronic nephritis

(iii) All patients with diabetes mellitus

(iv) All patients with syphillis. Here the Wasserman reaction had to be positive, the patient was not treated or there was positive Wasserman and evidence of a large syphilitic placenta.

(v) This group included patients with toxoplasmosis, systemic lupus erythematosis, jaundice in pregnancy.

Unclassified: This group included all patients where insufficient data was available to allocate a satisfactory group. An attempt was made to keep this group as small as possible.

3. Tables in Analysis:

When the computer forms were completed they were analysed by hand sorting and the following tables were extracted. Because of the enormous volume of data available the analysis to some extent had to be selective and arbitrary. In general the guiding principles in selecting data for analysis were aimed at prevention or selection of an appropriate group at risk.

(i) Overall causes by ethnic group (See 3.2.*1*)

A table was extracted showing the number of patients,

the percentage distribution and the rate per 1000 of the total population sample for each of the nine groups of the classification used. This included the unclassified group.

(ii) Congenital abnormalities (See 3.2.2)

The incidence overall and by ethnic group was studied. The effect of maternal age and parity was investigated and tables extracted.

(iii) Iso-immunisation (See 3.2.3)

The incidence overall was studied, but as the number of cases falling into this group was so small, and as the correct treatment for both prevention and curative therapy is known, the author felt it was unnecessary to pursue the group further.

(iv) Mechanical problems (See 3.2.4)

The overall incidence of mechanical problems causing death and a table of the number of patients, percentage distribution and rate per 1000 of total population sample was extracted.

(a) Mechanical vertex: The number of cases falling into this group were so small and as these were preventable and were usually individual errors in judgement, these were not investigated further.

(b) Mechanical breech: This group was investigated earlier (See 2.6.12; 3.1.12.a) and was not studied further.

(c) Mechanical cord: The numbers of patients with prolapse of the cord and with cord around the neck were separated and reviewed for various factors.

(d) Mechanical praevia: This group was analysed

separately under antepartum haemorrhage by cause (See 2.7.3.k).

(e) Mechanical other: This group was small and consisted of patients with ruptured uteri or obstructed labour due to transverse lie. This group was not analysed further.

(v) Cause of death uncertain - Term group

This heterogeneous group was tested for many epidemiological factors. The time of death, whether stillborn before or during labour or early neonatal death, was studied. The ethnic variation and effect of maternal age, parity, weight, height, were analysed and tables of the positive influences were drawn up.

The role of past obstetric history, prenatal care, and hypertension was examined; the association of premature rupture of membranes was examined.

A summary of the positive results was made.

(vi) Cause of death - PRETERM group

This group was studied in exactly the same way as the Cause of Death Uncertain TERM group. (See (v) above). The positive findings and the important negative findings were tabulated.

A summary of the findings was made.

(vii) Feto-placental inadequacy

This group was initially studied in two groups: A term group, who had completed 37 weeks pregnancy, and a PRETERM group, who had completed less than 37 weeks pregnancy. However, the numbers were small, and as the groups were homogeneous, they were re-analysed as a complete group.

The various factors studied in Cause of Death

Uncertain - TERM group (See (v) above) were studied and the positive findings and important negative findings were tabulated.

A summary of the significant findings was made.

Because of it being possible that the Cause of Death Preterm group contained some fetoplacental inadequate neonates who were not small for gestational age, this group was re-analysed for the various factors under study in two groups: (a) Cause of death - PRETERM, but where hyaline membrane disease was diagnosed and (b) Cause of death PRETERM but where no hyaline membrane disease was found.

This re-analysis would show in group (a) the associations with prematurity, i.e. infants born too soon whereas group (b) would show either a bias towards prematurity or fetoplacental inadequacy or be entirely different to the original analysis of the complete pre-term group (See 2.8; 3.3).

(viii) Accidental haermorrhage

This group was analysed for the various factors under study as in Cause of Death Unknown - TERM group (See (v) above).

In addition, the size of the retroplacental clot, the pressure of warning bleeds and the association with small for gestational age neonates was investigated.

All significant data was tabulated in the results.

A summary of the findings was made.

(ix) Maternal disease

The overall maternal disease incidence and a table on the numbers, the percentage distribution and the rate per

1000 of the total population sample was extracted.

The significance of essential hypertension, chronic nephritis and diabetes is wellknown in perinatal mortality and was not investigated further at this stage.

Syphilis was studied in more detail for various epidemiological factors.

The maternal disease "other" group was too heterogeneous a group for further analysis. Only the numbers of patients and their diseases were recorded.

In the previous nine sub-sections, the various causes of fetal death were partially or totally analysed against various maternal epidemiological factors for significant associations. It was thought essential to analyse selected factors by cause of death.

(x) Hypertension by cause of death

A table was extracted showing the numbers, percentage distribution and rate per 1000 of the total population sample for the three forms of hypertension analysed by cause of death. These three forms of hypertension were:

(a) Essential hypertension - defined as a blood pressure of more than 90 mmHg diastolic occurring before the 20th week of pregnancy or hypertension that was known to be present before the onset of the pregnancy (See 6).

(b) Pre-eclampsia with or without proteinuria - This was defined as a rise in blood pressure to more than 90 mmHg diastolic recorded on two or more occasions after the 20th week of pregnancy. For this diagnosis patients must have been booked before 20 weeks gestation (See 6).

(c) Hypertension of late pregnancy unclassified with or without proteinuria - This group contained all cases of hypertension who did not fall into group (a) or (b). This included all patients booking after 20 weeks gestation who had a diastolic blood pressure of over 90 mmHg on two or more occasions (See 6). This group in practice contained mainly patients who had pre-eclampsia or eclampsia but who could not strictly be put into group (b). Thus, in addition to the tables by cause of death for the three groups, a fourth table combining group (b) and (c) by cause of death was extracted.

(xi) Antepartum haemorrhage by cause of death

A table was compiled showing the numbers, percentage distribution and rate per 1000 of the total population sample for the three groups of antepartum haemorrhage analysed by cause of death. These three forms of antepartum haemorrhage were:

(a) Antepartum haemorrhage - UNKNOWN - This was defined as any bleeding, other than "a show" occurring during pregnancy after the 20th week which was not due to placenta praevia or accidental haemorrhage (See 6).

(b) Accidental haemorrhage (Abrupto Placenta) - This was defined as a revealed or concealed bleed from a normally situated placenta which showed evidence of retro-placental clot formation (See 6).

(c) Placenta praevia - This was defined as a placenta situated in the lower uterine segment diagnosed by vaginal palpation or seen at Caesarian Section (See 6).

The association between various forms of antepartum

haemorrhage and (a) forms of hypertension; (b) small for gestational age babies, was studied.

(xii) Premature rupture of membranes (P.R.O.M.) by cause of death.

A table showing the numbers, percentage distribution and rate per 1000 of the total population sample analysed by cause of death was extracted.

The various factors studied throughout were analysed for this group.

(xiii) Booking status by cause of death

The author felt the booking status to be an important factor and a table showing the cause of death of the booked and unbooked patients was extracted.

(xiv) Perinatal mortality in the P.M.S. district service analysed by cause of death

A table showing the number of stillbirths, neonatal deaths and live infants born on district was extracted and perinatal mortality rates calculated.

The number of perinatal deaths occurring in patients who were booked for district delivery but who delivered in hospital, was reviewed and these deaths were analysed in a table by clinico-pathological cause.

8. Combined analysis table of perinatal mortality determinants by cause of death

A table showing no relationship (-), tendencies (+) and statistically significant findings (++,+++) of various determinants for the different clinico-pathological cause groups was drawn up.

No correction factor was employed to compensate for the bias towards low socio-economic groups, as insufficient data was available for the 4,251 patients delivered in private institutions.

9. Statistical tests used in this thesis

All statistical calculations were done with the aid of a Hewlett-Packard 9100B Calculator in the Department of Obstetrics and Gynaecology, University of Cape Town Medical School. The calculator was programmed and operated by the statistician, Miss Christine Vader, and the author.

1. Two by Two Chi-Square Test

Yate's correction for continuity was used throughout (Armitage, 1971).

The entries in the two by two table was denoted as follows:

a	b	r_1
c	d	r_2
S_1	S_2	N

The continuity corrected version was:

$$X_c^2 = \frac{(|ad - bc| - \frac{1}{2} N)^2 N}{r_1 \; r_2 \; s_1 \; s_2}$$

The significance levels were obtained from a table of the distribution of Chi-Square (Fisher and Yates, 1963).

2. Two by Three Chi-Square Test

For each of the observed six frequencies, O, in the 2 x 3 table, the expected frequencies, E, were calculated thus:

$$E = \frac{\text{Row total x column total}}{N}$$

Next, for each frequency $\frac{(O - E)^2}{E}$ was calculated.

Finally:

$$\chi^2 = \frac{(O - E)^2}{E}$$

the summation being over the six cells of the table.

The significance levels were obtained from a table of distribution of Chi-Square (Fisher and Yates, 1963). Two tailed tests were applied throughout.

3. The extract test for fourfold tables (Armitage, 1971)

Where one or more of the frequencies in a 2 x 2 table were particularly small, i.e. the expected frequency was less than 5, the exact probability was calculated.

The entries in the 2 x 2 table were denoted as follows:

a	b	r_1
c	d	r_2
S_1	S_2	N

The exact probabilities of this table was given by the formula:

$$\frac{r_1 ! \; r_2 ! \; s_1 ! \; s_2 !}{N ! \; a ! \; b ! \; c ! \; d !}$$

Given any observed table, the probabilities of all tables with the same marginal totals were calculated. The p - value for the observed table was obtained by summation.

CHAPTER 3

Results:

Analysis of Master Tape for 1972 Deliveries

Analysis of Stillbirths and Neonatal Deaths for 1972

Combined Analysis Table of Perinatal Mortality Determinants by Cause of Death

CHAPTER 3

RESULTS

The results will be presented in the order of Chapter 2. Other results not shown in this chapter are tabulated in Appendix D (See 11).

1. Analysis of Master Tape for 1972 Deliveries

The sample size consisted of 15,251 patients of whom 1,755 were White, 11,194 were Coloured, and 2,302 were Bantu.

1. Overall stillbirth, neonatal, perinatal mortality rates for the 3 ethnic groups

From Table 3.1 and Figure 3.1, it was found that the stillbirth rate showed a significant variation between the ethnic groups ($\chi^2 = 37$ $p<0.001$).

The early neonatal death rates appeared to vary slightly although this was not statistically significant ($\chi^2 = 3,3$).

The overall effect of stillbirth rate and the early neonatal death rate, i.e. the perinatal mortality rate, showed significant variation between the ethic groups ($\chi^2 = 36$ $p<0.001$).

What was more interesting was that in the Whites, the number and rate of neonatal deaths was slightly higher than the stillbirths. However, for both the Coloured and Bantu the stillbirth numbers and rates were double the neonatal deaths.

Table 3.1.

Total births, stillbirths, early neonatal deaths, the stillbirth rate, early neonatal death rate, and perinatal mortality rate by ethnic group

	White	Coloured	Bantu
Total births	1755	11194	2302
Stillbirths	16	243	86
Early neonatal deaths	18	138	37
Stillbirth rate* (per 1000 total)	9,1	21,7	37,4
Early neonatal death rate** (per 1000 live)	10,4	12,6	16,7
Perinatal mortality rate*** (per 1000 total)	19,4	34,0	53,4

* Significant difference in stillbirth rate between ethnic groups $\chi^2 = 37$ $p<0,001$.

** No significant difference in early neonatal death rate between ethnic groups $\chi^2 = 3,3$ N.S.

*** Significant difference in perinatal mortality rates between ethnic groups $\chi^2 = 37$ $p<0,001$.

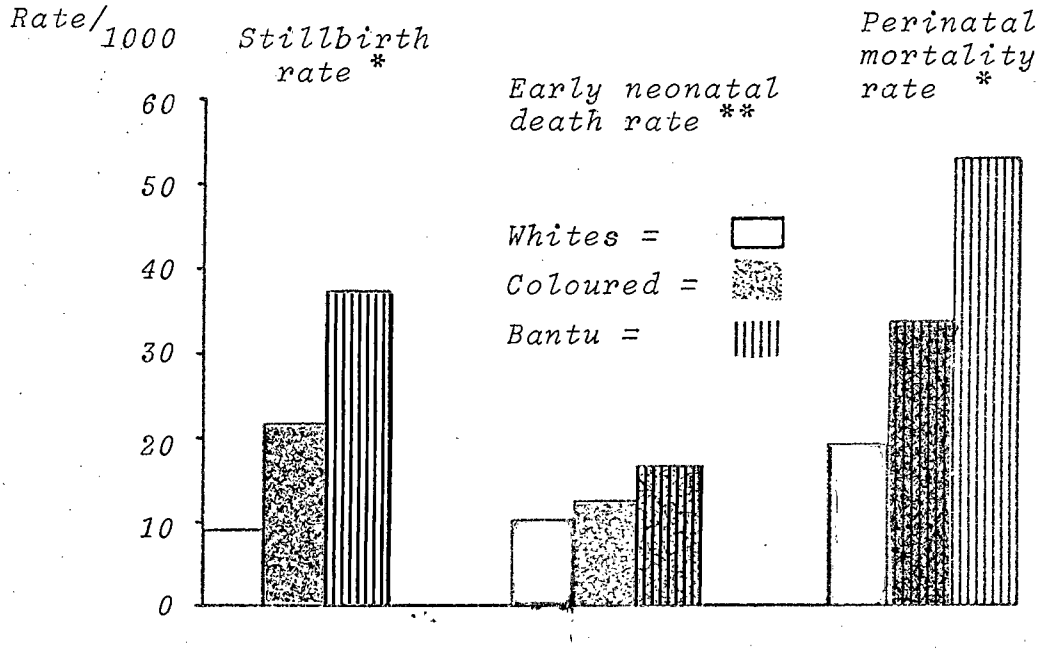


Figure 3.1.

Stillbirth rate, neonatal death rate and perinatal mortality rates among the three ethnic groups.

**Rate per 1000 total births.*
*** Rate per 1000 live births.*

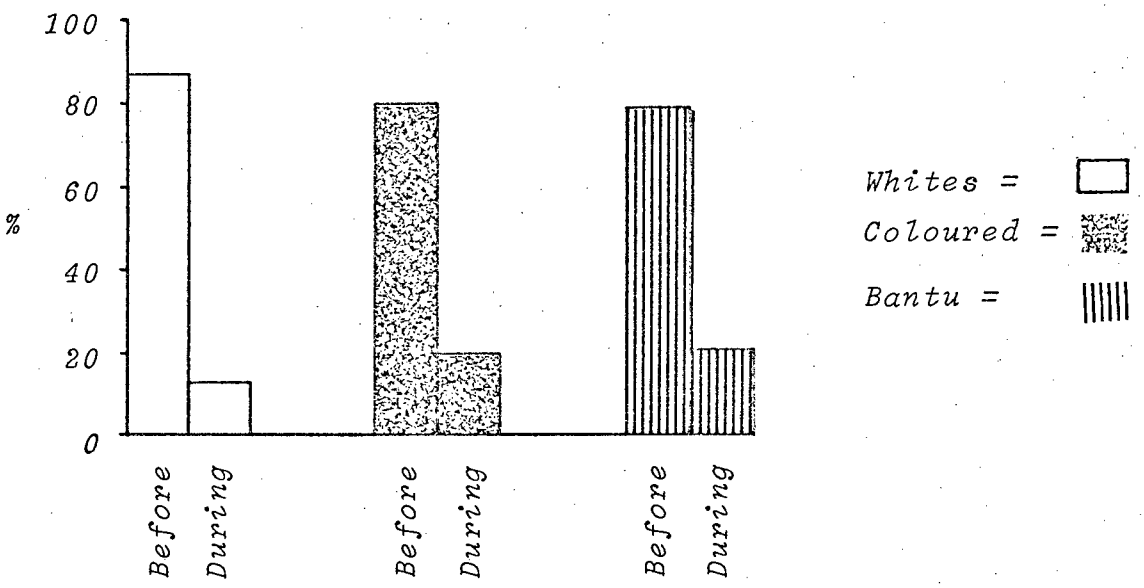


Figure 3.2.

Showing the percentages of stillbirths occurring before labour and during labour in the ethnic groups.

2. Time of stillbirth occurrence

Because the major variation in the perinatal mortality rates between the ethnic groups was accounted for by the variation in the stillbirth rate, the time of occurrence of the stillbirth was investigated.

From Figure 3.2 and Appendix Table 11.2 it was found that the vast majority of stillbirths occurred before labour but that there was no interracial variation for this finding (χ^2 = 0,6 Not significant).

Whether the causes for the stillbirths occurring before labour were the same for the different ethnic groups was investigated further on (See 3.2).

3. Maternal age

(a) The distribution of maternal age in the three ethnic groups studied was investigated (See Figure 3.3).

There was a significant difference in the <20 year age group between the three ethnic groups (χ^2 = 12,5 $p<0,01$).

There were many more Bantu under 20 years than Whites or Coloureds (χ^2 = 12 $p<0,001$).

The predominant age group in all three ethnic groups was 20 - 24 years. However, the Whites had significantly more in this group than the Coloureds and Bantu (χ^2 = 33 and χ^2 = 38 $p<0,001$).

In the group 25 - 29 years, there was no difference between the Whites and Coloureds. There were significantly less Bantu than Whites and Coloureds. (χ^2 = 7,8 $p<0,01$; χ^2 = 4,6 $p<0,05$ respectively).

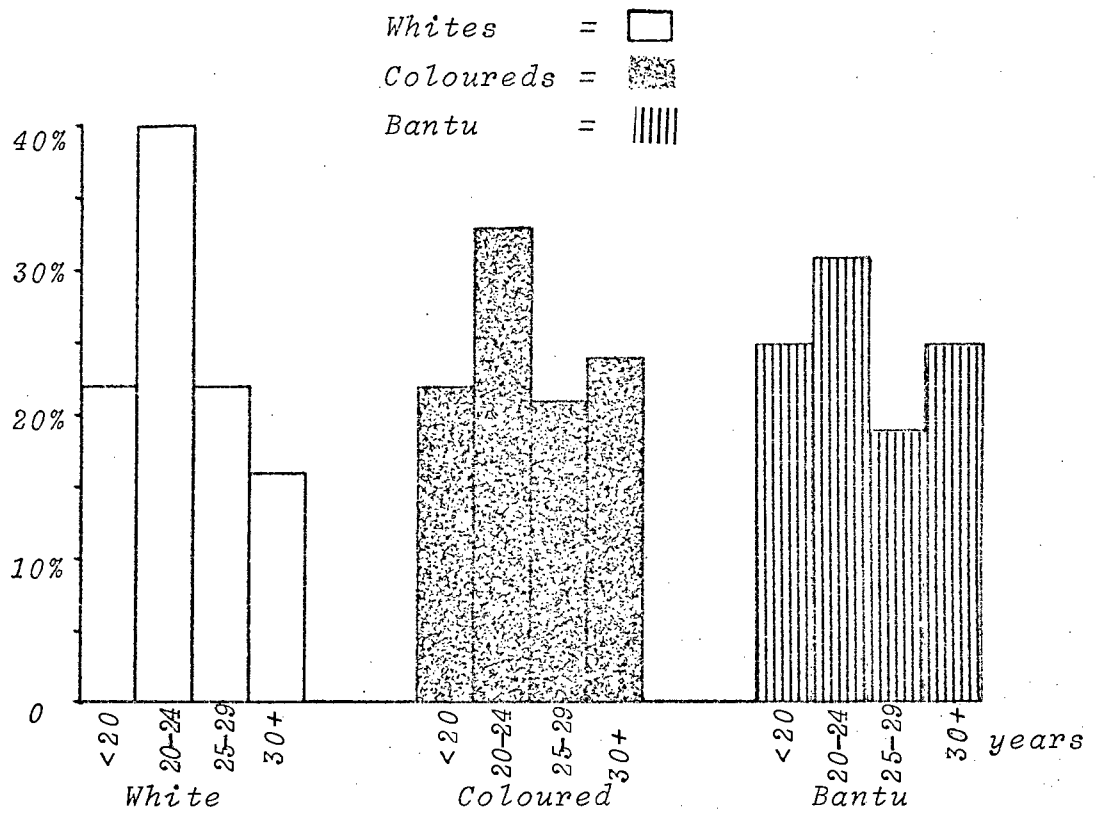


Figure 3.3

Distribution at various ages in the three ethnic groups.

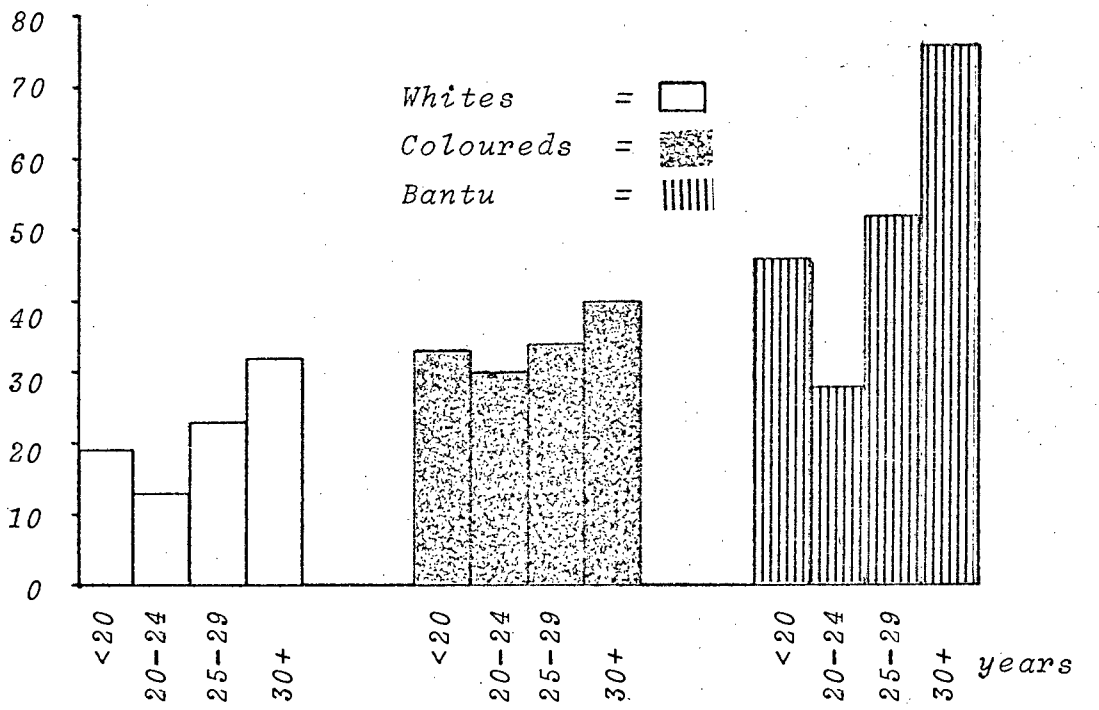


Figure 3.4

Showing the effect of maternal age on perinatal mortality rate in the three ethnic groups.

There were far fewer Whites over the age of 30 years than either the Coloureds or Bantu (χ^2 = 53 and 48 $p<0,001$). This difference was not shown between the Coloureds and Bantu.

For Table showing the number and percentage distributions of the sample population amongst the three ethnic groups at various age groups, see Appendix Table 11.3 .

Summary

The Whites were mainly between 20 - 24 years of age with fewer older mothers. The Coloureds were similar to the Whites, however, with more women over 30 years and the Bantu had significantly more teenagers and older patients than the other groups.

(b) The effect of maternal age on perinatal mortality in the three ethnic groups was studied. (See Figure 3.4. and Appendix Table 11.3).

The pattern of the effect of perinatal mortality at various maternal ages was the same for the three ethnic groups; perinatal mortality was higher in the <20 year group than the lowest 20 - 24 year. This latter group represents the largest group on distribution. After 24 years there was an increasing effect of maternal age on perinatal mortality.

There was a significant difference between the 20 - 24 year group and the 30+ group in perinatal mortality in Whites, Coloured and Bantu (χ^2 = 4; χ^2 = 4,1; χ^2 = 15,4 - $p<0,05$; $p<0,05$; $p<0,001$, respectively).

The Bantu had significantly higher perinatal mortality rates for all age groups than Whites and Coloured; they showed the effect of age i.e. young and older patients having higher

perinatal mortality rates, more than the Whites and Coloured.

In the 20 - 24 year group, the Coloureds had a significantly higher P.N.M. rate than Whites (χ^2 = 6,8 $p<0,01$).

4. Parity

(a) The distribution of parity in the three ethnic groups studied is shown in Figure 3.5 and Appendix Table 11.5.

There was no significant difference in the distribution para 0 to para 3 in the three ethnic groups.

However, there were significantly more para 4 and over in the Coloured and Bantu than in the Whites (χ^2 = 169 $p<0,001$).

(b) The effect of parity on perinatal mortality was studied in the three ethnic groups. In the Whites the numbers in each group were small and statistically there was no difference with parity on perinatal mortality. See Figure 3.6 and Appendix Table 11.6. However, both the Coloured and the Bantu showed a trend towards increasing perinatal mortality with increasing parity.

In the Coloured the para 4+ had significantly increased perinatal mortality rate over the primigravida (χ^2 = 3,8 $p<0,05$).

In the Bantu the para 1-3 group and the para 4 and over group had significantly higher perinatal mortality rate than the primigravida (χ^2 = 8,6 and χ^2 = 10,3 respectively, $p<0,01$).

4a. Combined effect of maternal age and parity on perinatal mortality rates

The combined effect of maternal age and parity on

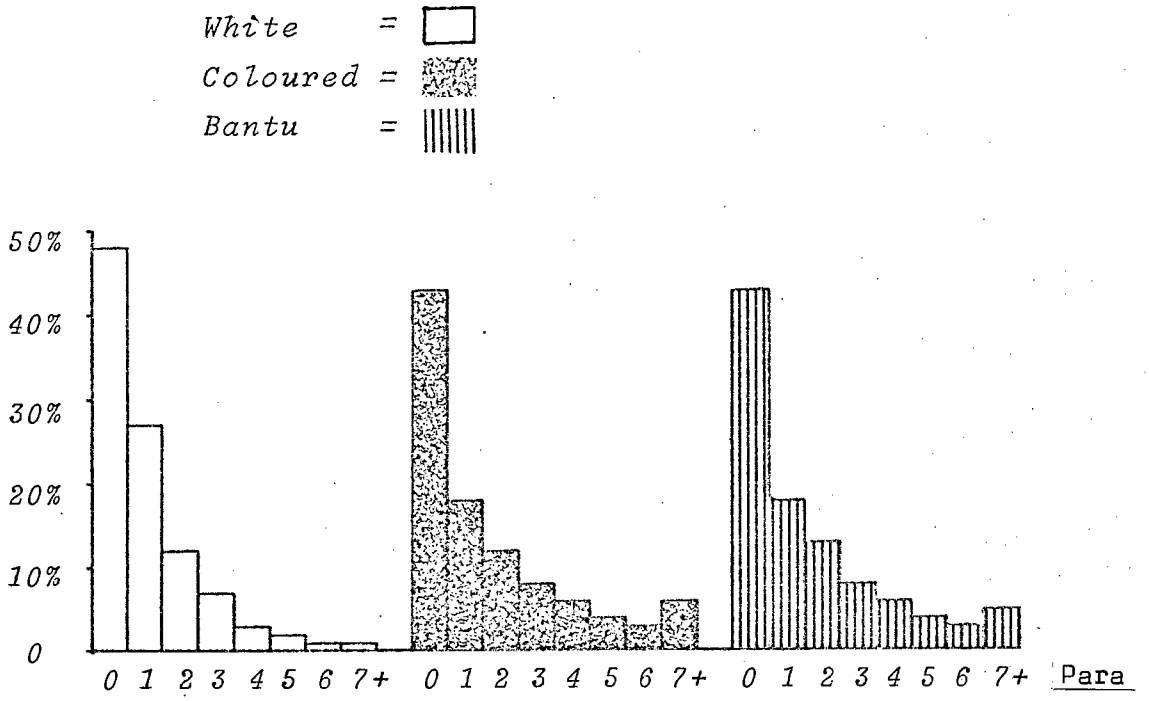


Figure 3.5

Distribution at various parities in the three ethnic groups.

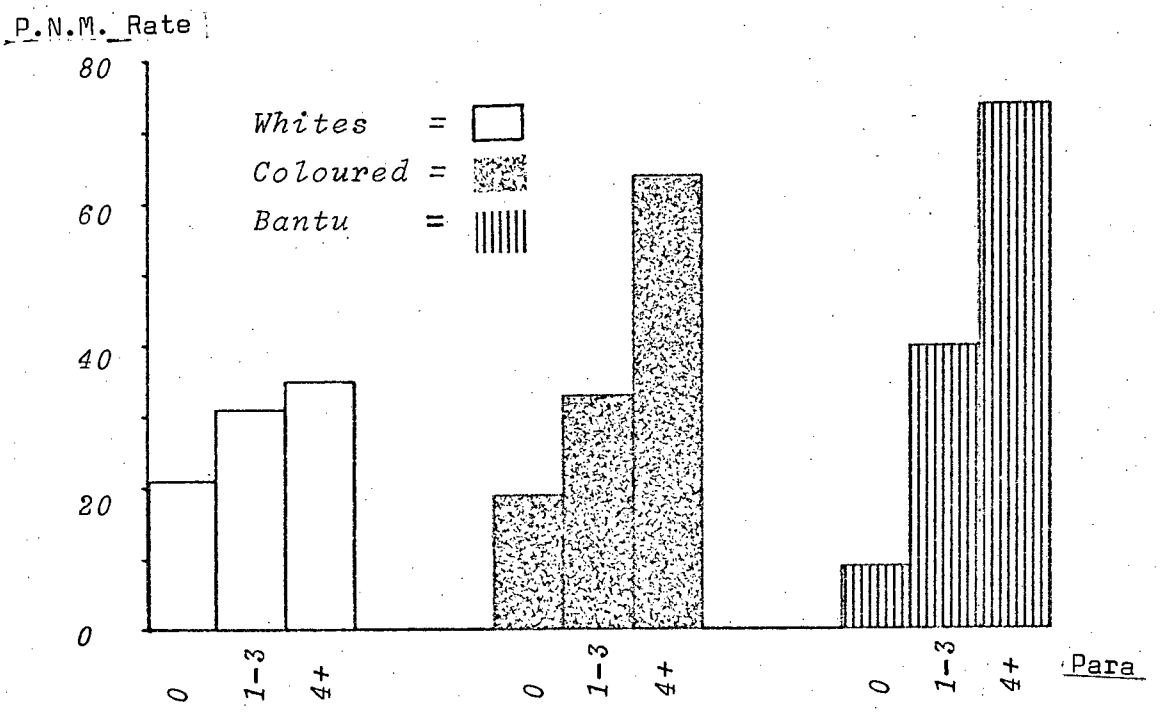


Figure 3.6.

Perinatal mortality at various parities by ethnic group.

perinatal mortality in the three ethnic groups was extracted (See Appendix Tables 11.7; 11.8; 11.9).

The trend for increasing perinatal mortality in primigravida with increasing age was shown in all three ethnic groups. Primigravida over 30 years had the highest mortality in all groups.

Teenage primigravida did not show an increased perinatal mortality. However, multiparous (para 1-3) patients in the teenage group showed increased perinatal mortality rates in both Coloureds and Bantu.

5. Maternal weight

(a) Distribution of maternal booking weight in the three ethnic groups was studied and is shown in Figure 3.7. There was no statistical difference between the distributions of the Whites and the Bantu. However, the Coloureds had significantly more under 45 kilogram mothers than the Whites or Bantu ($\chi^2 = 57$, $\chi^2 = 66$ respectively, $p<0,001$).

In the heavier mothers (i.e. more than 84 kilograms) the Coloureds had less than the Whites and Bantu ($\chi^2 = 9,5$ $p<0,01$; and $\chi^2 = 132$ $p<0,001$, respectively); the Bantu had even more heavy mothers than the Whites ($\chi^2 = 26$ $p<0,001$)

(b) The effect of maternal booking weight on perinatal mortality between the three ethnic groups can be seen in Appendix Table 11.10 and Appendix Figure 11.1.

There was no significant difference in the weight groups in the Whites and the numbers at the extremes of maternal weight in the Bantu were too few for analysis.

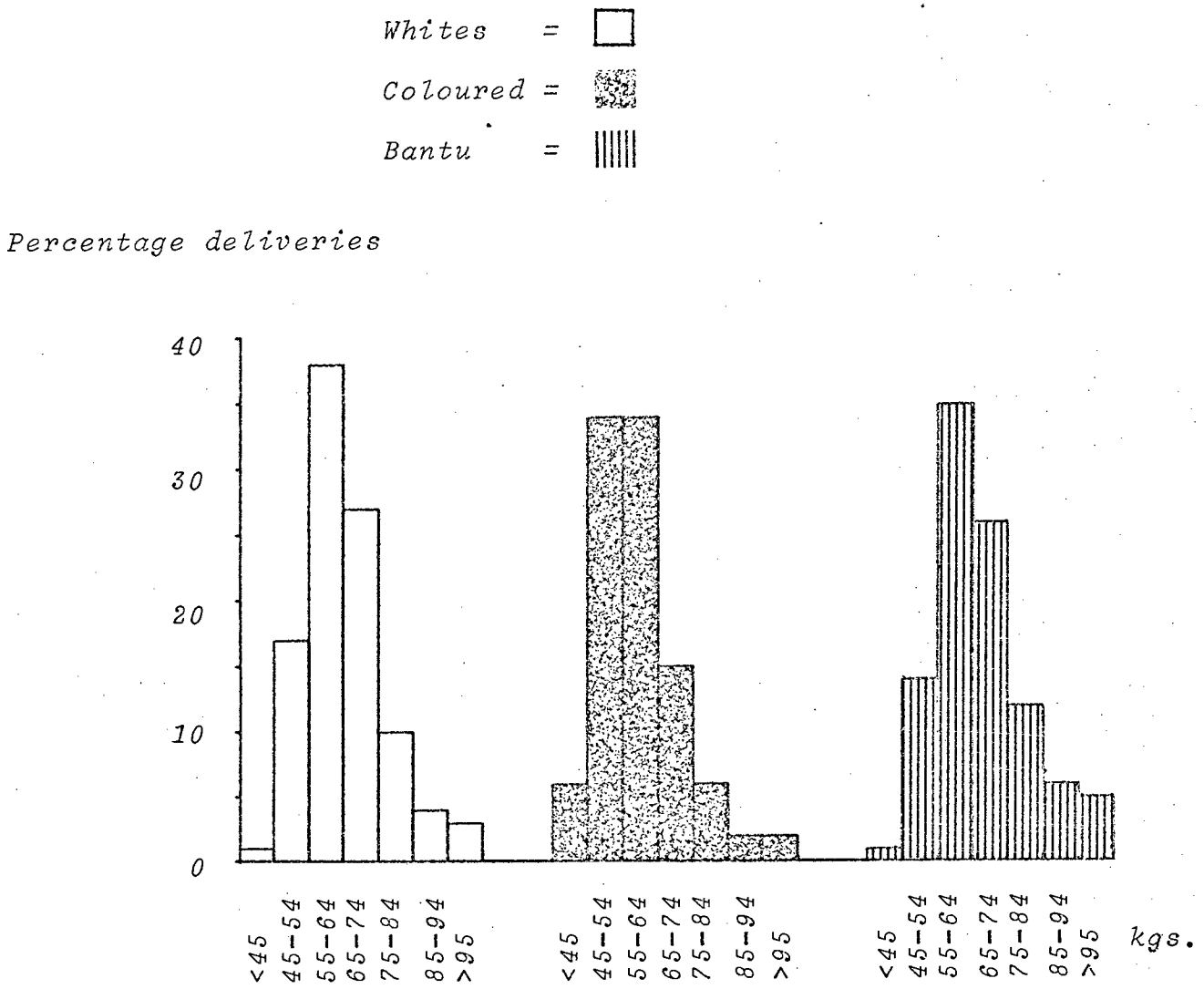


Figure 3.7.

Distribution at various maternal booking weights by ethnic group.

Table 3.2

Perinatal mortality at various maternal booking weight in the Coloured

Maternal booking weight	P.N. Deaths	Alive	P.N. Mort. rate per 1000 births
<45 kg	30	570	50
45-84kg	234	8775	26
85+ kg	17	451	36

The perinatal mortality rate was significantly higher in the Coloured for the mothers who weighed less than 45 kg (χ^2 = 12 $p<0,001$) but there was no difference between the heavy mothers and the 45 - 84 kg group (See Table 3.2).

The combined effect of maternal booking weight combined with maternal height was investigated.

6a. Maternal height

(a) Distribution of the maternal height in the three ethnic groups was studied and is seen in Figure 3.8 and Appendix Table 11.11.

The first striking feature was that there were many more short Coloured and Bantu than Whites and that there were many more short Coloured than Bantu.

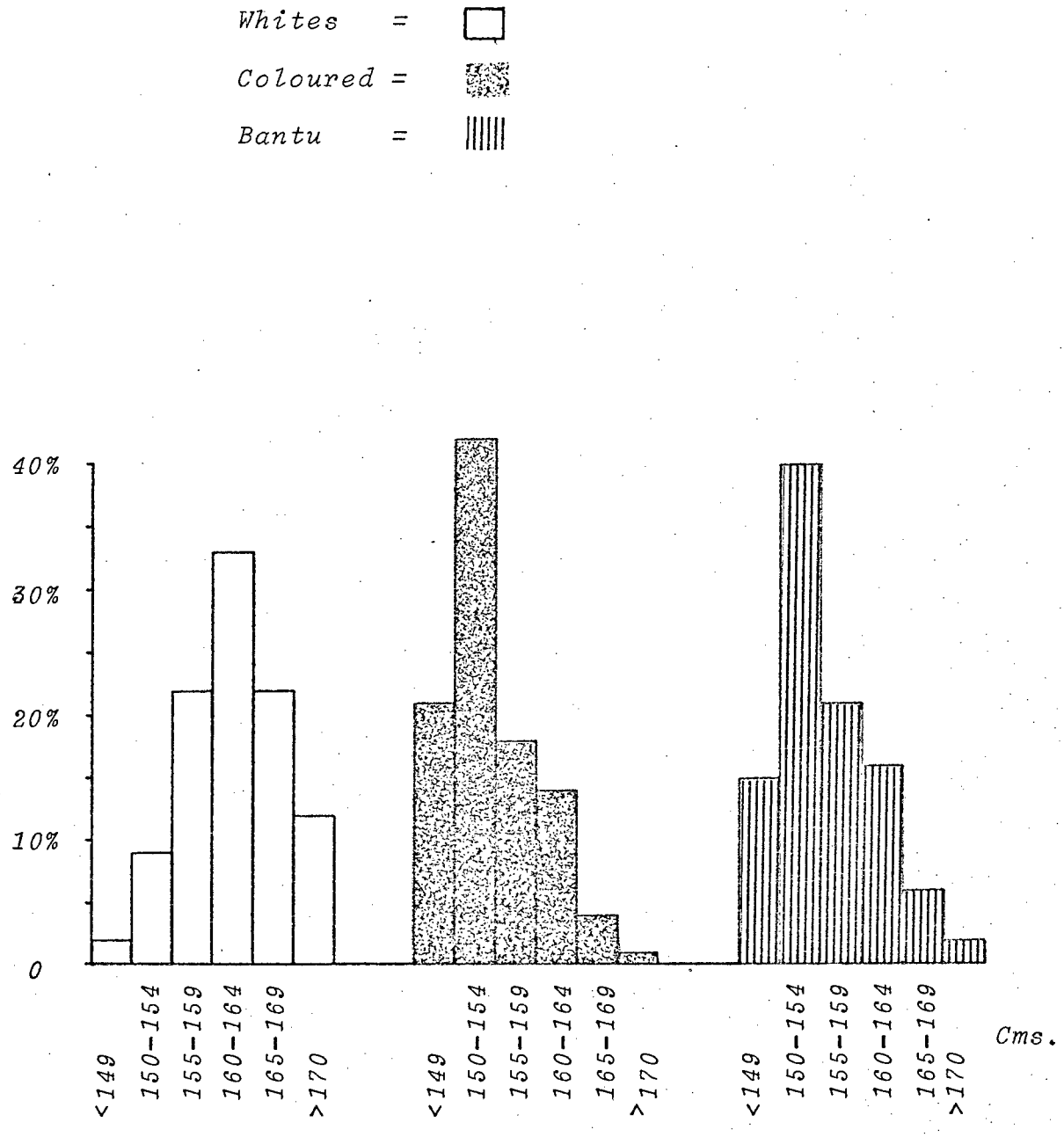


Figure 3.8.

Distribution at various maternal height groups by ethnic group.

Table 3.3

Numbers at various maternal height groups by ethnic groups

	Maternal height		<149 cm Group statistics
	< 149 cm	> 150 cm	
Whites	41	1658	More Coloured than Whites χ^2 = 338 p<0,001.
Coloureds	2119	7930	More Bantu than Whites χ^2 = 179 p<0,001
Bantu	280	1534	More Coloureds than Bantu χ^2 = 30 p<0,001

Similarly with the 150 - 154 cm group there were significantly more Coloureds and Bantu (p <0,001) than Whites.

With the tall group, the reverse applied. There were many more tall Whites than Bantu and Coloureds (χ^2 = 139, χ^2 = 532 respectively, p <0,001).

Summary

On average the Whites were significantly taller than the Coloureds and Bantu; the Bantu were taller than the Coloureds.

(b) The effect of maternal height on perinatal mortality was studied in the three ethnic groups and can be seen in Appendix Table 11.12 and Appendix Figure 11.2.

In the Whites, maternal height as a factor had no

significant effect on perinatal mortality.

In the Bantu due to small numbers there was no significant effect of maternal height on perinatal mortality. However, in the Coloured group (See Table 3.4) it was clearly shown that the short group (<149 cm) mothers had a significantly higher perinatal mortality rate than the medium group.

Because of this finding, the combined effect of maternal booking weight and maternal height was studied in the Coloureds.

Table 3.4

Number of dead (D) and number of alive (A) infants born to Coloured mothers of various maternal heights

	Height in cms	D	A
Short	< 149	82	2037
Medium	150-164	195	7173
Tall	> 165	10	552

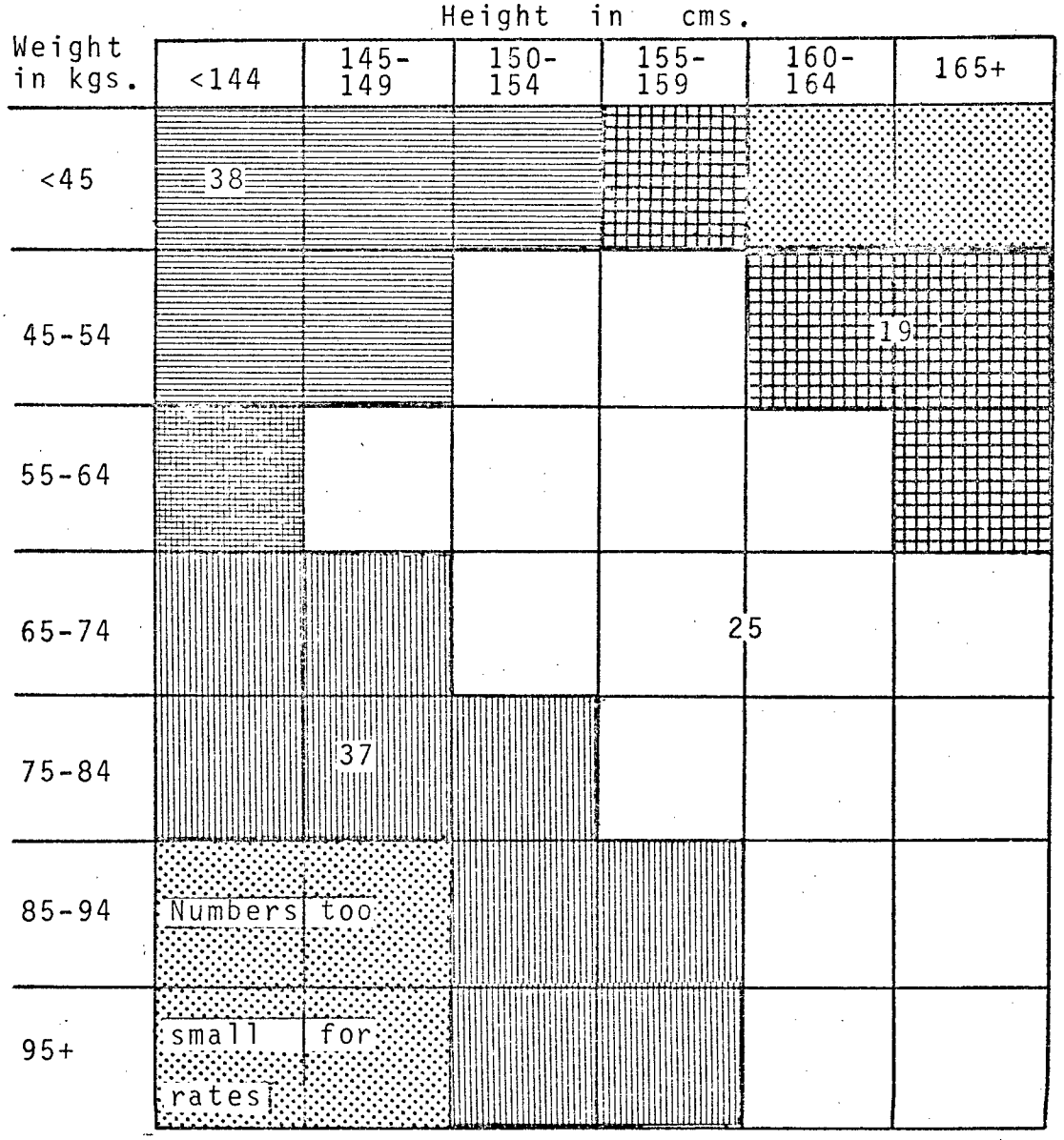
Chi-square between <149 cm and 150-164 - $\chi^2 = 8,7 \quad p<0,01$.

6b. Combined effect of maternal booking weight and maternal height

The combined effect of maternal height and maternal weight on perinatal mortality rate is seen in Table 3.5. (The full Table of deaths/alives and perinatal mortality rates is seen in Appendix Table 11.13).

Table 3.5

The combined effect of maternal height and maternal booking weight on perinatal mortality for Coloureds



	No. of patients
= Rate 38/1000 = Short/thin Coloured	65/1690
= Rate 37/1000 = Short/medium Ht/Fat Col.	35/ 934
= Rate 25/1000 = Medium Ht/Medium Wt Col.	171/6843
= Rate 19/1000 = Tall/thin Coloured	11/ 390
= Numbers too small <20 per cell	

The short/thin Coloureds had a significantly higher perinatal mortality rate than the medium height/medium weight Coloured (χ^2 = 9,1 $p<0,01$).

The short/medium height/fat Coloured had a significantly higher perinatal mortality rate than the medium height/medium weight Coloured (χ^2 = 5,0 $p<0,2$).

The medium height and medium weight Coloureds had a perinatal mortality rate of 25 per 1000 births and the tall/thin Coloureds had the lowest perinatal mortality rate. This difference was not significant (χ^2 = 0,1 N.S.)

7. Past obstetric history

(a) Distribution numbers of the factors studied are shown in Appendix Table 11.14. There were no significant results in distribution of patients with reproductive failure, previous hypertension or previous Caesarian Section.

(b) Effect of various past obstetric histories on perinatal mortality was investigated by ethnic group. It was seen from Table 3.6 that:

(i) Previous history of reproductive failure was associated with treble the overall perinatal mortality rate in Whites and double the overall perinatal mortality rate in Coloureds and Bantu

(ii) Previous history of hypertension appeared to be not significant although the numbers are very small

(iii) Previous Caesarian Section was associated with the same as the overall perinatal mortality rate.

Table 3.6

Perinatal mortality in various past obstetric history groups by ethnic group

	Whites		Coloured		Bantu	
	No. of deaths	P.N.Mort. rate	No. of deaths	P.N.Mort. rate	No. of deaths	P.N.Mort. rate
Prev.rep.fail.	8	75	67	54	29	102
Prev. hypert.	0	-	7	34	4*	-
Prev. C.S.	1*	-	16	35	8	52
Overall P.N. mortality rate		19,4		34,0		53,4

* small numbers

8. Maternal disease

The effect of cardiac disease, diabetes mellitus and renal disease was studied by ethnic groups and results are shown in Appendix Tables 11.15; 11.16.

(a) Cardiac disease. There were significantly more Coloureds with heart disease than Bantu ($\chi^2 = 6,33$ $p < 0,02$) and the incidence for this condition varied from 0,6% to 1,2% in the various groups studied.

(b) Diabetes mellitus. There was no significant difference in incidence between the three ethnic groups. The incidence was between 0,3% and 0,6%.

The numbers were too small to obtain interpretable perinatal mortality rates.

(c) Renal disease. There were significantly more Whites with this complication than Coloureds and Bantu (χ^2 = 25,9 p<0,001 and χ^2 = 4,7 p<0,05 respectively).

The perinatal mortality rates were higher for Whites and Coloured than the overall rates; the numbers were too small for interpretable results for the Bantu.

(d) The effect of maternal disease on perinatal mortality rates

Because of very small numbers, all patients with maternal disease were grouped together. See Table 3.7.

Table 3.7

Perinatal mortality associated with maternal disease by ethnic group

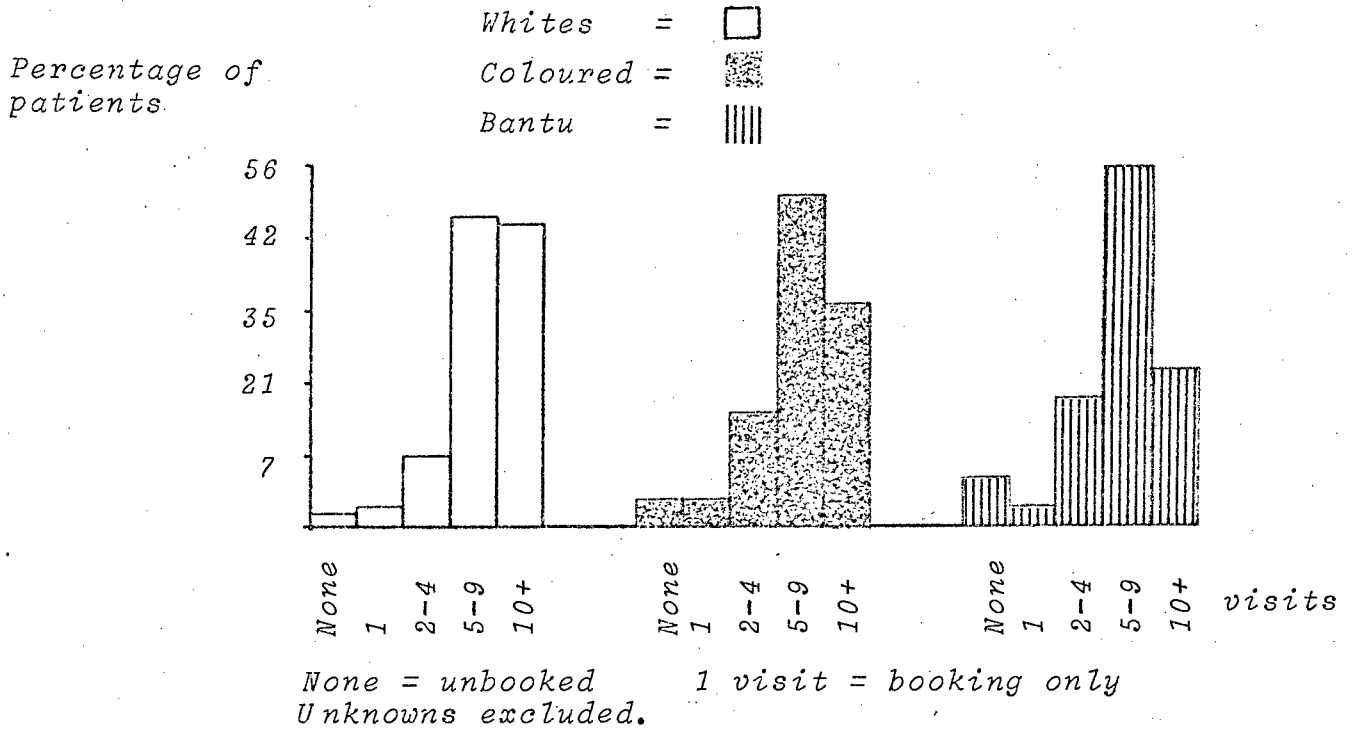
	Whites		Coloured		Bantu	
	No. of deaths	P.N.M. rate	No. of deaths	P.N.M. rate	No. of deaths	P.N.M. rate
with maternal disease	8	55	31	37	5	33
No maternal disease	26	16	350	34	118	55
Overall P.N. Mort. rates		19,4		34,0		53,4

It was interesting that in the White group the effect of maternal disease increased the perinatal mortality three times over the overall rate (19,4/1000). In the Coloureds the effect of disease was similar to the overall rate (34,0/1000) but in the Bantu the patients with disease had a very much lower rate than the overall rate (53,4/1000).

9. Prenatal care

(a) The distribution of booked versus non-booked patients was studied and the distribution of various numbers of antenatal visits during the antenatal care was studied. Figure 3.9 shows the distribution of antenatal care in the three ethnic groups. Two per cent of Whites, 4 per cent of Coloureds and 7 per cent of Bantu were unbooked in the population sample (See Appendix Table 11.17). The 4 per cent for Coloureds and 7 per cent for Bantu unbooked cases may well be higher as 6,3 per cent and 15,9 per cent of the total sample were UNKNOWN. This was largely a recording error at one hospital and it was thought that many may have been unbooked. The White group appeared to have had more antenatal care overall than the Coloured or Bantu groups.

(b) The effect of booking status and prenatal care on perinatal mortality rate was studied in the three groups. The results were very striking (See Figure 3.10 and Appendix Table 11.18. The UNBOOKED patients for all three ethnic groups had very significantly increased perinatal mortality rates over the patients who attended a booking visit only ($p<0,001$). The patients who booked or had 2-4 visits had a significantly increased perinatal mortality rate over the patients who had



None = unbooked 1 visit = booking only
Unknowns excluded.

Figure 3.9 Distribution of prenatal care by ethnic group.

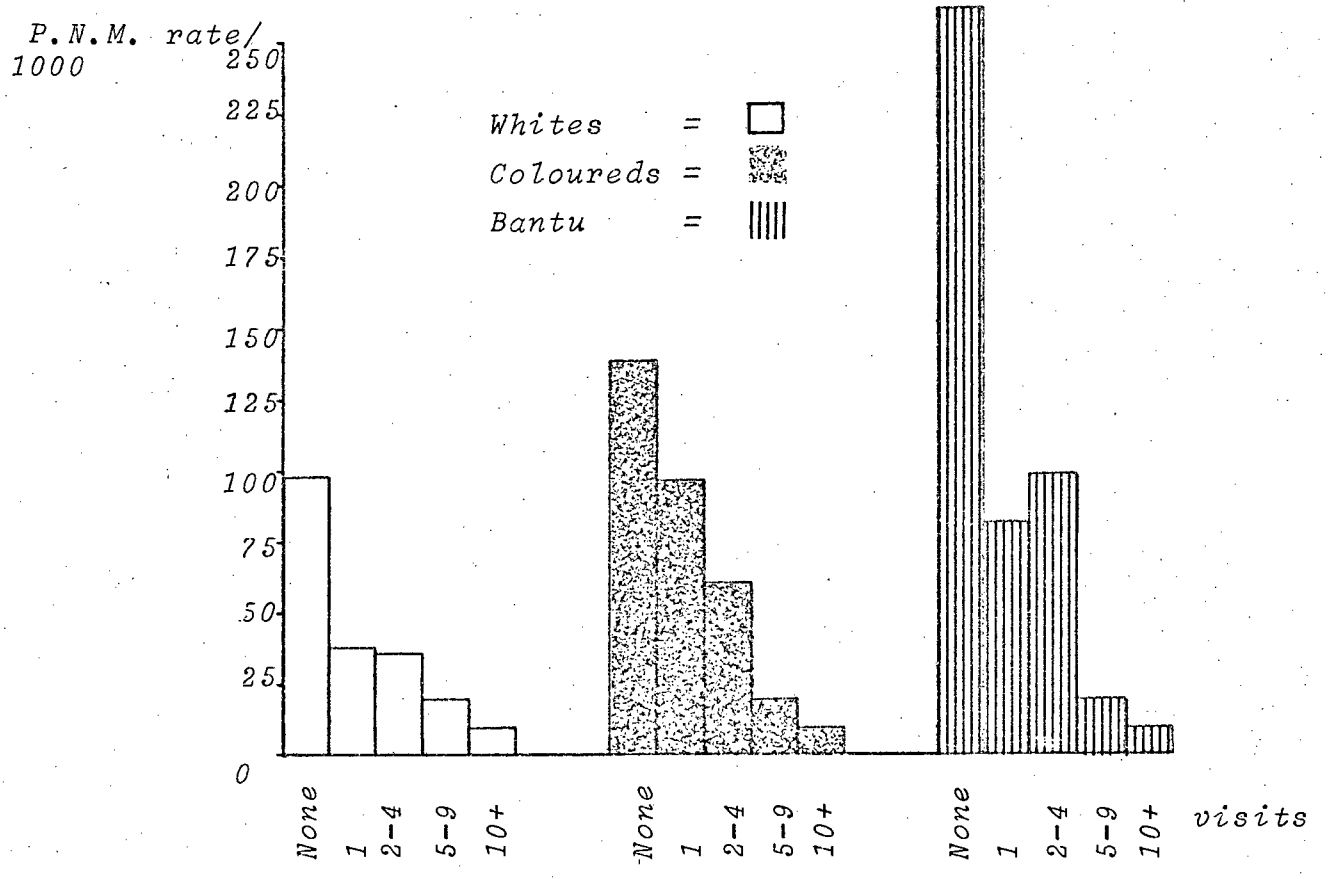


Figure 3.10

Showing the effect in patients with no prenatal care and various number of visits by the three ethnic groups.

more than five visits, for all three ethnic groups (White χ^2 = 5,2 $p<0,05$; Coloured χ^2 = 171 $p<0,001$; Bantu χ^2 = 59 $p<0,001$).

Twenty-one per cent of all deaths were unbooked patients. However, a number of patients were unknown, which when "unknowns" were clarified in phase 2, the proportion of unbooked patients rose to 33 per cent.

10. Hypertension and proteinuria

(a) Distribution of various forms of hypertension in the three ethnic groups: Hypertension in some form was present in 45,2 per cent of Whites, 32,6 per cent of Coloureds and 30,3 per cent of Bantu.

Pre-eclampsia and hypertension of late pregnancy unclassified occured in between 8,8 - 14,1 per cent of patients (See Appendix Table 11.19). This group had proteinuria complicating the disorder in a further 2,9 per cent of patients.

Essential hypertension occurred between 0,6 - 1,1 per cent of patients.

Intrapartum hypertension was the largest single group of patients in all the three ethnic groups.

(b) The effect of various forms of hypertension on perinatal mortality in the three ethnic groups (See Figures 3.11, 3.12, 3.13 and Appendix Table 11.20) was as follows:

(i) There was no increase in the perinatal mortality in patients with pre-eclampsia and hypertension of late pregnancy without proteinuria for all three ethnic groups Whites χ^2 = 0,6; Coloured χ^2 = 2,0; Bantu χ^2 = 0,1).

(ii) The presence of intrapartum hypertension alone had no effect on the perinatal mortality rate in all three

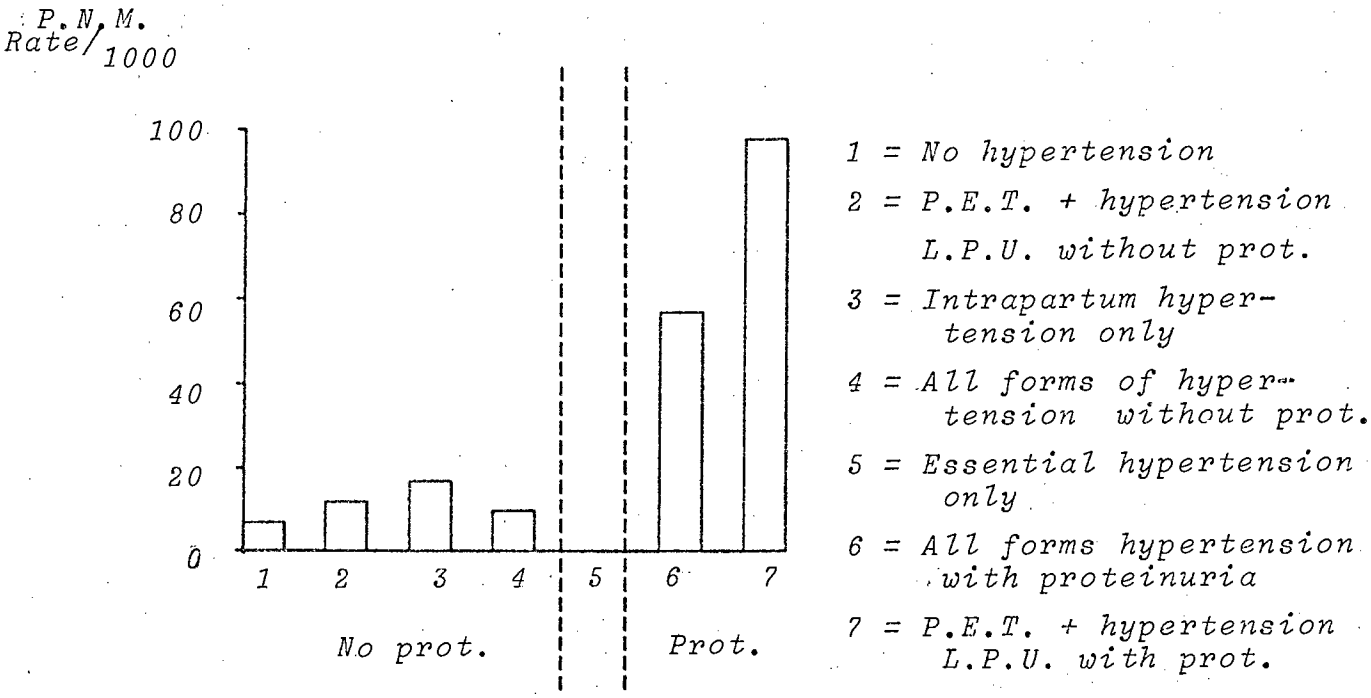


Figure 3.11

P.N.M. in various forms of hypertension and proteinuria in Whites.

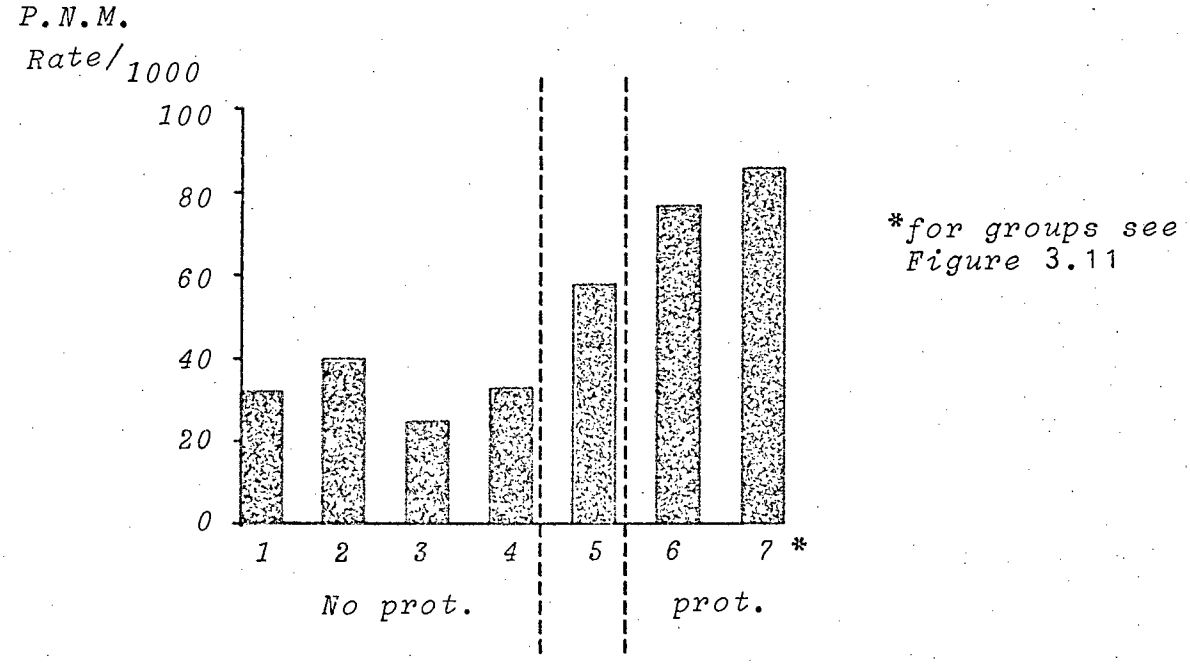


Figure 3.12

Perinatal mortality in various forms of hypertension and proteinuria in Coloureds

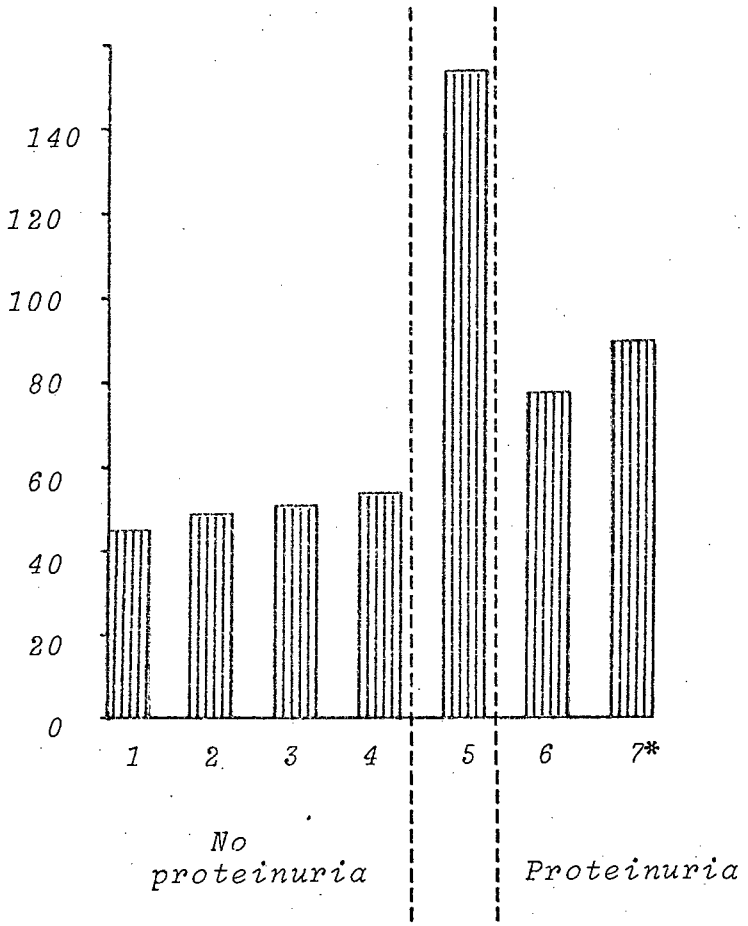


Figure 3.13

Perinatal mortality in various forms of hypertension and proteinuria in Bantu.

ethnic groups.

(iii) Essential hypertension appeared to have a significant effect on increasing the perinatal mortality rates in both the Coloureds and Bantu (χ^2 = 3,7 $p<0,06$; χ^2 = 6,8 $p<0,01$, respectively). The numbers in the Whites and Bantu were too small for further analysis.

(iv) There was no apparent influence on the perinatal mortality rates from non-essential hypertension (all forms of hypertension except essential hypertension) when proteinuria was not present. This result was constant for all three ethnic groups.

(v) However, the effect on perinatal mortality in hypertensive groups when proteinuria was present was highly significant in both the Whites and the Coloureds (χ^2 = 17, χ^2 = 23, respectively $p<0,001$). This finding was not significant in the Bantu (χ^2 = 2,1) because the overall perinatal mortality rate for the 'no hypertension' group was so high.

(vi) The effect on increasing the perinatal mortality rates in pre-eclampsia and hypertension of late pregnancy unclassified when proteinuria was present was strikingly significant in all three ethnic groups (Whites χ^2 = 34 $p<0,001$; Coloureds χ^2 = 27 $p<0,001$; Bantu χ^2 = 29 $p<0,001$).

(c) The effect of the maximum diastolic blood pressure on perinatal mortality in various forms of hypertension: The numbers were too small for Whites and Bantu, thus only the Coloureds were analysed.

(i) Essential hypertension: The perinatal mortality in the group where the diastolic blood pressure remained under

110 mmHg was 38 per 1000 (similar to overall rate) whereas the rate when diastolic blood pressure was >110 mmHg was 135 per 1000 (4 x the overall rate). This finding was significant. (χ^2 = 4,3 p<0,05).

(ii) Intrapartum hypertension. The results of this investigation showed no significant change in perinatal mortality rate for various levels of maximum diastolic blood pressure or combination of diastolic blood pressure.

(iii) Pre-eclampsia and hypertension of late pregnancy unclassified with and without proteinuria: The results here showed highly significant effect if a maximum diastolic reading of 110 mmHg was taken. The perinatal mortality with a maximum diastolic blood pressure of <110 mmHg was 36 per 1000 (similar to the overall rate) whereas it was 80 per 1000 (2,3 x the overall rate) when the diastolic blood pressure was >110 mmHg. See Table 3.8.

Table 3.8

Effect of maximum diastolic blood pressure on perinatal mortality rate for Coloureds. - (All forms of hypertension except essential)

Diastolic blood pressure mmHg	Dead babies	Alive babies	Perinatal Mort. Rate
< 110	38	1017	36
> 110	37	427	80

There were significantly more deaths when the diastolic blood pressure was over 110 mmHg in this group (χ^2 = 12,1 p<0,001).

11. Antenatal complications

Two major complications were studied in the three ethnic groups:

(a) Antepartum haemorrhage (A.P.H.) : The incidence for A.P.H. varied from 3,0 - 4,5 per cent for the three ethnic groups (See Appendix Table 11.21).

The perinatal mortality rates for A.P.H. appeared to be significantly different for Whites, Coloureds and Bantu (60/1000, 193/1000, and 257/1000 respectively). However, the numbers for Whites were too small for comparison.

The effect of various forms of A.P.H. on perinatal mortality can be seen in Figure 3.14 compared to P.N.M. rate from other causes.

A.P.H. - Unknown cause and placenta praevia were associated with 2-3 times the overall perinatal mortality rate. However, abrupto placenta was associated with 20 times the overall P.N.M. rate.

(i) A.P.H. unknown: The incidence of this condition varied from 1,7 - 2,6 per cent in the three ethnic groups but accounted for 59 per cent of A.P.H. patients. This was associated with a significantly raised P.N.M. rate in the Coloured (Double overall P.N.M. rate. This was highly significant. $\chi^2 = 12,7$ $p<0,001$). The numbers for Whites and Bantu were too small for statistical tests (Armitage, 1971).

(ii) Placenta praevia: The incidence of this condition varied from 0,5 - 0,7 per cent in the three ethnic groups but accounted for 16 per cent of all A.P.H. patients in the population sample. This was associated with a significantly

▒ = *All ethnic groups*

A.P.H. = *Antepartum haemorrhage*

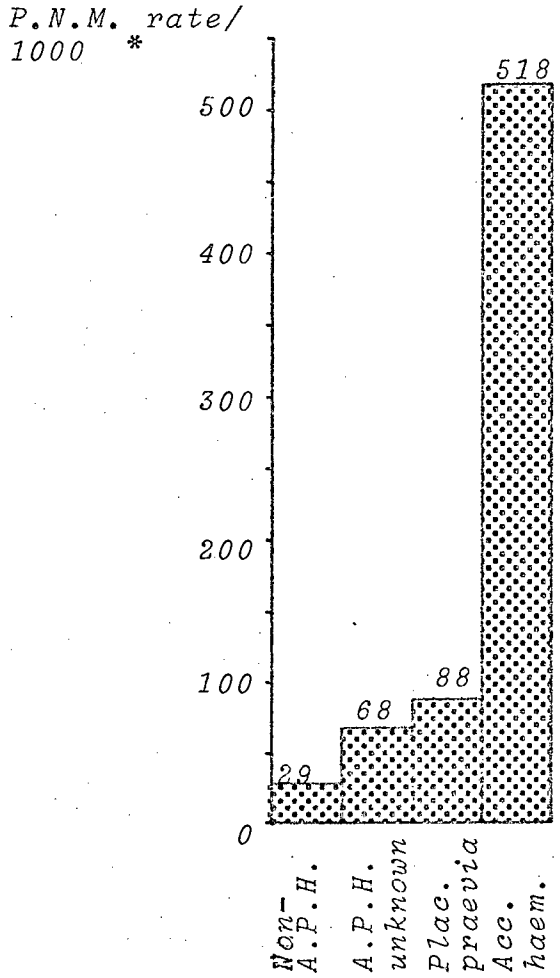


Figure 3.14.

Perinatal mortality in various forms of A.P.H. against non-A.P.H. group.

**P.N.M. rate per 1000 total births.*

increased perinatal mortality rate (3 x overall rate for all ethnic groups χ^2 = 8,5 p<0,01).

(iii) Abruptio placenta (accidental haemorrhage); The incidence of this condition varied from 0,7 - 1,2 per cent in the three ethnic groups, but accounted for 25 per cent of all A.P.H. patients in the population sample. This was associated with a very significant increase in the perinatal mortality rates (in Coloureds χ^2 = 1000 p<0,001 - the Chi-square test was invalid for the Whites and Bantu due to small numbers. Fisher and Yates, 1963). See Table 3.9 and Figure 3.14.

Table 3.9

Perinatal mortality in accidental haemorrhage by ethnic group

	Whites	Coloured	Bantu
Number of patients	13	132	19
Number of deaths	3	70	12
Perinatal mortality/ 1000 total births	231*	530	632*

*small numbers

(b) Premature rupture of membrane (P.R.O.M.): The incidence of P.R.O.M. varied from 1,7 - 1,9 per cent for the three ethnic groups. This condition was associated with a 5 x increased perinatal mortality rate in the Coloureds and a 3 x higher perinatal mortality rate in the Whites and Bantu - See Figure 3.15, Table 3.10 and Appendix Table 11.22.

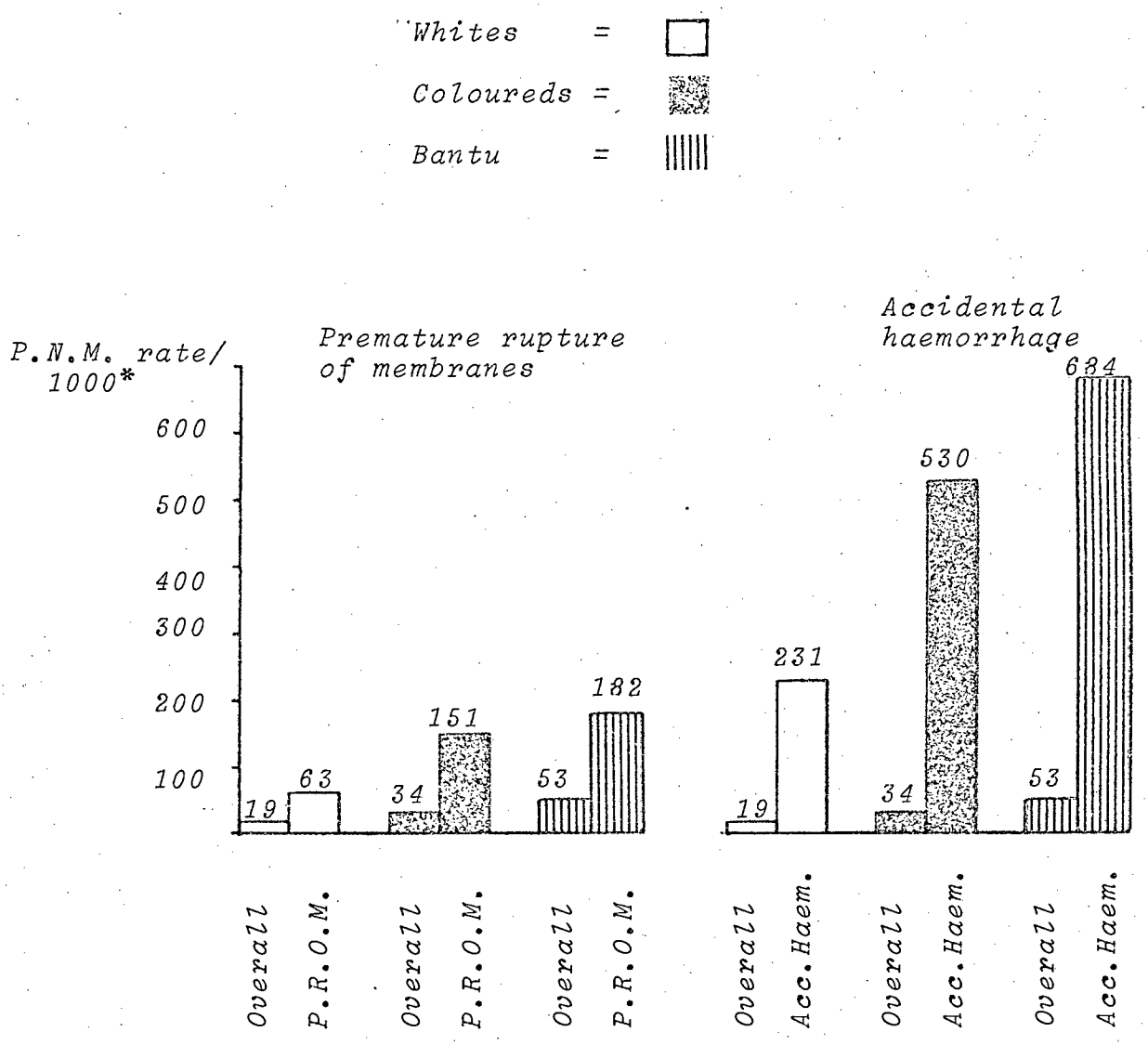


Figure 3.15

Perinatal mortality in P.R.O.M. and accidental haemorrhages by ethnic group.

**P.N.M. rate per 1000 births*

This was highly significant for Coloureds and Bantu (χ^2 = 81 p <0,001 and χ^2 = 14,6 p<0,001 respectively). The numbers were too small for Whites but the trends were similar. There was a significantly higher perinatal mortality in the Bantu than the Whites despite small numbers (χ^2 = 5,2 p<0,05).

Table 3.10

Perinatal mortality associated with premature rupture of membranes by ethnic group

	Whites	Coloured	Bantu
Number of patients	32	192	44
Number of deaths	2	29	8
Perinatal mortality/ 1000 total births	63*	151	182

*small numbers

12. Labour and delivery

Four aspects of labour and delivery were studied in the three ethnic groups.

(i) Onset of labour: All patients who had an elective Caesarian section and stillbirths before labour were excluded.

The incidence of inductions was higher in the Whites than the Coloureds and Bantu. See Table 3.11.

Table 3.11

Distribution and perinatal mortality for induction of labour by ethnic group*

	Whites				Coloureds				Bantu			
	No. of patients	%	No. of deaths	P.N.Mort. rate**	No. of patients	%	No. of deaths	P.N. Mort. rate**	No. of patients	%	No. of deaths	P.N.Mort. rate**
Induced	636	38	4	6,3	1365	13	17	12,5	225	11	2	8,9
Not induced	1037	62	14	13,5	9277	87	158	17,0	1911	89	53	27,7
Unknown	4		1		13		0		1		0	

*All elective Caesarian Sections and Stillbirths before labour were excluded.

** P.N.M. rate per 1000 total births.

The perinatal mortality in the non-induced patients was lower than the overall perinatal mortality rates for the three ethnic groups. This highlights the fact that in the Coloured and Bantu the major problem in perinatal mortality occurs before labour.

The trend in the perinatal mortality rates in the induced group was, if anything, lower than the non-induced group.

(ii) Duration of labour: All patients who had stillbirths before labour were excluded. The majority of patients delivered within 12 hours of labour in all three ethnic groups (Whites 84 per cent, Coloureds 74 per cent, Bantu 68 per cent). See Appendix Table 11.23.

There were significantly more Bantu labouring over 12 hours than Whites and Coloureds (χ^2 = 156, χ = 60, respectively, p<0,001); and significantly more Coloured than White (χ^2 = 73 p<0,001). However, this had no effect on the perinatal mortality rates.

(iii) Method of delivery: All stillbirths occurring before labour were excluded. The vast majority of deliveries were spontaneous vertex deliveries (S.V.D.) in the three groups (76 - 84 per cent). See Appendix Table 11.24 and Appendix Figure 11.3.

The forceps delivery rate varied from 4 - 7 per cent and the perinatal mortality rates associated with forceps delivery were not dissimilar to the overall perinatal mortality rates for the three ethnic groups. However, the spontaneous vertex delivery (S.V.D.) perinatal mortality rates were half the

forceps and overall rates.

Breech delivery had strikingly significant increased perinatal mortality rates for all three ethnic groups. This was investigated further under breech delivery.

The Caesarian Section rate was 8,5 and 9,0 per cent for Coloureds and Whites respectively. The rate was significantly higher for Bantu, 16,0 per cent (χ^2 = 114 $p<0,001$) and was associated with a very low perinatal mortality rate.

The vacuum extractor was used in between 1,5 - 3 per cent of cases and was not associated with an increased perinatal mortality rate.

(iv) Breech delivery: There was a significantly increased perinatal mortality associated with breech delivery for all three ethnic groups (Whites 182/1000, Coloureds 182/1000, Bantu 222/1000). These figures applied when stillbirths before labour had been excluded. A small study into breech delivery relative to birth weight was undertaken by ethnic group. (See Appendix Table 11.25). A comparable table for breeches delivered by Caesarian Section was taken out by ethnic group (See Appendix Table 11.26).

From these latter two tables, it was found that there were many more breeches of low birth weight (<2500 g) in the Coloureds and Bantu than in the Whites. There were no Caesarian Sections performed for infants under 1000 g in all three ethnic groups.

A combined Table (See Table 3.12) shows that 80 per cent of the deaths associated with vaginal breech delivery were in infants under 2500 grams birth weight.

In the birth weight group 1000 - 2499 grams, there was no statistical difference in the mortality between vaginal delivery and Caesarian Section - both were very high.

However, in the over 2500 gram group, significantly more infants died from breech vaginal delivery than delivery by Caesarian Section ($p<0,05$). This calculation was made using the exact test for fourfold tables (Armitage, 1971).

Table 3.12

Breech delivery by method of delivery and birth weight group - number alive and perinatal deaths*

	Vaginal delivery		Caesarian Section	
	Dead	Alive	Dead	Alive
< 1000 g	9	4	0	0
1000-2499 g	18	62	7	21
Subtotal	27	66		
> 2500	6	131	1	144
Total	33	197		

*Stillbirths occurring before labour or before Caesarian Section excluded

2. Analysis of stillbirths and neonatal deaths for 1972

As in 3.1, the results not tabulated in this section will be tabulated in Appendix D (See 11). The results are presented in the same order as in Chapter 2 on Methods (See 2.7).

From the 15,251 singleton pregnancies used for the analysis in 3.1, there were 538 stillbirths and early neonatal deaths. Of these 32 had no records that could be found. Thus the sample size of the analysis of stillbirths and early neonatal deaths consisted of 506 stillbirths and neonatal deaths of whom 32 were White, 355 were Coloured and 119 were Bantu.

These perinatal deaths occurred in 1755 Whites, 11,194 Coloureds and 2302 Bantu.

(i) Overall distribution of the clinico-pathological causes

From Table 3.13 and Appendix Table 11.27 it was seen that the number of major congenital abnormalities represented 6,5 per cent of the causes of perinatal deaths. This was an overall incidence of 2/1000 of the total population sample.

Iso-immunisation represented an insignificant part of the perinatal problem.

Mechanical causes represented 10,7 per cent of the causes of death and occurred in 4/1000 of the total population.

The cause of death uncertain - TERM group represented 12,6 per cent of the causes of death i.e. occurring in 4/1000 of the total population. In some of these the cause was known, i.e. fetoplacental inadequacy or neonatal infection or asphyxia but they did not fulfil the rigid criteria for the

Table 3.13

Perinatal mortality by clinico-pathological cause of death

	Number	Per cent distribution	P.N.M. rate per 1000*
Congenital malformation	33	6,5	2,1
Iso-immunization	4	0,8	0,3
Mechanical problems	54	10,7	3,5
Cause of death uncertain - TERM	64	12,6	4,0
Cause of death - PRETERM	146	28,6	9,8
Feto-placental inadequacy	64	12,6	4,0
Accidental haemorrhage	83	16,4	5,0
Maternal disease	54	10,7	3,5
Unclassified	4	0,8	0,3

*P.N.M. rate per 1000 total births

other groups.

The cause of death - PRETERM group formed the largest single group and constituted 28,6 per cent of the total number of deaths, representing 9,8/1000 of the total population.

Fetoplacental inadequacy was the cause in 12,6 per cent of the deaths. There were probably a few cases of feto-placental insufficiency in the pre-term group and in the cause of death uncertain - TERM group but as the criteria for feto-placental inadequacy included only small for gestational age

infants, they could not be classified here.

Accidental haemorrhage was the second largest known cause of death accounting for 16,4 per cent of the deaths and occurring in 5/1000 of the population sample.

Maternal disease accounted for 10,7 per cent of the causes of death.

Only 0,8 per cent of the deaths analysed had insufficient data available for analysis.

In the following sub-sections only relative results will be included under the various causal groups. Often other factors were analysed but if the results were not significant and deemed unimportant, then they were excluded. This was done to avoid the documentation of masses of unimportant irrelevant data - making this thesis unreadable!

(ii) Congenital abnormalities

Two groups of congenital abnormalities were recorded - those referrable to the central nervous system and others. The numbers were too small to draw any conclusions.

(a) Incidence: The overall incidence for congenital abnormalities severe enough to cause stillbirth or early neonatal death was two per 1000. The ethnic groups varied:

White	3 per 1000
Coloured	2 per 1000
Bantu	4 per 1000

The incidence in the Coloured was significantly less than for Whites and Bantu ($\chi^2 = 4,2$ $p<0,05$).

(b) Effect of age: There was no significant effect of age on the incidence of congenital abnormalities (χ^2 = 3,2. N.S.). See Appendix Table 11.28.

(c) Effect of parity: There was no significant effect of parity on the incidence of congenital abnormalities (χ^2 = 1,5. N.S.). See Appendix Table 11.29.

(iii) Iso-immunisation

Iso-immunisation was responsible for only four perinatal deaths and represented only 0,8 per cent of the total. Three were Whites and one Coloured. All were booked patients; one White, however, only booked at 34 weeks - this case may have been preventable.

The cause of this disease is known and no further analysis of these four patients was undertaken.

(iv) Mechanical problems

This group was divided into mechanical problems related to vertex delivery, breech delivery, cord complications (prolapsed cord or cord around the neck sufficient to cause the death), placenta praevia and other. The other group included only transverse lie, and ruptured uterus complications.

Mechanical problems responsible for fetal demise accounted for 10,8 per cent of all deaths. See Table 3.14.

Of these cord problems, largely due to prolapse of the cord, was the largest single group. Birth trauma associated with vertex delivery occurred in only nine patients (1,8 per cent of deaths).

There were 11 cases of placenta praevia.

Table 3.14

Perinatal mortality associated with various mechanical causes

	Number of cases	% of all deaths	P.N.M. rate/ 1000 of total sample *
Mech. vertex	9	1,8	0,6
Mech. breech	4	0,8	0,3
Mech. cord	21	4,2	1,4
Mech. placenta praevia	11	2,2	0,7
Mech. other	9	1,8	0,6
	54	10,8	0,9

*P.N.M. rate per 1000 total births

(a) Mechanical vertex: Of these all 9 were preventable and were due to errors in obstetric judgement. There was clear evidence of severe birth trauma in all cases and these were not analysed further.

(b) Mechanical breech: These were analysed separately by birth weight and method of delivery.

(c) Mechanical cord: There were 13 deaths associated with cord prolapse and 8 with cord around the neck sufficient to cause fetal death.

Time of death: The majority of the prolapsed cord patients died during labour or as early neonatal deaths (92 per cent).

Prenatal care: 69 per cent of patients with prolapsed cord were admitted as unbooked emergencies. One prolapsed cord was associated with placenta praevia.

Method of delivery: In the prolapse of cord group 62 per cent were delivered vaginally as vertexes, 8 per cent as breech and 30 per cent by Caesarian Section.

(d) Mechanical praevia: These were analysed separately under antepartum haemorrhage by cause of death.

(e) Mechanical other: There were 9 deaths in this group: 6 associated with ruptured uteri. Of these 3 were unbooked emergency admissions. The remaining three deaths were associated with transverse lie in labour.

(v) Cause of death uncertain - TERM group

This was a heterogeneous group, in some of whom the cause of death was known but in the vast majority no clear cut cause could be found.

There were, however, a number of deaths associated with fetoplacental inadequacy that were placed in this group where the infants died of "placental insufficiency", but were not small for gestational age and thus were not placed in group (vi).

This group was analysed as follows:

There were 64 deaths in this group and this accounted for 12,6 per cent of the total perinatal loss.

Time of death: Most of these deaths were stillbirths (58 per cent) and of these the majority were stillbirths before labour (78 per cent). (This was not significant $\chi^2 = 2,0$).

Ethnic group: Only two deaths occurred in Whites. However,

there was no difference between the ethnic groups.

Maternal age: This group was spread over all age groups and there was no relationship with maternal age.

Parity: (See Table 3.15). There was a spread in the various parity groups but significantly more in the para 4+ group ($\chi^2 = 6,5$ $p<0,05$). This fact correlates with the finding for parity effect on perinatal mortality rate as a whole.

Table 3.15

Cause of death uncertain - TERM group by parity groups

	Para 0	Para 1-3	Para 4+
All races	24	21	19 *
Total deliveries	6659	5870	2671

*Significantly more para 4+, $\chi^2 = 6,5$ $p<0,05$.

Maternal weight: In the Coloured group there tended to be more patients under 54 kg. than in the other maternal weight groups. This was not statistically significant but numbers are small (See Appendix Table 11.30).

Maternal height: There was even distribution in the maternal height groups with the majority in the medium and tall groups. There were no significant findings.

Past obstetric history: The majority of this group 78 per cent) had no past obstetric history. It should be remembered that hypertension has been analysed under maternal disease.

Prenatal care: (a) Twenty-two per cent of patients were unbooked. This fact when related to the total population sample was significantly higher as a cause of death than the booked group (χ^2 = 58 p<0,001). See Table 3.16.

Table 3.16

Cause of death uncertain - TERM group by booking status and ethnic group

	Booked	Unbooked
Whites	2	-
Coloured	38	6
Bantu	10	8
Total	50	14*
Total deliveries	13,582	578

* Significantly more unbooked relative to total deliveries, χ^2 = 58, p<0,001

However, this finding was substantiated in the overall analysis.

(b) Duration of pregnancy at first visit: Of those that did book, 48 per cent booked before 20 weeks and 78 per cent booked before 30 weeks gestation.

(c) Antenatal visits: Of those that did book, significantly more had less than five visits, (See Table 3.17) than for the total population sample (χ^2 = 11,2 p<0,01).

Hypertension: Fourteen per cent of this group had associated pre-eclampsia and hypertension of late pregnancy unclassified.

Table 3.17

Cause of death uncertain - TERM group by prenatal care groups

	1-4 visits	5-10+ visits
Number of deaths Death Uncertain Term	19	30*
Total population sample	2683	10,879

*Significantly more deaths occurred in the 1-4 visit group, $\chi^2 = 11,2$ $p<0,01$

Antenatal complications: Premature rupture of membranes (P.R.O.M.) See Table 3.18.

Table 3.18

Cause of death uncertain - TERM group associated with premature rupture of membranes (P.R.O.M.)

	P.R.O.M.	No P.R.O.M.
Total deaths in group Death Unc. Term.	6*	58
Total population sample deliveries	268	14,983

* Significantly more deaths occurred with P.R.O.M. in this group ($\chi^2 = 22$ $p<0,001$)

There were significantly more patients than expected with P.R.O.M. in this group of deaths ($\chi^2 = 22$ $p<0,001$)

Induction of labour: This was analysed but not found to be a determinant of perinatal mortality for this cause group.

Summary:

In this term group there were more stillbirths before labour, more para 4+ patients than expected. The Coloureds tended to be thin (low maternal weight) but not short. Many were unbooked (22 per cent) but of those booked, the majority were seen before 30/52; however, were seen less frequently than usual. Pre-eclampsia and hypertension of late pregnancy was seen in 14 per cent and premature rupture of membranes was significantly higher than expected.

(vi) Cause of death - PRETERM

This group corresponded to groups e(i), e(ii) and e(iii) in the classification used. (See 2.7.2).

There were 146 deaths in this combined group. However, the majority (68 per cent) died under 30 weeks gestational age (i.e. group e(iii).

Time of stillbirth: There were significantly more than expected of this group who died as neonatal deaths (χ^2 = 20,0 p 0,001). See Table 3.19.

Table 3.19.

Cause of death - PRETERM group by time of death

	Stillbirth before labour	Stillbirth during labour	Early neonatal death
Total deaths in Pre-term group	54	12	80*
All deaths in population sample	262	70	174

* Significantly more neonatal deaths in this group, χ^2 = 20, p<0,001

Ethnic group: There was no significant difference between the ethnic groups i.e. the proportion of deaths from this cause - prematurity was the same in all three groups. Furthermore, approximately one third of all deaths fell into this cause for all ethnic groups (See Table 3.20.

Table 3.20.

Cause of death - PRETERM group
by ethnic group - numbers of deaths

	Pre-term group	All deaths
Whites	10	32
Coloured	102	355
Bantu	34	119

Maternal age: This group spread over all age groups and there was no relationship to maternal age.

Parity: This group spread over all parities and did not show an increase in the para 4+ group as was shown in the overall effect of parity.

Maternal height: In the Coloureds there were significantly more in the short group than expected (χ^2 = 5,9 $p<0,05$). See Table 3.21.

This finding was repeated in the overall effect of maternal height.

Maternal weight: There was an even distribution in the maternal weight groups. The majority were in the lower, medium ranges (45 - 75 kg) with fewer in the heavy range (more than 75 kg). There was not the same tendency to be in the

54 kg group found in the TERM group.

Table 3.21

Cause of death PRETERM group by maternal height - number of deaths in Coloureds

	< 150 cms	150+ cms
Number of deaths in pre-term group	23*	47
Total Coloured deliveries in population sample	2119	7930

* Significantly more short Coloureds in this group, $\chi^2 = 5,9$ $p<0,02$

Past obstetric history: There were significantly more with a past history of previous reproductive failure in this group than was expected ($\chi^2 = 12,8$ $p<0,001$). See Table 3.22.

Table 3.22

Cause of death PRETERM group associated with previous reproductive failure

	Previous reproductive failure	No previous reproductive failure
Number of deaths in pre-term group	29*	117
Total deliveries of population sample	1637	13,614

*Significantly more previous reproductive failure in preterm group, $\chi^2 = 12,8$ $p<0,001$

This finding was observed in the total analysis when the effect of past obstetric history on perinatal mortality was analysed.

Prenatal care: (a) Thirty-five per cent of patients were unbooked. There were significantly more deaths in this group than in the booked group. See Table 3.23. (χ^2 = 359 p<0,001). This fact was found in the total population sample.

Table 3.23

Cause of death PRETERM group by booking status

	Booked	Unbooked
Number of deaths	95	51*
Total deliveries in population sample	13,582	578

*Significantly more unbooked relative to total deliveries, χ^2 = 3,59 p<0,001

(b) Duration of pregnancy at first visit: Of those that did book (65 per cent), the majority booked before 30 weeks.

(c) Of those that did book, significantly more had less than five visits than for the total population sample (χ^2 = 173 p<0,001). See Table 3.24.

Hypertension: Eighteen per cent of this group had associated pre-eclampsia and hypertension of late pregnancy unclassified.

There were no cases of essential hypertension in this group (as they were classified under maternal disease).

Table 3.24

Cause of death PRETERM group by prenatal care

	1-4 visits	5-10+ visits
Number of deaths pre-term group	70*	26
Total deliveries population sample	2,678	10,904

*Significantly more deaths occurred in the 1-4 visits only group, $\chi^2 = 173$ $p<0,001$

Antenatal complications - Premature rupture of membranes (P.R.O.M.) See Table 3.25.

Table 3.25.

Cause of death PRETERM group associated with premature rupture of membranes (P.R.O.M.)

	P.R.O.M.	No P.R.O.M.
Total deaths in pre-term	28*	118
Total population sample deliveries	268	14,983

*Significantly more deaths occurred with P.R.O.M. in this group ($\chi^2 = 259$ $p<0,001$

There was a significant excess of patients with P.R.O.M. in this group of deaths ($\chi^2 = 259$ $p<0,001$).

Induction of labour was analysed but not found to be a determinant of perinatal mortality for this cause group.

Summary:

In this PRE-TERM group there were significantly more neonatal deaths than expected. One third of all deaths in all three ethnic groups occurred in this group. The maternal age and parity had no effect. However, in the Coloureds there were more short but not low maternal weight mothers in this group. A past history of reproductive failure was prevalent in this group. Thirty-five per cent were unbooked and of those that booked, the majority were seen before 30 weeks, but were seen less frequently. Pre-eclampsia and hypertension of late pregnancy was present in 18 per cent of patients and premature rupture of membranes was very significantly higher than expected.

(a) Cause of death - PRETERM group - Hyaline membrane disease group (H.M.D.)

In this analysis, all infants were neonatal deaths and died of hyaline membrane disease diagnosed by the paediatrician.

There were 32 deaths, i.e. 40 per cent of the neonatal deaths in the total pre-term group.

There was no ethnic prevalence, effect of maternal age, parity, weight or height in this group.

The number of cases with a past obstetric history of reproductive failure was insignificant.

The number of UNBOOKED was very significant (See Table 3.26.

Table 3.26

Cause of death PRETERM - H.M.D. group by booking status

	Booked	Unbooked
Number of deaths in H.M.D. pre-term group	21	11*
Total deliveries of population sample	13,582	578

*Significantly more unbooked patients lost infants in this group (χ^2 = 75 $p<0,001$)

The duration of pregnancy at first visit was spread throughout pregnancy, but of those that booked they received significantly less prenatal care (χ^2 = 67 $p<0,001$)

Hypertension: In this group only one death was associated with pre-eclampsia and two deaths with hypertension of late pregnancy. There were no cases of essential hypertension as these were classified under maternal disease.

There was a very significant association with P.R.O.M. (χ^2 = 100 $p<0,001$).

Summary:

There was no variation with ethnic group, age, parity, maternal weight and height. There was no relationship with previous reproductive failure. This group was very similar to the previous group except (i) the tendency to short Coloureds was not substantiated; (ii) previous reproductive failure was not a feature and (iii) hypertension was not associated. Many were unbooked and the booked patients had less care. There

was no association with hypertension but very significant relationship to P.R.O.M.

(b) Pre-term group - Cause of death - Original group without hyaline membrane disease

In this group all neonatal deaths associated with hyaline membrane disease were excluded.

There were 114 deaths in this group i.e. 78 per cent of the total pre-term group.

There were significantly more neonatal deaths even though the hyaline membrane group were excluded (χ^2 = 3,9 $p<0,05$).

There was no ethnic prevalence, effect of maternal age, parity or maternal weight. However, there were significantly more short women in the Coloureds (χ^2 = 4,2 $p<0,05$).

The number of deaths associated with previous reproductive failure was significant (χ^2= 13 $p<0,001$).

The number of unbooked cases was highly significant (χ^2 = 282 $p<0,001$). Of those that booked they were seen less frequently (χ^2 = 111 $p<0,001$) although the majority booked before 30 weeks.

Hypertension: In this group 21 per cent (24/114) had pre-eclampsia or hypertension of late pregnancy. The overall incidence for the causes of death was 29 per cent (See Appendix Table 11.31).

There was a significant association with premature rupture of membranes (χ^2 = 161 $p<0,001$) (See Appendix Table 11.32).

Summary

This group is different in some respects to those

clearly "born too soon" i.e. dying of hyaline membrane disease. There were (i) more short Coloureds; (ii) previous reproductive failure was a feature; (iii) hypertension was associated with this group.

(vii) Fetoplacental inadequacy (F.I.):

This group included only infants that were small for gestational age as assessed from the birthweight by gestational age charts (Lubchenco et al, 1972) (See Appendix E).

There were, however, a number of fetoplacental insufficient deaths that were classified into the group d - Cause of death uncertain - TERM group and group e - Cause of death - PRETERM, who did not have small for gestational age neonates. These patients were not included in this group.

This group was initially analysed in two groups - F.I. term group and F.I. pre-term group. However, it was found that group f(i) - Feto-placental inadequacy occurring in infants over 37 completed weeks and groups f(ii), f(iii) and f(iv) - feto-placental insufficiency occurring in infants between 34-36 weeks, 31-33 weeks and 30 weeks or less, respectively, were very homogeneous. Because of numbers, they have been re-analysed as a combined group:

Time of death: There were significantly more still-births than neonatal deaths in this group ($\chi^2 = 4,1$ $p<0,05$) and of these the majority died before labour. See Table 3.27.

Ethnic group: There was a tendency to more Whites in the F.I. term group but overall there was no significant ethnic difference.

Table 3.27

Fetoplacental inadequacy (F.I.) group by time of perinatal death.

	Stillborn before labour	Stillborn during labour	Neonatal deaths
Number of deaths in F.I. group	42	6	16
All causes of death	262	70	174

Maternal age: There were more patients over 30 years of age than expected (χ^2 = 8,8 p<0,02). See Table 3.28.

Table 3.28.

Fetoplacental inadequacy (F.I.) group by maternal age

	<19 years	20-29 yrs	>30 years
Number of deaths in F.I. group	11	28	25*
Total deliveries in population sample	3449	8228	3565

*Significantly more patients over 30 years of age in this group (χ^2 = 8,8 p<0,02).

Parity: Overall in this group parity showed no significant effect although there was a tendency to be more frequent in the para 4+ group. However, in the F.I. pre-

term group there were significantly more in the para 4+ group (χ^2 = 6,86 $p<0,05$).

Maternal height: There was no effect of maternal height in this group.

Maternal weight: There was no significant effect of maternal weight. In the Coloureds there was a tendency to be in the lower and medium weight ranges.

Past obstetric history: There were significantly more patients than expected in this group with a past history of either previous reproductive failure or previous hypertension (χ^2 = 10,9 $p<0,001$). See Table 3.29.

Table 3.29.

Fetoplacental inadequacy (F.I.) group associated with past obstetric history groups

	None	Previous reproductive failure	Previous hypertension
Number of deaths in F.I. group	45	15*	2
Total deliveries in population sample	12,644	1637	293

*Significantly more with past obstetric history in this group (χ^2 = 10,9 $p<0,001$)

Prenatal care: (a) There were significantly more UNBOOKED patients in this group. However, 33 per cent of all deaths were unbooked so this finding was not exceptional.

(b) Of those who did book, there was an even distribution of the duration of pregnancy at first

visit in the three groups (under 20 weeks, 20-29 weeks and over 30 weeks).

(c) There was a significant difference in those who did book in the number of antenatal visits in this group. See Table 3.30.

Table 3.30

Fetoplacental inadequacy (F.I.) group by prenatal care*

	1-4 visits	5-10+ visits
Number of deaths in F.I. group	21**	31
Total deliveries in population sample	2678	10,904

** Significantly more deaths in the 1-4 visit group $\chi^2 = 17$ $p<0,001$.

* Unbooked and unknowns excluded

More F.I. patients have less than expected number of antenatal visits.

Hypertension: There were no cases in this group with essential hypertension (these were classified under maternal disease). However, 38 per cent of this group had pre-eclampsia or hypertension of late pregnancy unclassified.

Antenatal complications - P.R.O.M.: There were significantly more in this group than in the total population sample. See Table 3.31. ($\chi^2 = 32$ $p<0,001$).

This finding was similar to the group (d).

Table 3.31

Fetoplacental inadequacy (F.I.) group associated with premature rupture of membranes

	P.R.O.M.	No P.R.O.M.
Number of deaths in F.I. group	7*	56
Total deliveries in population sample	268	14,983

*Significantly more deaths in the P.R.O.M. group in this group ($\chi^2 = 32$ $p<0,001$)

Induction of labour: This was analysed but not found to be a determinant of perinatal mortality for this cause group.

Summary:

There were significantly more stillbirths in this group, most occurring before labour. There were relatively more Whites in the F.I. term group than expected. Older women were more common and this tended to be associated with the higher parous group.

There was no effect of maternal height. However, in the Coloureds there tended to be more in the lower and medium weight ranges. There were significantly more F.I. patients with a past obstetric history of previous reproductive failure and hypertension.

Many (26 per cent) were unbooked and of those that booked there were significantly more who had less than the expected number of antenatal visits.

There were no cases of essential hypertension in this group (these patients were classified under maternal disease). However, the incidence of pre-eclampsia and hypertension of late pregnancy was high (38 per cent).

There was a significant association with premature rupture of membranes in this group.

(viii) Accidental haemorrhage (Abruptio placenta)

Into this group, 83 deaths were classified, making up 16,4 per cent of the total causes of death. All patients had either evidence of placental separation, i.e. retroplacental clot with or without a clinical diagnosis of accidental haemorrhage.

Time of death: The vast majority of deaths occurred as stillbirths before labour (65 per cent). This was very significantly more than the total population sample. See Table 3.32.

Table 3.32.

Accidental haemorrhage group by time of perinatal death

	Stillbirth before labour	Stillbirth during labour	Early neonatal death
Number of deaths in accidental haemorrhage group	60*	11	12
Total number of deaths	262	70	174

*Significantly more deaths before labour in this group
$\chi^2 = 19,6 \quad p<0,001$

Ethnic group: There was no significant difference between the ethnic groups studied.

Maternal age: There was a tendency to occur slightly more frequently in the under 20 year group. This was almost significant (χ^2 = 3,81 $p<0,06$). It was not commoner in the over 30 year age group.

Parity: There were significantly more in the para 4+ group and less in the primigravid group. (χ^2 = 10,6 $p<0,01$). See Table 3.33

Table 3.33

Accidental haemorrhage group by various parity groups

	Para 0	Para 1-3	Para 4+
Number of deaths in accidental haemorrhage group	24	35	24*
Total deliveries in population sample	6659	5870	2671

*Significantly more para 4+ in this group (χ^2 = 10,6 $p<0,01$)

Maternal height: There was no effect of maternal height in this group.

Maternal weight: There was no effect of maternal weight in this group.

Past obstetric history: There was no significant difference or trend towards a more frequent history of previous reproductive failure or previous Caesarian Section or previous

hypertension in this group.

Prenatal care (a): There were significantly more unbooked patients than for all other causes of death and for the population sample as a whole. See Table 3.34.

Table 3.34

Accidental haemorrhage group by booking status

	Booked	Unbooked
Number of deaths in accidental haemorrhage group	43	40*
All other deaths	339	167
Total deliveries in population sample	13,582	578

*Significantly more unbooked than in other causes of death (χ^2 = 10,4 $p<0,01$) and than in the total population (χ^2 = 415 $p<0,001$) in this group.

(b) Of those that booked, there was an even spread in the three groups of duration of first visit i.e. before 20 weeks, 20-29 weeks and over 30 weeks.

(c) The patients who booked were seen significantly less frequently than the total population. See Table 3.35.

Hypertension: There was only one death associated with essential hypertension. Pre-eclampsia was evident in 10 per cent of deaths and hypertension of late pregnancy unclassified in 27 per cent (See Table 3.36). This meant

that 38 per cent of deaths from accidental haemorrhage were associated with significantly recorded hypertension.

Table 3.35.

Accidental haemorrhage group by prenatal care groups

	1-4 visits	5-10+ visits
Number of deaths in the accidental haemorrhage group	20*	23
Total deliveries in the population sample	2678	10,904

*Significantly more deaths in the 1-4 visit group
$\chi^2 = 21$ $p<0,001$

Table 3.36.

Accidental haemorrhage group associated with various forms of hypertension by ethnic groups

No. of deaths by ethnic group	No hyper-tension	Essential hyper-tension	Pre-eclampsia	Hypertension of late pregnancy
White	2	0	0	2
Coloured	44	0	7	15
Bantu	6	1	1	5
Total	52	1	8	22

Warning haemorrhages prior to the accidental haemorrhage: The vast majority of accidental haemorrhages - 92 per cent were associated with no warning bleeds.

Size of retroplacental clot: The size of the retroplacental clot was measured in millelitres. See Table 3.37.

Table 3.37.

Accidental haemorrhage group by retroplacental clot size in millelitres

	Clot size <500	Clot size 500-999	Clot size 1000-1999	Clot size 2000+
Number of deaths in accidental haemorrhage group	34	24	15	2

Association with small for gestational age babies:

There was no significant association between S.G.A. infants in patients with accidental haemorrhage in the perinatal deaths. (See Appendix Table 11.33). Sixteen per cent of infants who died from accidental haemorrhage were associated with S.G.A. infants. This is lower than the 22 per cent association of S.G.A. infants with all causes of death.

Summary:

The vast majority of this large group of deaths occurred before labour. There was no increase in incidence between ethnic groups. Maternal ages, heights and weights were not significant factors. However, this complication occurred more frequently in the para 4+ group. There was no

correlation with past obstetric history. Many of the patients were unbooked and those that booked attended clinic throughout pregnancy. Thirty-eight per cent of patients with accidental haemorrhage had associated hypertension. There was usually no warning bleed and perinatal death was not associated with intra-uteric growth retardation.

(ix) Maternal disease

This group of causes was divided into essential hypertension, chronic nephritis, diabetes mellitus, syphilis and other. The "other" group included cases of jaundice, toxoplasmosis, disseminated lupus erythematosis and blood dyscrasias.

Table 3.38 shows the number of cases, the percentage distribution and the rate per 1000 of total population sample of the various forms of maternal disease.

Maternal disease accounts for approximately 10 per cent of perinatal deaths. Syphilis was the single largest cause in this group.

(a) Essential hypertension: This was analysed under hypertension by cause.

(b) Chronic nephritis: The numbers were too small for further analysis.

(c) Diabetes mellitus: The numbers were too small for further analysis.

(d) Syphilis: Ethnic group: This condition only occurred in the Coloureds and Bantu and in these groups there was no difference in incidence.

Time of death: There were significantly more fetuses

dying as stillbirths before labour than expected (See Table 3.39).

Table 3.38.

Perinatal mortality associated with various forms of maternal disease

	Number of deaths	Percent of all deaths	P.N.M. rate/ 1000 of total sample
Essential hypertension	14	2,8	0,9
Chronic nephritis	4	0,8	0,3
Diabetes	6	1,2	0,4
Syphilis	25	4,9	1,6
Other	5	1,0	0,3
Total	54	10,7	3,5

Table 3.39.

Maternal disease - Syphilis group - by time of perinatal death

	Stillbirth before labour	Stillbirth during labour	Early neonatal death
Number of deaths in syphilis group	21*	1	3
All deaths in sample	262	70	174

*Significantly more stillbirths before labour in the maternal disease - Syphilitic group $\chi^2 = 5,8$ $p<0,05$.

Maternal age: See Table 3.40. There were significantly more teenagers than expected (χ^2 = 4,3 $p<0,05$).

Table 3.40.

Maternal disease - Syphilitic group - by maternal age groups

	<19 years	20-29 years	30+ years
Number of deaths in syphilitic group	10*	11	4
Total deliveries in population sample	3449	8228	3565

*Significantly more teenagers in the syphilis group than expected χ^2 = 4,3 $p<0,05$

Parity: There was a tendency to occur more frequently in primigravida but this was not statistically significant.

Marital status: Only 16 per cent were married i.e. 84 per cent occurred in single girls.

Past obstetric history: There were a significant number who had had a previous history of previous reproductive failure. (χ^2 = 3,9 $p<0,05$).

Prenatal care: (a) Over 50 per cent were unbooked. This was significantly more than for the population sample total (χ^2 = 147 $p<0,001$).

(b) Antenatal visits: There was a tendency to less visits but this was not significant.

Antenatal complications: None of these cases of syphilis presented with premature rupture of membranes.

Summary:

Only the Coloureds and Bantu had deaths from syphilis. The majority of deaths occurred before labour. These patients were largely unmarried teenagers, usually in the first pregnancy.

There were many with a previous history of reproductive failure.

Over 50 per cent were unbooked and of those that booked they received less antenatal care.

There was no association between syphilis and premature rupture of membranes.

(x) Hypertension analysed by cause of death

The influence of various forms of hypertension in the group of causes of death in this thesis was analysed. See Table 3.41.

(i) Essential hypertension: There was one accidental haemorrhage associated with this group. This group was all classified under maternal disease except when accidental haemorrhage occurred.

(ii) Pre-eclampsia: Twenty-nine per cent of cases were associated with pre-term delivery. Twenty per cent of pre-eclampsia was associated with accidental haemorrhage.

(iii) All forms of hypertension: Twenty-one per cent were associated with cause of death - PRETERM group and 18 per cent with fetoplacental insufficiency. This figure is increased to 24 per cent if the cause of death unknown - TERM group were added to the fetoplacental inadequacy group. Accidental haemorrhage was a complication in 24 per cent of the hypertensive group as a whole.

Table 3.41.

Perinatal mortality in various forms of hypertension by clinico-pathological cause - number of deaths

	Essential hypertension	Pre-eclampsia	Hypertension of late pregnancy	All forms of hypertension	Percentage incidence in cause	Percentage of all causes
Congenital abnormalities	-	2	3	5	15	4
Iso-immunisation	-	-	-	-	-	-
Mechanical	-	2	9	11	20	8
Cause of death uncertain-TERM	-	2	8	10	16	8
Cause of death PRETERM	-	10	17	27	18	21
Fetoplacental inadequacy	-	12	13	23	35	18
Accidental haemorrhage	1	8	22	31	37	24
Maternal disease	14	5	5	24	44	18
Unknown	-	-	-	-	-	-
TOTALS	15	41	75	131	26%	

Time of death: More than were expected of hypertensive patients lost their infants as stillbirths before labour (χ^2 = 9,4 p<0,01). (See Appendix Table 11.34.)

Ethnic group: There was no significant difference between the ethnic groups although there was a tendency for more Coloureds to have pre-eclampsia than Bantu and Whites. (See Appendix Table 11.35.)

Age: Essential hypertension was commoner in the over 30 year group. There was no association between maternal age and pre-eclampsia and hypertension of pregnancy unclassified. (See Appendix Table 11.36).

Parity: Essential hypertension tended to be in the high parous women. Pre-eclampsia tended to be in the primigravid. (See Appendix Table 11.37).

Past obstetric history: All forms of hypertension were associated significantly more than expected with a previous history of reproductive failure (χ^2 = 23 p<0,001). (See Appendix Table 11.38.

Prenatal care: There were significantly less unbooked fetal deaths associated with hypertension than expected (χ^2 = 7 p<0,01). (See Appendix Table 11.39).

Induction of labour: With stillbirths before labour and Caesarian Sections excluded, four times as many fetuses died who went into spontaneous labour than died associated with induction of labour. (See Appendix Table 11.40).

(xi) Antepartum haemorrhage analysed by cause of death

Antepartum haemorrhage occurred in 129 patients

with subsequent perinatal loss. See Table 3.42.

Table 3.42.

Distribution of antepartum haemorrhage in the various types

	Number of cases	% of A.P.H.	% Cause of all deaths
Antepartum haemorrhage unknown	32	26	6,5
Placenta praevia	13	10	2,6
Accidental haemorrhage	83	64	16,4
	129	100	25,5

Thus antepartum haemorrhage was associated with 25,5% of all perinatal deaths.

Accidental haemorrhage: This accounted for 64 per cent of all A.P.H. This has been analysed in detail.

Placenta praevia: This cause was classified as a mechanical cause of death and accounted for 10 per cent of A.P.H. and 2,6 per cent of perinatal deaths. Only 11 deaths were classified under mechanical praevia; 1 death was classified as mechanical cord as the cord prolapsed and one fetus died of syphilis before labour started and was classified under maternal disease syphilis.

Time of death: Eight out of 13 deaths (62 per cent) occurred during labour or as early neonatal deaths.

Age: Six out of 13 deaths (46 per cent) occurred in women over 30 years.

Parity: Twelve out of 13 deaths (92 per cent) occurred in parous women and this was significant ($\chi^2 = 6,9$ $p<0,01$).

Booking: Forty-six per cent of deaths occurred in unbooked patients.

Antepartum haemorrhage unknown: This group was distributed throughout the classified causes of death. See Table 3.43.

Table 3.43.

Distribution of antepartum haemorrhage unknown analysed by cause of death

	Number of cases	% of A.P.H. unknown
Congenital abnormalities	2	6
Mechenical vertex/ mechanical cord	2	6
Cause of death unknown-TERM	4	12
Cause of death-PRETERM	16	49
Fetoplacental inadequacy	8	24
Maternal disease	1	3
Total	33	100

However, the vast majority occurred in the cause of death - pre-term group and the fetoplacental inadequacy group (73 per cent).

Time of death: Forty-eight per cent died as still-births before labour. However, 44 per cent died as neonatal deaths.

Maternal age: There was even distribution with age.

Parity: The majority were parous women (72 per cent). This was not significant.

Past obstetric history: There were significantly more in this group with a previous history of reproductive failure ($\chi^2 = 6,8$ $p<0,01$).

Antepartum haemorrhage associated with hypertension: The association of A.P.H. with various forms of hypertension in the perinatal deaths was analysed. See Table 3.44.

There was no association with placenta praevia in any form of hypertension.

Accidental haemorrhage was associated with hypertension in 38 per cent of cases. Of these the majority were hypertension of late pregnancy unclassified. This was because the majority of accidental haemorrhages were in unbooked patients.

Table 3.44.

Various forms of antepartum haemorrhage associated with various forms of hypertension - number of deaths

	No hypertension	Essential hypertension	Pre-eclampsia	Hypert. of late pregnancy
Placenta praevia	13	0	0	0
Accidental haemorrhage	52	1	8	22
A.P.H. unknown	25	0	4	4
All A.P.H.	90	1	12	26

Antepartum haemorrhage associated with small for gestational age babies: The association of various forms of antepartum haemorrhage with S.G.A. babies was analysed.

There was no significant association with S.G.A. babies with any of the forms of antepartum haemorrhage (See Appendix Table 11.41).

(xii) Premature rupture of membranes analysed by cause of death

Premature rupture of membranes (P.R.O.M.) was associated with 11 per cent of the perinatal deaths (See Table 3.45). Of these perinatal deaths associated with P.R.O.M. 50 per cent were associated with PRETERM delivery. If the cause of death uncertain term group and fetoplacental inadequacy group were added together, this accounted for a further 26 per cent of P.R.O.M.

Time of death: See Table 3.46. There were significantly more neonatal deaths associated with P.R.O.M. Of the neonatal deaths 28 per cent died with hyaline membrane disease confirmed by the paediatrician.

Ethnic group: There were significantly more Coloureds and Bantu patients who had P.R.O.M. (χ^2 = 10,8 p<0,01). However, there was no difference between the ethnic groups in the proportion of deaths associated with P.R.O.M.

Maternal age: There was even distribution with age.

Parity: There was a tendency to be more than expected in parous women and less in the para 0 group (χ^2 = 5,7 p<0,02).

Past history: There was no association with a previous history of reproductive failure or hypertension.

Table 3.45

Premature rupture of membranes (P.R.O.M.) associated with various causes of death groups

	No. of P.R.O.M.	No. of deaths in this group	% of deaths in this group	% P.R.O.M. for all causes
Congenital abnormalities	5	33	15	9
Iso-immunisation	-	4	-	-
Mechanical problems	3	54	6	6
Cause of death Uncertain-TERM.	7	64	11	13
Cause of death PRETERM	27	146	18	50
Fetoplacental inadequacy	7	64		13
Accidental haemorrhage	-	83	-	-
Maternal disease	4	54	7	7
Unknown	1	4	-	2
Totals	54	506	11	100

Table 3.46.

Premature rupture of membranes (P.R.O.M.) by time of death

	Stillbirth before labour	Stillbirth during labour	Neonatal death
P.R.O.M.	18	7	29*
All deaths	262	70	174

* Significantly more neonatal deaths associated with P.R.O.M. $\chi^2 = 10,6$ $p<0,01$

Prenatal care: There were very significantly more than expected unbooked patients (χ^2 = 247 p<0,001) and of the unbooked patients significantly more died than expected (χ^2 = 4,8 p<0,05) in association with P.R.O.M.

Summary:

P.R.O.M. was associated with 11 per cent of perinatal deaths. These deaths were mainly neonatal deaths. The evidence of P.R.O.M. was higher in the Coloureds and Bantu and was more in the parous women. The association with being unbooked was very high.

(xiii) Booking status analysed by cause of death

One third (33 per cent) of all perinatal deaths were associated with unbooked patients. See Table 3.47.

The largest cause of death in the unbooked patients was the group - Cause of death - PRETERM group. These accounted for 30 per cent of all unbooked deaths.

However, accidental haemorrhage accounted for 24 per cent of all unbooked deaths and of the accidental haemorrhage group 48 per cent were unbooked emergencies.

Ten per cent of unbooked deaths were associated with a maternal disease.

Fetoplacental inadequacy - in this group there were less unbooked patients and 52 (10 per cent of all deaths) were booked patients who lost their infants due to placental insufficiency.

Table 3.47

Booking status associated with various clinico-pathological causes of death

	Unbooked	Booked	Total no. in cause	% unbooked in cause	% unbooked of all unbooked
Congenital abnormalities	11	22	33	33	7
Iso-immunisation	0	4	4	0	-
Mechanical problems	21	33	54	39	13
Cause of death uncertain-TERM	14	50	64	22	8
Cause of death uncertain-PRETERM	51	95	146	35	30
Fetoplacental inadequacy	12	52	64	23	7
Accidental haemorrhage	40	43	83	48	24
Maternal disease	16	38	54	30	10
Unclassified	3	1	4	-	-
Total	168	338	506	33	-

(xiv) Perinatal mortality in the P.M.S. District Service

The P.M.S. delivered 1,203 patients on the district service. These were only Coloured and Bantu patients. The perinatal mortality rate for this group was extremely low See Table 3.48.

This group consisted almost entirely of low risk/ high income Coloureds.

Table 3.48.

Perinatal mortality in P.M.S. District Service for Coloured and Bantu (1972)

	Stillbirths	Early neonatal deaths	Alive	P.N.M. rate
Coloureds	3	1	1198	3,3/1000
Bantu	0	0	2	0
Total	3	1	1200	3,3/1000

There were, however, 21 perinatal deaths who were booked for district but were delivered in hospital. The causes of death analysed by clinico-pathological cause can be seen in Table 3.49.

Table 3.49.

Clinico-pathological cause of death for perinatal deaths booked for district but delivered in hospital in 1972

Cause	Number of deaths
Congenital abnormalities	1
Mechanical causes	1
Cause of death uncertain -TERM	2
Cause of death -PRETERM	5
Fetoplacental inadequacy	5
Accidental haemorrhage	7
Total	21

There were no cases of iso-immunisation or maternal disease that were booked for District but delivered in hospital.

Thus the patients booked for district delivery in the P.M.S. accounted for 4,7 per cent of the total perinatal mortality for 1972. Of these only 3 deaths occurred in patients delivering on the District Service.

The major causes of death in the district booked patients who were transferred for hospital delivery were

(i) Accidental haemorrhage

(ii) Fetoplacental inadequacy

(iii) Cause of death - Preterm, i.e. Prematurity.

3. Combined analysis table of perinatal mortality determinants by cause of death

In this Table (See Table 3.50), where no correlation was found, a minus (-) was used, where a tendency was present one plus (+) was used, where the significance was $p<0,05$ two plus (++) was used, and where the significance was $p<0,001$ three plus (+++) was used.

The cause of death pre-term total group had significantly more N.N.D's, unbooked, short Coloureds, P.R.O.M. and a past obstetric history.

When the H.M.D. group of pre-term delivery were isolated, the past obstetric history and maternal height lost their significance.

In the pre-term remainder group, hypertension showed a tendency not illustrated for the total group.

Table 3.50.

Determinants of P.N.M. by clinico-pathological cause of death

	Stillbirth before labour	Stillbirth during labour	N.N.D.	Age: Teenage	Over 30	Parity: 0	: 4+	History reprod. failure	Unbooked	Hypertension	Antepartum haemorrhage	Weight: Low (< 54kg)	Height: Short	P.R.O.M.	Whites	Coloureds	Bantu
Congenital abnormalities				-	-	-	-										
Preterm Group - Total			+++	-	-	-		+++	+++	-		-	++	+++	-	-	-
H.M.D. group only			+++	-	-			-	+++	-		-		+++	-	-	-
Remainder			++	-	-			+++	+++	+		-	++				
Cause of death uncertain TERM	+			-	-		++	-	+++			+	-	+++	-	-	-
Fetoplacental inadequacy	++			-	++	-	+	+++	+++	++		+		+++	+		
Accidental haemorrhage	+++			+			++	-	+++	++		-	-		-	-	-
Maternal disease: Syphilis	++			++		+	++	++	+++	-				-			

\+ Tendency
++ Significant p 0,05
+++ p 0,001
\- No correlation

The cause of death uncertain - TERM group showed a tendency to stillbirths and low maternal weight, and significantly more high parous, unbooked patients with P.R.O.M.

The fetoplacental inadequacy group showed a tendency to high parity, low maternal weight and Whites, and significantly more stillbirths, over 30 year olds, hypertension, poor past obstetric history and P.R.O.M.

In conclusion, it will be seen that there are many similarities between the cause of death uncertain - TERM group and the fetoplacental inadequacy group and these groups can be added in certain circumstances. The pre-term remainder group have some similarities with the fetoplacental inadequacy group and probably the former group contain some fetoplacental inadequate neonates, particularly in the non H.M.D. group corresponding to Drillien's (1970) group (iii), (See 4.2.8).

CHAPTER 4

Discussion:

Introduction
Material and Methods
Results

CHAPTER 4

DISCUSSION

1. Introduction

"All men are created equal" (Thomas Jefferson, 1776). This statement could not possibly be true in the light of modern knowledge. The influence of the nutrition of the mother (Smith, 1947; Rosa, 1970), the intra-uterine environment (Gruenwald, 1969), the quality of obstetric care (Baird and Thomson, 1969), all play vital roles in the final end product of human reproduction. This final end product must vary tremendously. Furthermore, the first Human Right, "the right to be born biologically normal" (Reid, 1970) should and indeed must be the aim of modern obstetrics. The change in emphasis and importance during this last century from maternal mortality to perinatal mortality has been shown in the Introduction. Maternal mortality is now so low that it is not a good measure of obstetric care (Rosa, 1970; Menon, 1968; Browne and Dixon, 1970).

Perinatal mortality has fallen progressively during this last century (Lewis, 1964; Brown, 1973; Bonham, 1970; Rosa, 1970; Vital and Health Statistics, 1972), and this has largely been due to the improvements in the understanding of the requirements of obstetric care. However, there is still tremendous variation in the perinatal mortality in different countries, different regions, and different hospitals (Bonham, 1970; Wallace, 1970; Rosa, 1970). Furthermore, the major causes of perinatal mortality have changed during this century

and mechanical causes of death no longer play the important role they used to except in the third world, (Barron, 1974). Nevertheless, the mother's reproductive capacity and the standards of obstetric care are reflected in the P.N.M. rate (Baird, 1969).

As the problems in obstetrics vary throughout the world, the major causes of perinatal mortality will also vary and what will be an important factor or cause in one country or region or hospital will not necessarily be as important in another country, region or hospital.

Nevertheless, there is much common ground in discussions on perinatal mortality and it is the intention in this Discussion to show this common ground and to show the differences found in the determinants of perinatal mortality found in this study. These determinants have been measured in two ways. Firstly, as epidemiological factors i.e. maternal height, weight, age, parity etc. and secondly related to various clinico-pathological causes of death.

2. Materials and Methods

The material used in this retrospective study was similar in many ways to the British Perinatal Mortality Survey (Butler and Bonham, 1963; Butler and Alberman, 1969). The patients were predominantly from the lower socio-economic groups II, III, IV and V, using the same class criteria of Illsley and Kincaid (1963).

In this study there were less patients in social class groups I and II than in the British Mortality Survey, because most of the upper classes are delivered by private gynaecologists. The large number of class III, IV and V

patients is because the Coloured and Bantu patients deliver almost exclusively under our care. It will be seen that many of the ethnic differences are similar to the social class differences found in other studies (Butler and Bonham, 1963; Niswander and Gordon, 1972).

It is important to emphasize that the Whites correspond largely to social class II and III, the Coloureds to social class III and IV and the Bantu to social class IV and V, using the classification of social class used by Illsley and Kincaid (1963). Although no specific measure of social class was used for each individual, this above statement is supported by Langerman (1972), Malan (1973), Harrison (1973) and Moodie et al (1970). A major difference in this study was that three different ethnic groups were studied: Whites, Coloureds and Bantu.

The sample size

The overall study was performed on 15,251 singleton pregnancies (1,755 Whites; 11,194 Coloureds and 2,302 Bantu) and the 506 stillbirths and early neonatal deaths associated with the total sample. This represents the high risk group in the area of the Cape Town Municipality, as virtually all the social class I patients are excluded.

This means that this study has a biased sample of low socio-economic patients, which will make the results more unfavourable than they are for the whole community of the Municipality of Cape Town. This study has three advantages: (i) The majority (73 per cent) of the patients in the socio-economic groups studied delivered in the P.M.S. and this group

accounted for more than 95 per cent of the perinatal deaths in the Municipality of Cape Town (Langerman, 1972);
(ii) This study was comprised of three ethnic groups - the Whites, the Coloureds and the Bantu;
(iii) The material was gathered over the year 1972.

Because of the sample size, the results are comparable to the British Perinatal Mortality Survey, (Butler and Bonham, 1963; Butler and Alberman, 1969) where there were 16,994 singletons studied. This latter survey, however, was performed on data collected in 1958, and many obstetric practices have changed since then. Also ethnic variation was not included in their study. Their study, however, is outstanding in its completeness.

A more recent and much larger Collaborative Perinatal Study (Niswander and Gordon, 1972) performed on 19,048 Whites and 20,167 Negroes in the United States of America has been used for comparison in this study. Their study was confined to twelve teaching institutions throughout America and thus does not represent a whole population group as the British Perinatal Mortality Survey does. It too was performed on practice between 1959-1965.

There is to date no totally comparable study of this size, taking into account a population group and ethnic variation available in Southern Africa or a city of similar circumstances to Cape Town. Macnaughton (1974) is at present conducting a similar study to this one. Some preliminary results of his study have been contrasted.

Furthermore, this study represents a relatively

stable community of Whites, Coloureds and Bantu living at the "tip of Africa stopped by a mountain".

The recording of data on computer sheets

Many obstetricians would question the validity of data recorded on to the computer coding forms (See 9), and this is accepted as a valid criticism. The quality of data recording is all important. The author personally checked the computer data from a computer print-out on the 506 still-births and early neonatal deaths that were analysed on the study sheet (See 10). The accuracy of recording of the factors used in this study was very good. The errors in recording were errors of omission rather than commission i.e. the indications for induction of labour, the presence of P.R.O.M. were commonly omitted. However, data such as maternal height, maternal weight, age, parity, antenatal care, were all very accurately recorded and only when data was not in the correct place in the obstetric book (See 8) was it often recorded as UNKNOWN when in fact it was available. No major errors of coding the wrong antenatal complication or other factors studied were found. It would thus seem that the standard of the records used in this section of the thesis was good and that this system of recording obstetrical data (Marais and Strasburg, 1969) is excellent for studies of this type. Retrospective studies, such as this one, provide information about unsuspected correlations if broadly based. The amount of information from these computer forms for an in depth study on a single factor is not adequate. However, this degree of in depth study is usually only of value if conducted PROSPECTIVELY.

The quality of data collection with the double checking of the computer sheets by Consultant Medical Staff is comparable, if not superior, to the method used in the British Perinatal Mortality Survey (Butler and Bonham, 1963) where the information was recorded by the midwife in attendance and no cross check was undertaken. The quality of some information in the British study eg. gestational age and hypertension, was unsatisfactory, especially as many associations were based on this information.

Booking criteria

A criticism is that booking criteria should not be needed at all. It should be possible for all women to have their deliveries in hospital. However, this ideal is at present not possible in Cape Town for the Coloureds and Bantu and thus certain criteria must be fulfilled.

The effect of this is that a "middle group" of healthy para 2-3, aged 20-28 years, non-complicated obstetric patients are not in this study. However, bearing in mind that 73 per cent of the community available deliver in the Peninsula Maternity Service and 95 per cent of the perinatal mortality for the Municipality (Langerman, 1972) occurs in the P.M.S., only the distribution Tables will show a slight bias from lack of "middle group". The perinatal mortality Tables will not have this bias to the same degree.

No correction factor has been used in this thesis for either the socio-economic bias or the lack of "middle group" bias. It was felt that the sample size was sufficiently large and there was a sufficient proportion of perinatal mortality

in the P.M.S. to fulfil the objects of the study i.e. What sort of mothers loose their infants, what sort of infants die and how these can be reduced.

Prenatal care

This recorded the booking visit and the number of antenatal visits only and did not take into account antenatal ward admission. The fault of this system is that a patient could conceivably book at 30 weeks, for example an antepartum haemorrhage, she could be admitted, found to be placenta praevia and kept in hospital until delivery. This would be recorded as prenatal care booking visit only, when in fact she had received maximum care. The number falling into this group must be relatively small. This same system has been used by Butler and Bonham (1963) and Niswander and Gordon (1972).

Maternal weight recording

The maternal weight recorded is the first visit maternal weight and is not a pre-pregnancy weight (Eastman and Jackson, 1968; Tomkins et al, 1955). In the Whites, where the majority of patients book before 20 weeks, the maternal weight is a true first visit or booking weight, used by others (Niswander and Gordon, 1972). In the Coloureds and the Bantu many of whom book after 20 weeks NO correction factor has been employed. This makes any distribution curve difference more significant when referring to underweight patients and less significant when referring to the heavy group.

Hypertension and proteinuria

Initially nine groups of hypertension and proteinuria were extracted. However, pre-eclampsia and hypertension of late pregnancy were the same group and only the strict definition

of pre-eclampsia used prevented many of this latter group from being classified as pre-eclampsia.

As in the British Perinatal Mortality Survey (Butler and Bonham, 1963) no cognisance of weight gain or oedema was included in the definition. The groupings were similar to the study by Butler and Bonham (1963). There were, however, the following differences in this study:

(i) A single blood pressure reading was not sufficient to diagnose pre-eclampsia and two different readings were necessary.

(ii) Intrapartum hypertension only, was separated from the other forms of raised blood pressure.

(iii) Conditions without proteinuria were separated from conditions associated with proteinuria.

The relationships of hypertensive conditions in pregnancy with weight gain in pregnancy as used by MacGillivary (1961) are important; however data to this end was not available for study.

The choice of birth weight and gestational age chart

In the analysis of stillbirths and early neonatal deaths, each death was assessed as appropriate for gestational age (A.G.A.), large for gestational age (L.G.A.), or small for gestational age (S.G.A.). Various authors have used different charts (Usher et al, 1966; Lubchenco et al, 1963; Gruenwald, 1966; Malan et al, 1967; Thompson et al, 1968; Lubchenco et al, 1972). The disadvantage of the Usher et al's (1966) chart was that they used the 3rd and 97th percentiles for the lines below and above which they called infants S.G.A. or L.G.A. respectively, and the author felt this would only

pick up the grossly S.G.A. neonates and omit many S.G.A. neonates who have relative fetoplacental failure. Any infant with a birthweight two standard deviations below the mean, is definitely growth retarded (Gruenwald, 1969). This would miss many others, and for this reason a chart using the 90th and 10th percentiles, was required. This was the advice of others (Harrison, 1973; Malan, 1973; Ounsted, 1973). The advantage of the charts drawn up by Malan et al (1967) was that they applied specifically to the Cape Town - White, Coloured and Bantu and had been drawn up by them for this community. However, there were several criticisms to using them in this study. Firstly, they presupposed that ethnic group was the cause of the difference or if not, that there was a difference and therefore the three ethnic groups should be charted separately on their own ethnic charts. This applied particularly to the Coloured whose 10th percentile line corresponded roughly with a 3rd percentile line drawn on to a Lubchenco et al (1963) growth chart. Malan et al's (1967) chart for Whites corresponded very closely to the Lubchenco et al (1963) chart but due to small numbers was not available below 35 weeks gestational age. The author felt he could not accept a presupposition of an ethnic variation and required charts that were suitably projected back giving 10th and 90th percentile lines from 26 weeks.

Other workers have shown that socio-economic factors play a major role in fetal growth patterns (Gruenwald et al, 1967; Thomson et al, 1968) and that ethnic variations in birthweight are to a large extent due to socio-economic

differences (Scott et al, 1950; Singer et al, 1973). In this study the Coloured and Bantu groups both fall into the lower socio-economic groups. For this reason, and the fact that the Colorado series was performed on a low socio-economic-part pay mixed racial sample of Mexican, Spanish and Indian (Lubchenco et al, 1963), the author chose to use the Lubchenco growth charts. The original charts by Lubchenco were separated for boys and girls. However, at each gestational age, this variation was not more than 100 grams (Lubchenco et al, 1963). Lubchenco further modified these sex charts into one combined chart. In 1972 Lubchenco et al published a new modified chart made on the same population type. This chart was the one used in this study (See Appendix E) (Lubchenco et al 1972). This chart was made at 10,000 ft above sea level and may not be exactly applicable particularly if high altitude slows the rate of intrauterine growth (Ounsted and Ounsted, 1973). However, it was felt that this was the best to date chart available for use.

The birthweight gestational age charts formed by Thomson et al (1968) included many other factors such as parity, maternal height and weight and sex of the infant. These charts were higher on average than Lubchenco et al (1963; 1972) and as the South African Whites on Malan et al's (1967) chart corresponded to the Lubchenco charts (1963; 1972), this latter chart was favoured.

It is appreciated that in precise research standard curves have to be used that take into account various variables such as maternal height, weight, sex, ethnic group, social

class; but these Tables are not available at present for South Africa as a whole or Cape Town in particular. This point is stressed by Thomson et al (1968). Ideally each worker should make his own charts (Ounsted and Ounsted, 1973), although the concept of a gestogram of standard fetal growth which could be flexible for international use (Dunn and Butler, 1971) is very good.

The clinico-pathological classification of cause of death

There are many classifications that have been used to classify causes of death (Baird, 1954; Bound et al, 1956; Potter, 1959; Butler and Bonham, 1963; Baird and Thomson, 1969; Low et al, 1970; Baillie and Butler, 1974). These classifications vary from descriptive classifications to pathological classifications, to clinical classifications. What the author required was a clinico-pathological classification that would as far as possible give the closest mechanism of death on a clinico-pathological basis. The reason for this was that if the clinico-pathological cause was known, it could be determined which groups of patients could be prevented in the future. Furthermore, a classification was required which could be performed by a single person and would avoid as far as possible arbitrary assignment. The classification should be simple enough to use on this basis but obviously there must be a small degree of observer bias.

To descriptive and pathological classifications preventive treatment can NOT be applied.

Perhaps the closest classification to the author's

requirements was that devised by Baird et al (1954) using Environmental and Obstetric groups of causes; and "malformation (DEF)", "Rh incompatibility" and a "small miscellaneous group", from this classification were accepted into this study classification. However, it was felt that "antepartum haemorrhage (A.P.H.)" (Baird et al, 1954) was too heterogeneous a group and that these should not all be grouped together. Accidental haemorrhage was a separate condition, which was largely unpreventable; placenta praevia caused death on the basis of mechanical obstetric obstruction and required totally different treatment to accidental haemorrhage. The A.P.H. unknown group was often associated with fetoplacental inadequacy and this was treated in a different way to the former two types of A.P.H.

"Toxaemia (Tox)" (Baird et al, 1954) does not kill fetuses and is associated with no recognisable state in the fetus. Most pathologists hesitate to ascribe a death to toxaemia per se (Potter, 1959). These infants die either through being born too soon, i.e. prematurity, for example by untimely induction of labour, or through intrauterine growth retardation, i.e. fetoplacental inadequacy or accidental haemorrhage. The treatment of all these three mechanisms of death is different.

In the "mechanical group", in this study it was felt necessary to only include term babies who had clear evidence of mechanical trauma. Pre-term infants, i.e. infants born before 37 completed weeks, usually died because they were born too soon and although the delivery may have had a bearing on the death, the major cause was that the woman

laboured pre-term.

The cause of death uncertain - Term group used in this study included many babies dying of "placental insufficiency" together with known causes such as asphyxia neonatorum and neonatal infection.

The "cause of death uncertain - preterm group (P.U.)" used by Baird (1954) and Baird and Thomson (1969) included basically three groups of infants (Drillien, 1970). It is important to distinguish between infants of low birth weight due to fetal growth retardation from those which are pre-term births but normal for their gestational age (Gruenwald, 1965; Usher et al, 1966; Thomson et al, 1968; Macnaughton, 1974).

There is growing recognition of three groups of infants falling into this group (Gruenwald, 1964; Gruenwald, 1965; Drillien, 1970):

(i) small because of premature delivery
(ii) small because of intrauterine growth retardation
(iii) small because of a combination of (i) and (ii)

The author hoped to be able to distinguish between these three groups using his classification and in the group cause of death - preterm, he could exclude group (i) by extracting the deaths due to hyaline membrane disease and the remainder would correspond to group (iii) (Drillien, 1970). All of group (ii) would fall into the fetoplacental inadequacy group. A baby who is two standard deviations below the mean birth weight for gestational age is definitely growth retarded (Gruenwald, 1969). However, it is probable that babies below the 10th percentile on weight for gestational age charts that

are appropriate for the group under study, are growth retarded (Ounsted, 1973).

The classification used by Low et al (1970) is more physiological than that of Baird et al (1954) and Baird and Thomson (1969), and could best be used in a prospective study as indeed it was used.

The classification used by Baillie and Butler (1974) was very similar to that used in this study. However, they did not use the same mechanical group and did not differentiate fetoplacental inadequacy on the basis of appropriate (A.G.A.) or small for gestational age (S.G.A.).

The author would accept as a criticism of his classification, the differentiation of fetoplacental inadequacy on the basis of S.G.A. as defined on a Lubchenco growth-gestational age chart. It can be argued that a S.G.A. baby may in fact be one of the healthy infants dying of prematurity if pre-term, particularly if one believes that smaller mothers have smaller babies (Ounsted and Ounsted, 1966; Thomson et al, 1968; Ounsted and Ounsted, 1973). The concept of maternal constraint has been shown in animal experiments (Walton and Hammond, 1938) and is postulated to occur in humans by Ounsted and Ounsted, 1973. However, there are still many other factors involved in fetal growth. The environment clearly showed its influence in the seige of Leningrad (Antonov, 1947) and in Holland (Smith, 1947).

Conversely, an appropriate for gestational age infant may be a growth retarded infant or the level of intrauterine growth retardation may not have been sufficient to drop the

weight below the 10th percentile. It was, however, argued that although this was true, the MAJORITY of S.G.A. babies were in fact growth retarded and the MAJORITY of A.G.A. babies were premature if born PRE-TERM.

Because of the controversy of whether S.G.A. meant intrauterine growth impairment, the author, in the analysis of the cause of death - Pre-term group, reanalysed this group excluding all the babies known to have died of hyaline membrane disease. This would have shown a character type similar to the fetoplacental inadequate group had there been many intrauterine growth retarded infants left in the group. However, this group closely matched the cause of death - Pre-term - hyaline membrane disease group. Thus it would seem that this whole group corresponded closely to Drillien's (1970) group (i) small because of premature delivery and a few were a combination of premature and growth retarded babies.

3. Results

1. The overall perinatal mortality rate for the total population sample was 33,2 per 1000. This is similar to the British Perinatal Mortality Survey (Butler and Bonham, 1963) figure of 33,6 per 1000 and 35,07 (in Whites) and 41,97 (in Negroes) in the Collaborative Study (Niswander and Gordon, 1972). It must be remembered that these two latter studies occurred during the late 50's and early 60's over a decade before this study. The improvement since 1958 in Britain to 23 per 1000 in 1970 (Browne, 1973) has only been matched by the Whites in this study (19,4 per 1000). The Coloureds and Bantu rates are still well above the current British levels. Jacobziner et

al (1961) found similar ethnic variation in P.N.M. rates in New York amongst the Whites (27 per 1000), Puerto Ricans (37 per 1000) and Negroes (47 per 1000 total births). This could be a failure of the social class "gap" to narrow (Illsley, 1955) with associated poverty (Rosa, 1970). Other authors have found this ethnic difference and feel this is due to socio-economic difference (Shapiro et al, 1960; Jacobziner et al, 1961; Rennard, 1969; Wallace, 1970; Osofsky and Kendall, 1973).

The total sample number of deaths was 506, of which 345 were stillborn and 161 early neonatal deaths. The British Perinatal Mortality Survey (1963) had 369 stillbirths and 248 neonatal deaths. Fairweather et al (1966) in 14,594 deliveries found 296 stillbirths and 253 neonatal deaths. There were proportionately more stillbirths in this study as was found in the Collaborative Study (Niswander and Gordon, 1972).

In the developed countries the stillbirth rates and neonatal deaths are approximately equal (Tompkins, 1970; Rosa, 1970). Only in Portugal and Japan is the stillbirth rate almost double the neonatal death rate (Rosa, 1970), as was found in this study. It is unusual for the neonatal death rate to exceed the stillbirth rate. This has been found in Austria and Yugoslavia (Rosa, 1970). The significantly higher still-birth rate in males found in Uganda (Simpkiss, 1968) was not studied.

The time of stillbirth was highly significant in this study with over 80 per cent of all stillbirths occurring before the onset of labour in all three ethnic groups. There were many more fresh stillbirths during labour in the Collaborative

Study (Niswander and Gordon, 1972). Thus 54,7 per cent of the total perinatal mortality in this study occurred as still-births before labour. Clearly the prevention of this group does not rest with any aspect of labour ward care! As will be seen later, the prevention of this group rests in booking all patients and altering the approach to antenatal care. The greatest change in P.N.M. rate will come with antenatal care and the selection of the high risk pregnancy before labour. This was also found in Rome by Massi et al (1971). This is very different to the problem found by Dawkins (Baird, 1962) who found 30 per cent of all perinatal deaths to be due to intra-partum asphyxia.

2. Maternal age

Maternal age, parity and social class are all inter-dependent (Feldstien and Butler, 1965; Duncan et al, 1952). In the low income group from low socio-economic classes, pregnancies occur in "the too young, the too old, and --- too often". (Birch and Gussow, 1970). In this study there were more teenage Bantu. This is partly because of African custom of proving fertility prior to marriage, but more probably because of low social class and earlier onset of sexual activity. These latter two reasons are more likely because many of the associations with the Bantu are those of social class rather than cultural differences (eg parity, living conditions, accidental haemorrhage). The change in distribution for the over 30 age group is interesting. The low number of Whites in this group is because of better family spacing and planning, lowered parity and improved social class. In the Coloureds and Bantu

there are many more women over 30 years of age usually of high parity and low socio-economic class. Family planning and family spacing, although available to this sector of the community, have had no impact on their reproductive patterns at the present time. Birch and Gussow (1970) in New York found increased birth rates in the young and over 30 year old associated with low income, as found in this study.

The trend for increased perinatal mortality in teenagers and from 30 years upwards found by others (Butler and Bonham, 1963; Feldstein and Butler, 1965; Birch and Gussow, 1970; Wallace, 1970; Macnaughton, 1974) has been confirmed in this study. In the Collaborative Study it was found that the teenagers had lowered perinatal mortality rates and the optimum age for delivery was 18-19 years. In the Negroes, as found in the Coloured and Bantu, there were many more teenage pregnancies than in the Whites (Niswander and Gordon, 1972).

3. Maternal parity

In the distribution of parity there were many more high parous women in the Coloured and Bantu, similar to the Negroes (14 per cent) in the Collaborative Study (Niswander and Gordon, 1972). This is because of poor family spacing and planning, poor socio-economic class as has been found by others (Baird, 1965; Russell, 1969, Naeye et al, 1971). "High parity, and obstetric and paediatric consequences that flow from it, are essentially a problem seen in the lower socio-economic groups" (Russell, 1969). In the Coloured often, as a form of insurance, it is customary for the children of a Cape Coloured family to give support to their mother when they are earning money. Clearly

the mother with 10 children will have a greater pension than one with only two or three! In the Bantu the men believe that women should bear children throughout their reproductive lives and failure to continue to have children is a sign of infidelity. However, in the urban Bantu this belief is not as strong as in the rural areas. Another major problem is the difficulty the Bantu have in accepting sterilisation as a form of birth control. The Bantu male believes that the woman loses her sexual prowess if sterilised and for him it is not even considered. The author does not know of a single Bantu male who has consented to vasectomy! These ethnic variations are probably adaptive mechanisms used by low socio-economic groups and would be found in similar groups throughout the world.

Baird's (1945) concept of a "practice run" being essential before optimum performance, has not been borne out in this study because the low risk/high income Coloured and low risk Bantu, who were usually in the 1-3 parous group, were often delivered outside the Peninsula Maternity Services. However, the deterioration of reproductive performance after the fourth pregnancy found by others (Butler and Bonham, 1963; Russell, 1969; Osofsky and Kendall, 1973; Macnaughton, 1974) was confirmed in this study. That this is largely due to increasing maternal age (Feldstein and Butler, 1965) has not been confirmed except for primigravida. Due to an active policy of tubal ligation in Aberdeen, the high perinatal mortality associated with grandmultiparity has been substantially reduced (Baird, 1965).

When maternal age and parity were combined there was

increased perinatal loss in the over 30 year old primigravidas in all three ethnic groups as found by others (Butler and Bonham, 1963; Butler and Alberman, 1969). However, the tendency for perinatal mortality rates to increase with age in the other parity groups, as found in the Collaborative Study, was not confirmed (Niswander and Gordon, 1972).

4. Maternal weight

The variation in the distribution of maternal weight in the three ethnic groups is interesting. The significantly higher distribution of low weight Coloureds may well be due to long-standing malnutrition (Eastman and Jackson, 1968) rather than ethnic. The high proportion of heavy Whites is due to good nutrition and heavy Bantu is due to a diet in which carbohydrates are overwhelmingly in excess with proteins being markedly deficient (Moodie et al, 1970). This accountsfor the apparent paradox of heavier Bantu with a poorer reproductive performance.

There were more Bantu over 95 kgs than Whites or Coloureds, similar to the increased number of Negroes over 180 pounds in the Collaborative Study (Niswander and Gordon, 1972.) One wonders whether the Negroes have similar dietary habits.

Perinatal mortality was significantly higher in the light (under 45 kg) Coloureds, which would support the concept of chronic maternal undernutrition (Eastman and Jackson, 1968). Tomkins et al (1955) found an increase in prematurity in low weight mothers, as was found in this study, and states that the ensuring of a steady weight gain, particularly in the first 20 weeks of pregnancy would markedly reduce the incidence of prematurity in this group. This is discussed further under

maternal weight and height combined. The Collaborative Study finding of increasing perinatal mortality with increasing pre-pregnancy weight was not confirmed in this study and the opposite was true for the Cape Coloureds.

The significance of weight gain trends during pregnancy and their relationship to pre-eclampsia, prematurity and perinatal mortality as studied by Thomson and Billewicz (1957) was not investigated in this thesis. Macnaughton (1974) advocates induction of labour if weight gain ceases after 36 weeks and points out that this will reduce the perinatal loss in the cause of death uncertain - Term group. Eastman and Jackson (1968) stress that more attention must be given to subnormal weight gain in the low weight mothers. This will detect the S.G.A. fetuses (Elder et al, 1970).

5. Maternal height

In the distribution between the three ethnic groups there were significantly more short Coloureds than Whites and Bantu. This would support the concept that "the distribution of height and the percentage of tall and short women in a representative group of women in any geographical area of a community is a useful indication of the level of physical development and health" (Baird, 1969).

There is evidence in Britain that women less than 155 cm (5 ft 1 in) may not have grown to their full genetic potential due to environmental factors (Baird, 1952; 1962). Furthermore, the percentage of women less than 155 cm increase from 10 in social classes I and II to 29 in social classes IV and V, whereas the percentage measuring 163 cm (5 ft 4 in) or more

decreases from 47 to 21 respectively (Baird, 1963). Correspondingly, the perinatal mortality increases from social class I to V from 17,9 to 35,6 respectively (Russell, 1969). If this is true then there were many more poorly developed and unhealthy Coloureds and this would have been reflected in an increased perinatal mortality. In the short Coloured (less than 149 cm) there was a significantly higher perinatal mortality. Short women have higher perinatal mortality rates than tall women (Thomson and Billewicz, 1963; Baird, 1962; Baird and Thomson, 1969). This is confirmed in this study but not confirmed in the Collaborative Study (Niswander and Gordon, 1972) who found the distribution of height to be the same in Whites and Negroes and that perinatal mortality was not affected by maternal height. This could suggest that the American Negro is better nourished than the Cape Coloured and has a higher social status.

When the maternal height and weight were combined for Coloureds, the highest perinatal mortality was found in the short and the lowest rate in the tall Coloureds. It would appear that height has a greater influence on fetal outcome and this is because height is a better measure of overall maternal nutrition than maternal weight (Thomson, 1957; Thomson and Billewicz, 1963; Moodie et al, 1970). The Ponderal index would be the best means of assessing the overall nutritional status. This is the height in inches over cube-root of weight in pounds (Eastman and Jackson, 1968; Berry, 1972). This has not been done in this study. There is, however, evidence in this study to suggest that the Cape Coloured community have

relatively more undernourished in their group than the Whites and Bantu in this study. The Coloureds were on average lighter and shorter than the Whites and Bantu and came from poor socio-economic conditions (Moodie et al, 1970). It must be emphasized that the Bantu in this study are predominantly urban Bantu and differ in many ways from the rural Bantu. They are on average better nourished and earning more per capita income than rural Bantu (Langerman, 1972). Baird (1952) has shown that there is a close relationship between maternal height and social class and when environmental conditions deteriorate, the number of short women increase. This is well shown in this study. The mechanism of death in the short group was not mechanical as might be expected but prematurity or fetoplacental inadequacy, and both of these are associated with poor nutrition and poor social class (Baird, 1962; Thomson, 1963; Steer and Moore, 1969).

6. Past obstetric history

The presence of a past obstetric history of previous reproductive failure i.e, a previous stillbirth or neonatal death or recurrent abortion, had a significant effect and was associated with three times the overall perinatal mortality rate. This has been confirmed by others (Macnaughton, 1961; Butler and Bonham, 1963; Niswander and Gordon, 1972; Osofsky and Kendall, 1973).

"Patients who start their reproductive life with an abortion have an increased risk of theatened abortion and perinatal death in their second pregnancies" (Macnaughton, 1961).

7. Maternal disease

The influence of maternal diabetes on perinatal mortality is well known (Jackson, 1967; Pedersen, 1967; Brudenell and Beard, 1972) and is not discussed further.

The Whites had a higher incidence of renal disease (which has all been grouped together, i.e. chronic nephritis, urinary tract infection) than the Coloureds. The opposite was found in the Collaborative Study between the Whites and Negroes for kidney or urinary tract infection until they re-analysed the group including only positive bacteriological cases (Niswander and Gordon, 1972).

It is interesting to see that Bantu with any maternal disease collectively have a much lower than average perinatal mortality rate than Bantu with no disease. This can be explained by the fact that patients with disease are booked patients receiving antenatal care and treatment and the effect of this is sufficient to significantly lower the perinatal mortality to below the overall rate.

The Whites, however, have a much higher P.N.M. rate in this group which suggests that treatment is not the important variable but rather the all pervading socio-economic status. As the Whites are a relatively optimum group, the small increased risk of maternal disease will be apparent whereas the other ethnic groups have such a high P.N.M. rate from the background of socio-economic conditions (eg. pre-term delivery, accidental haemorrhage), that the loss in maternal disease is actually less as most of them are associated with low parity and age.

8. Prenatal care

Two per cent of Whites, 4 per cent of Coloureds and 7 per cent of Bantu were unbooked cases, coming to hospital as emergencies. If the first visit group is added then 5 per cent Whites, 8 per cent Coloureds and 10 per cent Bantu fall into this group. This is not dissimilar to the 6,5 per cent rate for Whites and Negroes in the Collaborative Study (Niswander and Gordon, 1972). What is confirmed is the 3-5 times increased perinatal mortality rate for unbooked cases found by others (Butler and Bonham, 1963; Niswander and Gordon, 1972).

The Whites were seen slightly more frequently than the Coloureds and Bantu and perinatal mortality fell progressively with more antenatal care. There was no increase in the perinatal mortality in the group seen with many visits, who presumably include patients with problems, as was found in the Collaborative Study (Niswander and Gordon, 1972).

Approximately one third of all perinatal deaths were associated with unbooked patients. When this was analysed by cause of death, it was found that prematurity and accidental haemorrhage accounted for 54 per cent of the perinatal loss in this group. These two conditions are both more frequent in poor social class groups (Thomson, 1963; Naeye,1972).

Ten per cent were associated with maternal disease. This was largely due to untreated syphilis.

In this unbooked group - maternal disease (10 per cent), fetoplacental inadequacy (7 per cent), prematurity (30 per cent) and mechanical problems (13 per cent) i.e. 60 per

cent of total are largely preventable with good antenatal and intrapartum care.

There is no way of knowing whether the prematurity linked deaths were associated with interference or spontaneous in onset particularly in the Bantu. One of the Bantu methods of criminal abortion is late 2nd trimester and possibly early 3rd trimester rupture of membranes, resulting in delivery of an immature infant. If this weighs more than 500 grams then by definition it would be classified as stillbirth or neonatal death. This factor is critical in assessing whether antenatal care would alter the outcome, as it would at first sight appear to do.

9. Hypertension and proteinuria

The overall distribution of hypertension is seen in the Results. The largest number of patients had intrapartum hypertension only. (See 3. 2.10.)

Pre-eclampsia without proteinuria was associated with no increase in perinatal mortality over the control group. This either means that pre-eclampsia in this mild form has no effect on the fetus or that the current treatment of pre-eclampsia in our unit is such that the disease process is adequately controlled. This finding is different to the British P.N.M. Survey who found pre-eclampsia was associated with a higher perinatal mortality than the national average (Butler and Bonham, 1963). There is little doubt that the importance of "toxaemia" as a cause of perinatal mortality, can be greatly reduced by a high standard of antenatal care and by admission to hospital when out-patient treatment seems to be insufficient

(Baird and Thomson, 1969).

The presence of proteinuria presented a different picture and was associated with 2-3 times the overall perinatal mortality rates. This has been found by others (MacGillivary, 1961; Butler and Bonham, 1963; Macnaughton, 1974). This can mean either that proteinuria is associated with a greater degree of severity and is responsible for affecting fetal growth and placental function, or that the obstetrician becomes increasingly concerned and terminates the pregnancy too soon, and that the infants are dying of prematurity. Because of this, hypertension was analysed by cause of death and it was found that both contentions were partially true. Twenty nine per cent of pre-eclampsia associated fetal deaths were associated with the prematurity group and 29 per cent of pre-eclampsia related fetal deaths were associated with fetoplacental inadequacy. However, the presence of pre-eclampsia and hypertension was much commoner in the fetoplacental inadequate group than in the cause of death pre-term group. The conclusion must be that some infants of pre-eclamptic mothers die because they are "born too soon". However, many infants of pre-eclamptic mothers die because of fetoplacental inadequacy. It would follow that in the management of patients with pre-eclampsia and hypertension of late pregnancy, it is of paramount importance to decide whether or not the fetoplacental unit is decompensating or whether it is still functioning normally whatever the blood pressure reading, before deciding when to terminate the pregnancy.

Intrapartum hypertension did not appear to have an effect on perinatal mortality. This is either because the

treatment of raised blood pressure in labour is satisfactory or possibly the effect of raised blood pressure in labour alone is not as serious as was previously thought. The author feels the first reason to be most logical and fears a rise in eclampsia if any relaxation on the treatment of hypertension in labour occurs. No comparable studies were found.

Essential hypertension was associated with an increased effect on perinatal mortality in the Coloured and Bantu. The number in Whites was too few for analysis. This finding is similar to that found by Walters (1966) where the perinatal mortality was 72,7 per 1000 total births with sustained hypertension throughout pregnancy.

Maximum diastolic blood pressure has been used as a measure of severity of hypertensive disease and in this study it was found that 110 mmHg or above was associated with an increased perinatal mortality rate, whereas a diastolic of less than 110 mmHg was not. The level of change was lower (100 mmHg) in the British P.N.M. Survey. However, other factors such as maternal age must be related to blood pressure readings before significance can be truly evaluated. MacGillivary (1961) studied the relationships of blood pressure rise and weight gain at various stages during pregnancy. Unfortunately this data was not available from our records for comparison but is of importance to take cognisance of (MacGillivary, 1961; Elder et al, 1970).

Nelson (1955) in an epidemiological survey found that the incidence of mild pre-eclampsia increased over the age of 30, but not severe P.E.T., that there was no variation with

social class and height of the mother and, that excess weight gain between 20-30 weekswas associated with a higher risk of pre-eclampsia. These factors were not studied.

10. Antenatal complications

Antepartum haemorrhage (A.P.H.) occurred in between 3,0 - 4,5 per cent of the total population sample.

Antepartum haemorrhage unknown cause was associated with double the overall perinatal mortality rate and accounted for 59 per cent of all A.P.H. This is similar to the Collaborative Study (Niswander and Gordon, 1972). However, this group accounted for only 26 per cent of the deaths associated with A.P.H. This finding is similar to the British P.N.M. Survey where they showed that this group formed 72 per cent of A.P.H. and the perinatal mortality rate was higher than in placenta praevia (Butler and Bonham, 1963).

Placenta praevia: The incidence of placenta praevia was 0,5 - 0,7 per cent accounting for 15,5 per cent of A.P.H. This is similar to others (Niswander 1966; Niswander and Gordon, 1972). However, this represented only 10,5 per cent of deaths associated with A.P.H.

Accidental haemorrhage: This condition although accounting for 25,5 per cent of A.P.H. is the most important form of A.P.H. in terms of perinatal mortality (63,5 per cent). In the Collaborative Study accidental haemorrhage was assessed in various degrees of severity - partial, complete, and unspecified degrees of placenta abruptio. This was associated with perinatal mortality rates varying between 144,6 - 826,0 per 1000. In this study the perinatal mortality rates

varied between 231 - 632 per 1000. One third of accidental haemorrhage in the British P.N.M. Survey was associated with no toxaemia (Butler and Bonham, 1963). However, in this study only 31 per cent of patients with accidental haemorrhage had any form of association with hypertension. This would suggest that in this environment the association between toxaemia and accidental haemorrhage is not as significant as in Britain. It has been realised over the last few years that the toxaemia associated with accidental haemorrhage is often the result and not the cause. The method of recording hypertension in the British P.N.M. Survey may in part account for this discrepancy. The tragedy with accidental haemorrhage is that there is very little that can be done to prevent this condition at present. It is known that the association with accidental haemorrhage in the lower socio-economic groups is high (Baird, 1962; Macnaughton, 1974) but nevertheless the condition still occurs throughout all social strata. Paintin (1962) disagrees with this finding and found in his study no association with any form of antepartum haemorrhage and social class or maternal height. Macnaughton (1974) disagrees with Paintin and states that improvement in social class and decrease in parity does lower the incidence of accidental haemorrhage and would be one preventive measure. The absence of warning haemorrhages was most marked in this study. No association with accidental haemorrhage and S.G.A. infants was found. This is because placental abruption is an acute condition where the fetus usually dies of acute anoxia. However, Niswander and Gordon (1972) showed a high correlation between this condition and low

birth weight infants.

(b) Premature rupture of membranes

This condition was associated with 3-5 times the perinatal mortality rate in the three ethnic groups. This has been shown by Niswander and Gordon (1972). When analysed by cause of death, the majority died of prematurity and fetoplacental inadequacy (63 per cent). This would support the concept that the larger the degree of immaturity in this group, the greater the perinatal risk and the high association of this condition with infants less than 2,501 grams (Niswander and Gordon, 1972).

11. Labour and delivery

It must be stressed that in the Coloured and Bantu approximately 50 per cent of the total perinatal mortality has occurred as Stillbirths Before Labour.

Onset of labour: One third of Whites and only 11-13 per cent of the Coloureds and Bantu were induced. In the Collaborative Study 5 per cent of Whites and 10 per cent of Negroes were induced (Niswander and Gordon, 1972). This very high White induction rate in this study is difficult to explain and the author suspects this includes some Whites, in whom labour was augmented.

Baillie (1974) however, in a personal communication does not find the high White induction rate surprising and does not feel the augmented labour group is included. A very much more active management of pregnancy, time of delivery, and labour is followed at Mowbray Maternity Hospital. Could this in part be responsible for the very much lowered stillbirth

rate found in Whites or is this due to social class variation? The answer probably lies between these two possibilities. A prospective re-evaluation of induction of labour in the ethnic groups is required to answer these questions. Anderson et al (1968) in Aberdeen has shown that the induction rate in primigravida has increased from 26,8 per cent (1958-1962) to 36,3 per cent (1964-1966). Clearly a more active management policy is followed in Aberdeen, as at Mowbray Maternity Hospital.

The perinatal mortality in the induction group is very low. It would appear that the correct group of patients were being induced and that prematurity as a complication of induction of labour was not prevalent. It may well be that the role of induction of labour in the Coloured and Bantu should be much greater and that a planned induction for all patients at term or even after 37 weeks where there is uncertainty about the fetal status should be started as suggested by Macnaughton (1974).

Duration of labour: The majority of this series delivered within 12 hours, as has been found by others (Niswander and Gordon, 1972). What is interesting is the significantly higher number of Bantu with longer labours. The Caesarian Section rate in this group for cephalopelvic disproportion is correspondingly higher. Is this the effect of good nutrition during pregnancy in a previously malnourished group? It would appear that this is possible. It is also true that the incidence of android and anthropoid pelvis are much higher in the Bantu (Heyns, 1946). With the increase in Caesarian Section rates the number of prolonged labours have decreased, as found by Anderson et al (1968). The increased perinatal mortality

rate found by Anderson in labours over 24 hours, was not found in this study because very few labours are allowed over 24 hours without intervention in the Peninsula Maternity Services (See Appendix Table 11.23.)

Methods of delivery: The lowered perinatal mortality associated with forceps delivery shown by Niswander and Gordon (1972) has not been shown in the study. The overall P.N. mortality associated with forceps was double that associated with spontaneous vertex delivery. This may be due to different indications for forceps application. High forceps has no place in modern obstetrics (Browne, 1973) and perinatal mortality increases progressively with the increasing difficulty of forceps delivery (Niswander and Gordon, 1972). From these observations it would seem possible that the indications or application of forceps were different to those in the Collaborative Study.

Breech delivery carries a very much greater perinatal risk that vertex deliveries. This has been shown clearly in this study and others (Mair, 1953; Law, 1967; Browne, 1973). Of these breeches that die, very many are small infants. However, of infants over 2500 g more die associated with vaginal delivery than Caesarian Section, and although the numbers in this study are small, it is still significant. Thus it would appear that a very good reason is needed in modern obstetrics to allow vaginal delivery in mature breeches. This is also suggested by Butler and Bonham (1963). Small breeches die as often if delivered by Caesarian Section or vaginal delivery. Thus they are not dying from the trauma of breech delivery but rather because of prematurity and its complications. This

would support the decision in the classification used, to only include TERM infants under the cause of death - mechanical group. It is felt that this is a weakness in Baird's classification of mechanical deaths (Baird, 1954) where 1800 g is arbitrarily selected as the dividing line between immaturity and trauma as a cause of death in breech deliveries.

The use of the vacuum extractor in this study was not associated with an increased perinatal mortality. This is similar to others (de Villiers and Bornman, 1965; Chalmers, 1971). The vacuum extractor is used sparingly in our unit.

12. Overall distribution of clinico-pathological Cause

Congenital malformations: Congenital malformations sufficient to cause perinatal death of the fetus accounted for less perinatal mortality than other recorded series (McIntosh et al, 1954; Anderson et al, 1958; Claireaux, 1962; Thomson et al, 1963; Butler and Bonham, 1963; Fairweather et al, 1966; Macnaughton, 1974) but not lower than found by Thomson et al (1963) in Hong Kong during 1958-9. Without autopsies being performed on all perinatal deaths, a number of congenitally abnormal babies will be undiagnosed (Bound et al, 1956; Rosa, 1970; Naeye, 1972).

No doubt when the major problems of prematurity, feto-placental inadequacy and accidental haermorrhage are reduced then the importance of congenital abnormalities will be relatively greater. What is interesting is that the Cape Coloured appears to have a significantly lower incidence of congenital abnormalities than Whites and Bantu. Horner and Lanzkowsky (1966) found similar results in Cape Town in a

previous study.

Barron (1974) found a much lower incidence of congenital abnormalities in Makassar, Indonesia than is found in Britain. Ethnic variation is described by others between the Whites and Negroes in the U.S.A. (McIntosh et al, 1954; Altemus and Ferguson, 1965; Frazier, 1960).

There was no significant effect of maternal age on the incidence of congenital malformations as found by Carter (1950), McIntosh et al (1954) and Anderson et al (1958).

Ingalls et al (1954) found an increased incidence of hydrocephalus with maternal age, and anencephaly and spina bifida with increasing parity. In this study the majority of congenital abnormalities were central nervous system abnormalities. However, numbers were too few for detailed analysis.

13. Mechanical problems

It is important when discussing this group to exclude all antepartum deaths (Gruenwald, 1955) as has been done in this study. Mechanical problems are assuming less importance in obstetrics and whereas at the turn of the century mechanical obstetric difficulties were common, and even in the fifties birth trauma represented 8-11 per cent of deaths in some series (Bound et al, 1956; Claireaux, 1962), in the present time they occur infrequently (Anderson et al, 1968). Potter and Davis (1969) found in the Chicago-Lying-In Hospital that deaths due to birth trauma fell from 5,3/1000 in 1918-25 to 0,2/1000 in 1956-61. In this study the rate is still 4,0/1000. Variations in incidence are difficult to compare as different

definitions are used in different classifications. In the British Perinatal Mortality Survey trauma accounted for 3,0/ 1000 perinatal deaths (Claireaux, 1962; Butler and Bonham, 1963). Often today mechanical deaths are errors in obstetrical judgement and although this group is preventable, these types of errors will always be with us, but hopefully in smaller numbers as in Chicago Lying-In Hospital (Potter and Davis, 1969).

The inclusion of placenta praevia under mechanical problems has not been described before. The author felt that placenta praevia represents a purely mechanical problem and the consequences and management for this condition are totally different to the other causes of A.P.H.

As found by Baird and Thomson (1969), cord prolapse and compressions accounted for the majority of mechanical problems in this study. In an unpublished series from Tygerberg Hospital, it was found that many cases of prolapse of the cord died after medical intervention with positioning the mother in the Trendelenberg position. It is felt that the modified Sims or left lateral position is the most satisfactory position for transport of the patient to theatre (Van Niekerk, 1974).

14. Cause of death uncertain - Term Group

This group corresponds approximately with "Death of uncertain origin - mature" group of Baird and Thomson (1969). Many of this heterogeneous group died of placental insufficiency, intrapartum anoxia, and neonatal problems in this study. The association in this group with high parity, low maternal weight and failure to book for antenatal care corresponds very closely

to Baird's findings of high parity and low social class. Macnaughton (1974) in a study in Glasgow still in progress, has found an increase in age and parity in this group but social class was not as importnat. Increasing socialisation in Britain may well have resulted in a narrowing of the social class differences, thus making this a less important factor in Macnaughton's study.

Associations with this group and fetoplacental inadequacy group will be discussed in Section 3.3.

15. Cause of death - Preterm Group

This group does not correspond exactly with Baird's classification (1945) but in the author's opinion, is a purer group of premature infants i.e. infants born too soon (PRETERM) as understood in the context of modern obstetrics (Gruenwald, 1964; Gruenwald, 1970). However, this group has not been restricted to neonatal deaths and stillbirths associated with intraventricular haemorrhage only as recommended by Gruenwald, (1955). The high proportion of early neonatal deaths in this study with the high association with hyaline membrane disease would tend to confirm that many fulfilled Gruenwald's (1955) criteria. The association of prematurity with adolescence and frequent pregnancies found by Bishop (1964), was not confirmed in this study. The association with short patients (proved statistically in the Coloureds only) and non-booked patients is similar to the findings of Baird (1962) who found increasing perinatal mortality rates with decreasing maternal height and low social class, as has been found by others (Jacobziner et al, 1961; Thomson et al, 1963; Baird and Thomson, 1969).

In England and Wales between 1963-1965, Brimblecombe et al (1968) found a linear relationship between mortality and birth weight under 2501 grams and, that although only 7 per cent of babies born during this period weighed less than 2501 grams, they accounted for 65 per cent of the perinatal mortality. Clearly this group includes both the prematures and fetoplacental failure babies.

Prematurity accounted for one third of all perinatal deaths in all three ethnic groups, and consequently stands out as THE MAJOR cause of perinatal mortality in the Peninsula Maternity Services. This finding is confirmed by others (Claireaux, 1962; Thomson et al, 1963; Hutton, 1964; Malan et al, 1967; Steer and Moore, 1969; Barron, 1974). Is this on a nutritional or social class basis? Thomson (1963) suggests that socio-economic status plays a very major role in the aetiology of premature babies. Bishop (1964) found teenage pregnancies and high parity -two factors known to be associated with low socio-economic status, to be causal factors in premature infants. On the of the major factors responsible for the low perinatal mortality rates in Sweden is the improvement in socio-economic status overall and the fall in the prematurity rate to 4 per cent (Rennard, 1969). The Swedes have also done much to lower the cause of death unknown- Term group (Gruenwald, 1970). More prospective studies into these problems must be done to answer these questions. Furthermore, research is needed to look for high risk predictors in this group to try and define which of the short, low social class group are indeed going to be liable to develop this complication of pregnancy.

Tomkins et al (1955) suggest that women 20 per cent underweight are more liable to have infants weighing less than 5,5 lbs. This is using the older definition of prematurity and clearly would include both S.G.A. infants and true premature infants. Nevertheless more attention should be taken of undernourished mothers particularly if their weight gain is decreased in the first 20 weeks of pregnancy (Tomkins et al, 1955; Eastman and Jackson, 1968).

There was an increased association of prematurity with a past obstetric history of poor reproduction. This was confirmed by Macnaughton (1961) with past history of abortions and Fedick and Butler (1970) with poor obstetric past history in a group of hyaline membrane disease deaths.

A scoring system used in Canada is weighted heavily in favour of the effect of gestational age, because of the undoubted risk of immaturity and pre-term delivery (Goodwin et al, 1969). Using this method of scoring, Goodwin et al were able to predict the high risk group liable to have complications due to prematurity. The majority of low risk scores who lost their infants, were due to major congenital abnormalities.

Reduction in the numbers of pre-term births with their inherent dangers of functional immaturity, would be the most important single step in reducing perinatal mortality (Gruenwald, 1969). Failing the prevention of prematurity, a more active management is to be recommended. This includes prolonging of the pregnancy by stopping incipient labour using salbutamol (Baillie, 1972) until sufficient betamethazone can be given to the fetus to stimulate surfactant activity and reduce the

incidence of respiratory distress syndrome (Liggins and Howie, 1972).

Wortis and Freedman (1962) concluded that "the person most likely to have a premature infant is a young Negress, in her first pregnancy, who has received no antenatal care, come from an underprivileged home, works hard and eats badly". This statement was true for the Coloureds and Bantu in the present study.

16. Fetoplacental inadequacy

The criticism of most other classifications of causes of perinatal death is that very often this group of patients become mixed up in various other groups, for example "toxaemia" or "antepartum haemorrhage". The author felt it of paramount importance to single out this group irrespective of the cause to find out if there was an epidemiological type of patient falling into this group.

Gruenwald (1969) states that any baby with a birth weight 2 standard deviations below the mean for its week of gestation, is definitely growth retarded. For reasons already discussed the author used the lowest 10 per cent of babies in each gestation age group as a criteria for this group of fetoplacental inadequate infants (Lubchenco et al, 1972).

The high incidence of stillbirth before labour in this group was expected (Gruenwald, 1964), as was the high association with a past obstetric history of previous reproductive failure. The association with primiparity found by Ounsted (1974) was not shown in this study. However, what was surprising was that 74 per cent of patients in this group were booked patients and

in the majority of cases, the diagnosis of fetoplacental inadequacy had not been diagnosed by means of routine antenatal care. The difficulty of diagnosing this condition, using clinical methods alone, is well understood.

Nevertheless, a condition accounting for some 13 per cent and probably more if the cause of death uncertain - Term group is added (this would mean approximately 20 per cent of perinatal deaths), of whom the majority are booked patients, should have some means of detection at antenatal clinics. Is our present system of antenatal care adequate if this group is largely undiagnosed? Gruenwald (1963) suggested four groups of factors that can lead to intrauterine growth retardation. These are - environmental factors, maternal (pre-placental) factors, placental factors and maldevelopment of the fetus. Variations in these factors may account for different associations, reported by different authors, eg. Wigglesworth (1964) who suggests that the vast majority of fetoplacental insufficiency seen in Britain is vascular (pre-placental) in origin. Should our attention not be focused towards socio-economic status, maternal nutrition and causes predisposing to "placental insufficiency" such as hypertension, chronic nephritis, etc in an attempt to detect the types of fetoplacental inadequacy as suggested by Winick et al (1973)? Should more attention be paid to weight gain during pregnancy, particularly after 34 weeks of gestation, as suggested by others? (Mac Gillivary, 1961; Eastman and Jackson, 1968; Elder et al, 1970; Macnaughton, 1974).

The high association in this group with hypertension would suggest that a number of these patients were indeed

suffering from placental vascular insufficiency (Ounsted, 1973; Winick et al, 1973). Thirty eight per cent of S.G.A. babies were associated with hypertension in pregnancy in this study. This is confirmed by others (Rumbolz et al, 1961; McDonald, 1965), but is higher than Scott and Usher's study (1966) where only 14,5 per cent of S.G.A. babies had hypertension. However, the association in the Coloureds in the low weight ranges may indeed be associated with general malnutrition as suggested by others (Naeye et al, 1971; Winick et al, 1973). Ounsted and Ounsted (1973) found more underweight mothers in their S.G.A. group than in controls. The critical appraisal of weight gain in pregnancy during the first 20 weeks of pregnancy, particularly in the undernourished weight group (Eastman and Jackson, 1968) may form an important aspect in detecting malnourished mothers. Mothers who weigh less than 45 kg (100 lbs) who have failed to gain $\pm$ 12 lbs by 20 weeks pregnancy, should be admitted to the antenatal wards for high protein diet and careful intrauterine growth monitoring.

This group, where fetoplacental inadequacy may be suspected, should not be allowed passed 40 weeks gestation and the role of induction of labour has increased over the past decade. In primigravida, Anderson et al (1968) found in Aberdeen, that by increasing the induction rate the perinatal mortality rate from "placental insufficiency" has decreased. Macnaughton (1974) stressed the increased place for induction of labour, particularly among the low socio-economic group.

It would be interesting to know whether any of these S.G.A. fetuses, who did not have post-mortem examination, had

congenital abnormalities which were responsible for poor intra-uterine growth, as has been shown by Van den Berg and Yerushalmy (1966). McIntosh et al (1954) found significantly more congenital abnormalities in low birth weight infants (<2500 gr).

17. Accidental haemorrhage

Accidental haemorrhage represents the second largest single cause of perinatal mortality in this study. It was associated with a very high perinatal mortality rate and accounted for 64 per cent of all A.P.H. deaths. This finding is confirmed by others (Paintin, 1962; Niswander, 1966; Macnaughton 1974).

One third of accidental haemorrhage deaths were associated with pre-eclampsia or hypertension of late pregnancy unclassified. This is much lower than was found in the British Perinatal Mortality Survey (Butler and Bonham, 1963). As has been discussed earlier, this may be due to the method of recording of blood pressure on a single reading as was used in the British P.N.M. survey.

There was no correlation with ethnic group and maternal height, similar to Paintin's (1962) findings of no correlation with maternal height and social class. However, there was a significant association with high parity which would suggest poor family planning and lower social class in this study. This finding was confirmed by Macnaughton (1974) in Glasgow. Perhaps it is better to suggest that good family planning and spacing, and smaller size of families, would reduce the number of deaths due to this cause. When parity improves, social class rises and birth control is adequate,

antepartum haemorrhage rate decreases (Macnaughton, 1974).

Unfortunately the past obstetric history, prenatal care and presence of warning bleed was not significantly associated with accidental haemorrhage to be used as predictors. This condition is difficult to prevent at present.

18. Maternal disease

As a group, it would appear obvious, that a mother with any form of maternal disease should be associated with higher than optimum prenatal mortality. However, in the Bantu the overall perinatal mortality was higher than for the group with maternal disease. This emphasizes that patients receiving antenatal care and hospitalisation when necessary, do have significantly lower perinatal mortality. This is particularly true for the Bantu, who had the largest group not covered by the Peninsula Maternity Services.

Syphilis: More Negroes than Whites have syphilis (Niswander et al, 1972). This was confirmed in this study where only the Coloureds and Bantu had perinatal deaths associated with syphilis. The association with teenage primigravida who were usually single would suggest promiscuity. This condition only caused death in the Coloured and Bantu groups but nevertheless was responsible for nearly 5 per cent of deaths. Venereal disease is on the increase locally (Sungren, 1973) and worldwide (Guthe and Willcox, 1971; Willcox, 1972). Thus it would seem that it is no longer sufficient to perform a single blood test for syphilis early on during pregnancy and not repeat this same test during the end of the second or beginning of the third trimester. This

is discussed under Conclusions.

19. Hypertension analysed by cause of death

The author accepts the criticism that pre-eclampsia and hypertension of late pregnancy can cause death of the fetus and therefore should be included as a separate cause of death as was done in the classification of Baird (1954; 1963). However, he was more concerned with what caused the hypertensive infants to die. Essential hypertension was classified separately under maternal disease and it is interesting to note that only one case had an associated accidental haemorrhage.

Pre-eclampsia and hypertension of late pregnancy will be referred to as "Toxaemia" for the purpose of this discussion. If the cause of death uncertain - TERM group (many of whom lost their infants through fetoplacental inadequacy, but where the infants were not small for gestational age), are added to the fetoplacental inadequacy group, it can be seen that "Toxaemic" mothers lose their infants from the following causes:

(a)	Fetoplacental inadequacy	28%)	
(b)	Accidental haemorrhage	26%)	77%
(c)	Prematurity (Pre-term delivery)	23%)	
(d)	Associated maternal disease	9%	
(e)	Mechanical problems	9%	
(f)	Congenital abnormalities	4%	

Thus it is seen that 77 per cent of "Toxaemic" deaths are due to the three main causes of death.

(i) Fetoplacental failure
(ii) Accidental haemorrhage
(iii) Prematurity

Clearly the prevention of these deaths is different for each of

the above three causes. It was because of this finding that the author chose to use a classification not using "toxaemia" as a cause of death. This approach has not been used in other studies (Butler and Bonham, 1963; Thomson and Baird, 1969; Niswander and Gordon, 1972) and hence many erroneous conclusions have in the past been drawn. For example, if one had a P.N.M. rate associated with "toxaemia" of 40 per 1000 (of whom 60 per cent were dying of fetoplacental failure and 20 per cent of prematurity) and advocated early induction of labour at say 37 weeks gestational age in all "toxaemics" to reduce this, a possible result would be the P.N.M. rate falling to 20 per 1000 (of whom 20 per cent were now dying of fetoplacental inadequacy and 60 per cent dying of prematurity). The conclusion would be that induction of labour reduces P.N.M. rate, therefore must induce toxaemic patients. However, the correct conclusion should be that many infants are dying of prematurity as a result of induction of labour and some are being incorrectly induced.

What becomes clear is that in the management of patients with "toxaemia" it becomes imperative to know the state of the fetus in utero, if the correct treatment for individual fetal wellbeing is to be implemented.

If the placenta is failing and the fetus in utero is showing biochemical and ultrasonic evidence of intrauterine growth retardation then delivery is necessary. However, if there is no evidence of intrauterine growth retardation, then the pregnancy can be continued provided the maternal life is not in danger, until such time as the fetus is mature enough

not to die from prematurity. The role of antenatal monitoring, antenatal stress tests and intensive antenatal care in a high risk maternity unit has its most important value in this type of condition. The prevention of accidental haemorrhage is not nearly so straight forward. It is at present very difficult to predict which mothers will develop accidental haemorrhage and at what stage during pregnancy the haemorrhage will occur.

Induction of labour in hypertension was associated with a quarter of the mortality of cases when compared to hypertensives where induction was not practiced. This shows the value of induction in hypertensive disease. It is necessary to know as accurately as possible the intrauterine status and placental reserve and, when in labour, the use of intrapartum monitoring is a very useful adjunct to management. It would appear that the optimum time for delivery must be assessed in each case and then induction of labour performed. This optimum time depends on NOT delivering a pre-term infant unless fetoplacental failure has occurred or the maternal condition becomes the dominant risk.

20. Antepartum haemorrhage analysed by cause of death

The author accepts the criticism that he could have used antepartum haemorrhage as a cause of death. However, he felt that in placenta praevia and accidental haemorrhage, the mechanism of cause of death varied, the socio-economic associations are known to be different (Hibbard and Hibbard, 1963; Hibbard, 1964) and the clinical management differs markedly. Therefore it was felt justified to separate accidental haemorr-

hage (and the clinically similar A.P.H. unknown group) and placenta praevia.

One quarter of all deaths were associated with A.P.H. Of these the majority were due to accidental haemorrhage as has been found by others (Paintin, 1962; Butler and Bonham, 1963; Niswander, 1966).

The association with hypertension and A.P.H. was only found in the accidental haemorrhage group, where one third of patients had "toxaemia".

The association of A.P.H. with S.G.A. infants (Niswander and Gordon, 1972) was not found in the perinatal deaths in this study. This is probably because placental abruption causes an acute anoxic episode to the fetus and this episode is not necessarily associated with S.G.A. infants.

21. Premature rupture of membranes analysed by cause of death

Half of all the cases of P.R.O.M. occurred in the prematurity group. These infants are being born too soon. The association with prematurity increased in the Coloureds and Bantu and therefore was probably associated with social class, as has been found by others (Wortis and Freedman, 1962; Baird, 1962; Thomson, 1963; Steer and Moore, 1969).

The degree of immaturity was associated with the degree of perinatal risks i.e. the more immature, the greater the perinatal mortality rate. This is confirmed by Niswander and Gordon (1972).

One possible associated cause in some cases in the Bantu has been discussed, namely "criminal abortion" in the

late second and early third trimester.

22. Booking status analysed by cause of death

One third of the perinatal deaths were associated with unbooked emergency admissions. The high perinatal mortality rate associated with unbooked patients found by Butler and Bonham (1963) has been confirmed in this study. This was particularly true for the Coloured and Bantu patients. (Many of the Bantu patients were booked to attend the Municipal Clinics or were booked with private midwives).

One third of the unbooked patients died of prematurity, 25 per cent of accidental haemorrhage and, if cause of death unknown - Term group was added to fetoplacental inadequacy, then 15 per cent died of "placental insufficiency". Thus again the three big causes of death are prevalent and account for 69 per cent of the unbooked cases. The maternal disease group was almost entirely due to syphilis, which had not been treated.

Mechanical problems, although relatively uncommon as a cause of death, are very much more prevalent in this group. This is due to patients being referred into hospital by private midwives in the late phases of labour or with prolonged delay in the second stage, when they should have been transferred at a much earlier stage.

CHAPTER 5

Summary and Conclusions:

Overall Conclusions

What Sort of Mothers Lose Their Infants?

What Sort of Fetuses and Neonates Die?

How Can These Be Prevented?

Suggested Projects

CHAPTER 5

SUMMARY AND CONCLUSIONS

1. Perinatal mortality has fallen progressively over the last 20 years in the Peninsula Maternity Services, but with the use of available medical knowledge, could still be significantly lowered.

2. The computer recording system providing the data for this thesis is of value in eliciting the determinants of perinatal mortality. However, a measure of socio-economic status based on husband's occupation or father's occupation if single, must be incorporated into future programmes.

3. The ethnic variation in perinatal mortality rates is largely due to variations in socio-economic status of the three groups although there may be a much smaller genetic component. This needs further investigation.

4. The stillbirth rate is double the neonatal death rate and 80 per cent of the former die before labour. Thus 54,7 per cent of the total perinatal mortality in the Peninsula Maternity Services occurs before labour.

5. The effect of age on perinatal mortality is increased in teenagers and rises steadily with increasing age after 24 years of age. In primiparous women the perinatal mortality increased with age.

6. The increased number of highly parous women in the Coloured and Bantu is due to the lower socio-economic class, and inadequate family spacing and planning. Perinatal mortality

tended to increase with parity.

7. There were significantly more thin (<45 kg) Coloureds, probably due to maternal undernutrition. This was reflected in the significantly higher perinatal mortality for Coloureds under 45 kg. There was a tendency for this group to lose their babies through fetoplacental failure.

8. There were significantly more short Coloureds, probably due to failure of development of their full growth potential. This was reflected in the significantly increased perinatal mortality rates for the short Coloureds. Many of these infants died of prematurity.

9. The short (< 149 cm), thin (< 45 kg) Coloureds had the highest perinatal mortality when maternal height by weight was studied.

10. A previous history of reproductive failure was associated with treble the overall perinatal mortality rate.

11. The ethnic variation in unbooked cases is due to variation in socio-economic class. Ten per cent of Bantu are unbooked or only have one antenatal visit. This is reflected by the 7-fold increase in perinatal mortality for the unbooked Bantu. The Whites and Coloureds also have greatly increased perinatal mortality rates for unbooked patients.

12. Unbooked patients accounted for one third of all perinatal deaths. Pre-term delivery or accidental haemorrhage was the clinico-pathological cause in 54 per cent of these deaths.

13. Albuminuria associated with hypertension in pregnancy was associated with 2-3 times the overall perinatal mortality rates, as was essential hypertension for the Coloureds and Bantu.

14. Hypertension without albuminuria or intrapartum hypertension during labour was not associated with an increase above the overall perinatal mortality rate.

15. Persistent diastolic blood pressures above 110 mmHg were associated with 4 times the overall perinatal mortality rates.

16. Approximately one quarter of perinatal deaths from hypertensive mothers are due to fetoplacental inadequacy; one quarter due to accidental haemorrhage and 18 per cent due to pre-term delivery.

17. Premature rupture of membranes is associated with 2-3 times the overall perinatal mortality rate. The majority of these deaths were due to either pre-term delivery or fetoplacental failure.

18. There is a major discrepancy between the number of Whites in whom labour was induced and the number of Coloureds and Bantu. This should be investigated further and the place of induction of labour in the two other groups re-evaluated.

19. The methods of delivery of breech presentation must be critically re-evaluated. Caesarian Section is a significantly safer method of delivery for breech presentation when the infant is more than 2500 grams.

20. The MAJOR causes of perinatal mortality were pre-term delivery, accidental haemorrhage and fetoplacental inadequacy, in that order. These three causes account for 57,6 per cent of perinatal deaths.

21. Congenital malformations may have a lowered incidence in the Coloureds. Until routine post-mortems are done on all perinatal deaths, the true incidence and significance of congenital abnormalities will not be appreciated.

22. Mechanical causes account for 10 per cent of perinatal deaths. The majority of these are due to prolapse of the cord.

23. Pre-term delivery accounted for one third of all perinatal death. With the advent of newer techniques for controlling labour and accelerating pulmonary maturity, the deaths from this cause should fall. However, much prospective study could still be done on this group.

24. Fetoplacental inadequacy is a largely preventable cause of death. The majority (74 per cent) were booked patients and died before labour. Much greater awareness of fetal wellbeing should be made at antenatal clinics. The role of induction of labour and monitoring of labour have an important place in this group. No doubtful case of fetal condition should be allowed past 40 weeks gestation and possibly not past 38 weeks gestation.

25. Accidental haemorrhage is largely unpreventable at the present time and accounts for 16,4 per cent of all perinatal deaths. When the socio-economic status of this group of

patients improves, hopefully the incidence and significance as a cause of death will diminish.

26. Pre-term delivery was the cause of death in 50 per cent of patients whose membranes ruptured prematurely. This condition is associated with lower socio-economic class more frequently.

27. Syphilis accounted for 5 per cent of perinatal deaths, occurring only in Coloureds and Bantu.

What sort of mothers lose their infants in the Peninsula Maternity Services?

Unbooked mothers
Mothers of poor socio-economic status
Teenagers and elderly mothers
Highly parous
Thin Coloureds
Short Coloureds
Mothers with a previous history of reproductive failure
Hypertensive mothers with albuminuria
Mothers with diastolic blood pressures of >110 mmHg
Mothers with premature rupture of membranes
Mothers with antepartum haemorrhage

What sort of fetuses and neonates die?

Ones born pre-term (prematurely)
Ones whose mothers have an accidental haemorrhage
Ones whose placentae fail to nourish them
Ones whose mothers have serious diseases
Ones who have mechanical problems
Ones who are congenitally abnormal
Ones whose mothers have syphilis

How can these be prevented?

By focusing attention on antenatal care

By devising a high risk predictor score system to be used antenatally and in labour (Goodwin et al, 1969; Aubrey and Pennington, 1973)

By booking more Bantu - or selecting out the high risk Bantu from the Municipal Clinics. One third of all deaths occur in unbooked patients and the majority of these are in the Bantu

By ensuring that the exact period of gestation is known for each patient and once this is sure the growth of the fetus and liquor volume must be assessed critically antenatally

By using beta adrenergic drugs to stop labour or postpone labour until adequate corticosteroids can be administered to promote adequate pulmonary surfactant and thus prevent hyaline membrane disease, in cases of premature rupture of membranes and premature labour in pre-term infants

By paying more attention to maternal booking weight, weight gain in the first 20 weeks of pregnancy, weight gain pattern in third trimester.

By not allowing any patient to go past 40 weeks unless being sure of the state of the fetus

By inducing patients where doubt about the state of the fetus exists once over 37 completed weeks

By selecting out the high risk group and applying intensive care labour ward facilities to this group

By performing post-mortems on all perinatal deaths to give added information as to the cause of death

By ensuring better family spacing, family planning and preventing grandmultiparity in the low socio-economic group. This would fulfil Baird's fifth freedom - "freedom from the tyranny of excessive fertility" (Baird, 1965)

Suggested projects

A prospective study of the short/thin Coloured community to obtain more information as to why this is a high risk group

A re-evaluation of induction of labour, its risks, complications and outcome at the Peninsula Maternity Services. Together with this evaluating the outcome of inducing all high risk patients at or before 40 weeks of gestational age.

A more detailed analysis of the perinatal mortality and perinatal morbidity associated with breech delivery for various weights and gestational ages

A pathological analysis by post-mortem of a number of consecutive perinatal deaths and the correlation of this with the clinico-pathological approach used in this study

A prospective study to devise and evaluate a score system of epidemiological criteria to predict the high risk group. The author feels it should be possible to devise a score system similar to others (Goodwin et al, 1969; Aubrey and Pennington, 1973) that would put 30 per cent of patients in a high risk group that gave rise to 70 per cent of the perinatal deaths

A prospective study in the Coloured and Bantu, who have negative tests for syphilis in the first 20 weeks of pregnancy, re-testing them for syphilis in the third trimester to elicit whether or not there is a significant pick-up of syphilis during pregnancy. This study must be applied particularly to unmarried teenagers.

GLOSSARY

6. GLOSSARY

Abortion

An abortion implies the expulsion of the products of conception of less than 500 grams or under 20 weeks gestation. Should the abortion show any signs of life after separation from the mother, then registration as a live birth is required.

Antepartum haemorrhage

Antepartum haemorrhage unknown: Any episode of vaginal bleeding, other than a "show" occurring after the 28th week of pregnancy, which is not due to placenta praevia or accidental haemorrhage.

Accidental haemorrhage (Abruptio placenta): Revealed or concealed vaginal bleeding associated with continuous pain, a tense tender uterus together with a retroplacental clot or if at Caesarian Section, a Couvelaire uterus had to be present for this diagnosis to be made. Clinical evidence of abruption alone without retroplacental clot formation was not sufficient.

Placenta praevia: This could only be diagnosed if the placenta was seen at Caesarian Section or felt on vaginal examination to be in the lower uteric segment. Radiological or ultrasonic diagnosis was not accepted.

Gestation, length of:

This was measured in completed weeks from the date of the last menstrual period.

Pre-term: Delivery: Any delivery occurring before 37 completed weeks.

Fullterm delivery: Any delivery occurring after 37 completed weeks.

Hypertension and Proteinuria

1. Pre-eclampsia only: This is defined as a rise in blood pressure to more than 90 mmHg diastolic recorded on two or more occasions after the 20th week of pregnancy when the blood pressure prior to the 20th week was normal.

2. Essential hypertension: There has been a blood pressure of more than 90 mmHg diastolic occurring before the 20th week of pregnancy or the hypertension has been known to be present before the onset of pregnancy.

3. Pre-eclampsia and Proteinuria: Hypertension as above associated with significant proteinuria which is not due to contamination or infection occurring in the last half of pregnancy.

4. Hypertension of late pregnancy unclassified: All patients who do not fulfil the above criteria in *1, 2, 3* above. For example, those in whom there is a rise in systolic blood pressure above 140 mmHg without a rise in diastolic blood pressure to above 90 mmHg, or those who are found to be hypertensive at booking after 20 weeks.

5. Hypertension and proteinuria of late pregnancy unclassified: Hypertension as in *4* above and significant proteinuria as in *3* above.

6. Intrapartum hypertension with or without proteinuria: This includes only patients who have a diastolic blood pressure above 90 mmHg in labour. They should not have been hypertensive during pregnancy. The presence of proteinuria is as

in *3* above.

Low birth weight

A low birth weight infant is a neonate weighing less than 2500 grams regardless of the gestational age.

Maternal weight

This is the weight of the mother in kilograms taken at the booking visit or on admission to hospital. No correction for length of gestation was made.

Neonatal death

Only early neonatal deaths were studied, defined as liveborn infants who died within the first seven days.

Only early neonatal death rates are quoted, defined as the number of early neonatal deaths per 1000 live births.

Parity

The parity of a mother is the number of her previous viable births (more than 500 grams or more than 20 weeks gestation). Any previous abortions or ectopics are not counted.

A primipara (para 0) was a mother whose baby was her first viable birth.

A multipara is used to describe a mother who has delivered at least one viable baby before this study, i.e. Para 1 is a woman who was having her second viable child, a para 2 is a woman having her third viable child.

Past obstetric history

Previous Caesarian section: This includes all women who have had a Caesarian section or a hysterotomy.

Previous reproductive failure: This group included women who had a previous stillbirth, neonatal death or low birth

weight infant (an infant born alive but weighing less than 2500 grams) or who had recurrent abortion (three or more non-induced abortions occurring after one another).

Previous hypertension: Any episode of hypertension occurring during any previous pregnancy.

Perinatal mortality

This group included the stillbirths and the early neonatal deaths.

Perinatal mortality rate: is the total number of stillbirths and early neonatal deaths per 1000 total births.

Preterm (Prematurity)

This group is defined as those neonates born before 37 completed weeks and is not related to birth weight.

Stillbirths

A stillbirth is death prior to the expulsion or extraction from its mother of a product of conception, of 500 grams weight or more and at least 20 weeks gestation. Stillbirths were divided into stillbirths occurring before labour and stillbirths occurring during labour.

Stillbirth rate is the number of stillbirths per 1000 total births.

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8. APPENDIX A

This appendix contains the forms included in the obstetric folder used for recording notes on obstetric patients:

1.	Peninsula Maternity Services Initial Consultation	G.S.H.446
2.	Record of Antenatal Attendance	
3.	Antenatal Admission Record	G.S.H.454
4.	Blood Pressure (Toxaemia) Chart	G.S.H.378
5.	Record of Labour	
6.	Progress of Labour	
7.	Surgical Induction/Caesarian Section	G.S.H.442
8.	Forceps Delivery/Vacuum Extraction	G.S.H.440

PENINSULA MATERNITY SERVICES

LAMSON PARAGON – SPEEDISET®
8/73 18M GSH 446

INITIAL CONSULTATION

AN. No. | | | | | | | |
M | S | W | D

NAME.....AGE.....RACE.....

ADDRESS.....OCCUPATION.....

REFERRED BY.....ADDRESS.....

REASON FOR REFERRAL.....L.M.P.....E.D.D..... | Sure | Unsure |

PREVIOUS BLOOD TRANSFUSION | YES | NO | REASON.....WHERE.....

PREVIOUS OBSTETRICAL HISTORY (INCL. ABORTION AND ECTOPIC PREGNANCY)

No.	Year	Dur. in Wks.	Pregnancy	LABOUR and PUERPERIUM METHOD of DELIVERY and COMPLICATIONS	INFANT							
					Place of Birth	Birth Weight	Sex	A. S.B. D.	Jaund. YES/NO	Blood Transf. YES/NO	IF STILLBORN or DIED Cause	Age

MENSTRUAL HISTORY: CYCLE...../..... | Regular | Irregular | DETAILS.....

GENERAL MEDICAL HISTORY.....

.....

FAMILY HISTORY.....

PRESENT OBSTETRICAL HISTORY.....

.....

.....

SISTER'S RECOMMENDATION (INCL. HOME CONDITIONS).....

EXAMINATION

GENERAL

HEIGHT..... cm. (.....ft. .....In.)
WEIGHT..... kg. (..... lb.)
C.V.S. .....
R.S. .....
OEDEMA .....

URINE: Alb.....Sugar.....
B.P..... / .....
TEETH .....
BREASTS .....
VARICOSITIES .....

OBSTETRICAL

ESTIMATED MATURITY: by dates...../52
,, ,, by palpation...../52

PRESENTATION..... F.H.....
ENGAGEMENT .....

ANTENATAL RECORD

OTHER FINDINGS.....

.....

DIAGNOSIS.....

BOOKED FOR DELIVERY AT | G.S.H. | M.M.H. | P.M.H. | DISTRICT | NEXT VISIT.....WKS.

FOR HOME CONFINEMENT: REFER TO MUNICIPAL CLINIC/DR.....

DATE.....

.....
SIGNATURE

RECORD OF ANTENATAL ATTENDANCES

GRAVIDA..... PARA..... LOW/HIGH RISK CASE (SPECIFY).....

BOOKING INVESTIGATIONS:

W.R. Result:..... Date:.....

PAP. SMEAR Result:..... Date:.....

BLOOD GROUP:..... Rh:.....

Type:.....

ATYPICAL A.B.—Titer:.....

Date:.....

X.R. CHEST Result:..... Date:.....

M.S.U. Result:..... Date:.....

RECOMMENDATIONS:

Att. No.	Date	Gestation		Presentation	Engagement	F.H. or F.M.	B.R.	Urine	Weight	Oedema	Hb.	Remarks and Treatment	Return in Weeks	Seen by
		By Date	By Palp.											

ANTE-NATAL ADMISSION RECORD

GSH. 454. (PLEASE WRITE NEATLY, SAVE SPACE, AND SIGN) Reliance 51532/10/73/10,000

NAME..... AGE..... GRAV..... PARA.....

Date		Signature

G.S.H. 378 C

LEXLINES - A36572/2/73/150 PADS

BLOOD PRESSURE (TOXAEMIA) CHART

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME ..... AGE .....

FOLDER No. ..... BIRTH ..... RACE ..... SEX .....

ADM. ..... DEPT. ..... WARD .....

MONTH DATE																															
	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10
IF OTHER THAN 6 HOURLY – PRINT TIMES BELOW																															
BLOOD PRESSURE 210																															
200																															
190																															
180																															
170																															
160																															
150																															
140																															
130																															
120																															
110																															
100																															
90																															
80																															
70																															
60																															
PROTEINURIA ++++																															
+++																															
++																															
+																															
Trace																															
Absent																															
S.G.																															
INTAKE ml.																															
OUTPUT ml.																															
MASS KG.																															

G.S.H. 378

EXLINES A36572 2/73/150 PADS

BLOOD PRESSURE (TOXAEMIA) CHART

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME ..... AGE .....

FOLDER No. ..... BIRTH ..... RACE ..... SEX .....

ADM. ..... DEPT. ..... WARD .....

MONTH DATE																															
	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10	5	11	5	10
IF OTHER THAN 6 HOURLY – PRINT TIMES BELOW																															
BLOOD PRESSURE 210																															
200																															
190																															
180																															
170																															
160																															
150																															
140																															
130																															
120																															
110																															
100																															
90																															
80																															
70																															
60																															
PROTEINURIA ++++																															
+++																															
++																															
+																															
Trace																															
Absent																															
S.G.																															
INTAKE ml.																															
OUTPUT ml.																															
MASS KG.																															

RECORD OF LABOUR

MIDWIFE'S EXAMINATION ON ADMISSION

BOOKED | NOT BOOKED | FLYING SQUAD DATE: ..... TIME: a.m./p.m. EXAMINED BY .....

REASON FOR ADMISSION:

(A) IN LABOUR— CONTRACTIONS: NO/YES
TIME COMMENCED ... A.M./P.M. AND DATE ... DURATION ... (HR.)
MEMBRANES RUPTURED: NO/YES
TIME OF RUPTURE ... A.M./P.M. AND DATE ... DURATION ... (HR.)
SHOW: NO/YES

(B) OTHER—SPECIFY: .....

HISTORY: L.M.P. ..... E.D.D. ..... PERIOD OF GESTATION BY DATES ..... WEEKS

OTHER RELEVANT HISTORY: .....

EXAMINATION: TEMP.: ..... PULSE: ..... B.P.: / OEDEMA: NO/YES .....

URINE— ORDINARY SPECIMEN / C.S.U. ; ALBUMEN: ..... SUGAR: ..... KETONES: .....

OBSTETRICAL— MATURITY: ..... WEEKS PRESENTATION: ..... POSITION: ..... ENGAGEMENT: .....

F.H. RATE ..... REG./IRREG.: .....

CONTRACTIONS—STRENGTH: ..... INTERVAL: ..... MIN. DURATION: ..... SEC.

CONSENT SIGNED: YES/NO

SISTER'S ORDERS

OBSERVATIONS: .....

INSTRUCTIONS: SHAVE: YES | NO DONE ENEMA: YES | NO DONE BATH: YES | NO DONE

RECORD OF LABOUR

HOUSE-SURGEON'S EXAMINATION ON ADMISSION

DATE:..... TIME:..... a.m./p.m. EXAMINED BY:.....

RELEVANT HISTORY:

.....

.....

.....

.....

.....

.....

EXAMINATION:

GENERAL CONDITION:.....

C.V.S. ..... B.P.:...../..... Hb.:.....

R.S. .....

ABDOMEN .....

SCAR: NO/YES .....

OBSTETRICAL—MATURITY:..... WEEKS PRESENTATION:..... POSITION..... ENGAGEMENT:.....

CONTRACTIONS: NO/YES DETAIL:.....

.....

.....

F H.: ..... REGULAR/IRREGULAR—SPECIFY:.....

P.V. TO BE DONE ON EVERY PATIENT ON ADMISSION AND RECORDED OPPOSITE

OTHER FINDINGS: .....

.....

.....

.....

DIAGNOSIS:.....

.....

.....

REGISTRAR'S COMMENT AND FURTHER TREATMENT:.....

.....

.....

.....

.....

PROGRESS OF LABOUR

LOW RISK (FLUID DIET) | HIGH RISK (NIL PER MOUTH) | EMERGENCY – FOR C/S

DELETE WHERE NOT APPLICABLE

All entries, whether by Midwife or Doctor to be made consecutively and initialled

All vaginal examinations to be written in red

Date	Time	Mat. Pulse	F.H.	B.P.	Observations, Rectal and Vaginal Examinations and Treatment Given	Signature

PROGRESS OF LABOUR—*Continued*

All entries, whether by Midwife or Doctor to be made consecutively and initialled

All vaginal examinations to be written in red

Date	Time	Mat. Pulse	F.H.	B.P.	Observations, Rectal and Vaginal Examinations and Treatment Given	Signature

SURGICAL INDUCTION OF LABOUR

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME _____ AGE _____

FOLDER NO. _____ BIRTH _____ RACE _____

ADM. _____ DEPT. _____ WARD _____

(INCLUDING UNSUCCESSFUL ATTEMPTS BUT EXCLUDING A.R.M. IN LABOUR)

DATE: _____ AND TIME _____ A.M./P.M. PERFORMED BY: _____

INDICATIONS

1. (PRIMARY INDICATION) _____

2. _____

3. _____

FINDINGS AT INDUCTION

ALL OTHER DETAILS TO BE RECORDED UNDER "HOUSE-SURGEON'S EXAMINATION" IN THE "RECORD OF LABOUR" AT THE TIME OF INDUCTION.

VAGINAL EXAMINATION:

CERVIX DILATION: _____ EFFACEMENT: _____

APPLICATION: _____ POSITION: _____

PRES. PART: PRESENTATION: _____ POSITION: _____

FLEXION: _____ STATION: _____ SPINES

CAPUT: _____ MOULDING: _____

CORD: NOT FELT/FELT: _____

PELVIC ASSESSMENT: _____

INDUCTION

METHOD: HIGH RUPTURE: NO/YES LOW RUPTURE: NO/YES SUCCESSFUL/UNSUCCESSFUL.

LIQUOR: AMOUNT: _____ MLS. (_____ OZ.) AND APPEARANCE: _____

ON COMPLETION: CORD: NOT FELT/FELT: _____ F.H. _____ REG./IRREGULAR

COMMENTS

PROSPECTS FOR LABOUR: _____

INSTRUCTIONS RE FURTHER MANAGEMENT: _____

SIGNATURE

_____

Ace C.T.10/72/50 Pads

G.S.H. 442

CAESAREAN SECTION

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME _____ AGE _____

FOLDER NO. _____ BIRTH _____ RACE _____

ADM. _____ DEPT. _____ WARD _____

INDICATIONS

1. (PRIMARY INDICATION) _____
2. _____
3. _____

CONDITION

FOETUS	MOTHER
F.H.: _____ REG. / IRREGULAR _____	B.P.: _____ PULSE: _____

OPERATION

SURGEON: _____ ASSISTANT: _____

ANAESTHETIST: _____ DATE: _____ TIME: _____ A.M./P.M.

UTERINE SCAR | ABSENT | PRESENT | DESCRIPTION: _____

INCISION	LOWER SEGMENT	CLASSICAL	OTHER	DESCRIPTION: _____

PRESENTATION OF FOETUS IN UTERO: _____ POSITION:: _____ ENGAGEMENT: _____

PLACENTAL INSERTION: UPPER/LOWER SEGMENT: DEGREE _____ ANTERIOR/POSTERIOR _____

RETROPLACENTAL CLOT: NO/YES DETAIL: _____ TOTAL BLOOD LOSS _____ ML. (_____ PINTS)

OVARIES: _____ FALLOPIAN TUBES: _____

KIDNEYS: _____ OTHER ORGANS: _____

FURTHER DESCRIPTION OF OPERATION AND OTHER COMMENTS: _____

POST-OPERATIVE INSTRUCTIONS

_____

SIGNATURE

FORCEPS DELIVERY

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME..... AGE.....

FOLDER NO..... BIRTH..... RACE.....

ADM..... DEPT. ..... WARD.....

DATE:..... AND TIME:..... A.M./P.M. PERFORMED BY:.....

INDICATIONS

1. (PRIMARY INDICATION) .....

2. .....

3. .....

CONDITION BEFORE DELIVERY

FOETUS	MOTHER
.....	.....
FOETAL HEART:..... REG./IRREGULAR.....	B.P. ...../..... PULSE:.....

FINDINGS AT FORCEPS DELIVERY

ALL OTHER DETAILS TO BE RECORDED UNDER "PROGRESS OF LABOUR" AT THE TIME OF FORCEPS DELIVERY

VAGINAL EXAMINATION:

CERVIX DILATION:..... EFFACEMENT:.....
APPLICATION:..... POSITION:.....

PRES. PART PRESENTATION:..... POSITION:.....
FLEXION:..... STATION:..... SPINES
CAPUT:..... MOULDING:.....

CORD: NOT FELT/FELT:.....

PELVIC ASSESSMENT AND OTHER COMMENTS:.....

.....

.....

METHOD

ANAESTHETIC: GENERAL/LOCAL DETAIL:.....

DRUGS USED WITH AMOUNTS:.....

INSTRUMENT:..... APPLICATION: EASY/DIFFICULT/VERY DIFFICULT:.....

TRACTION:..... ROTATION: EARLY/LATE/NOT ROTATED — O.P./O.A. — SPONTANEOUS/MANUAL/INSTRUMENTAL

DURATION OF OPERATION:..... MINS. ABOVE/AT/BELOW SPINES/ON PERINEUM

CONDITION OF INFANT AT BIRTH:..... APGAR AT 3 MINS.....

REMARKS AND POST-OPERATIVE INSTRUCTIONS

.....

.....

.....

.....

SIGNATURE

G.S.H. 440

VACUUM EXTRACTION

COMPLETE BY HAND WHEN LABEL NOT AVAILABLE

NAME..... AGE.....

FOLDER NO..... BIRTH..... RACE.....

ADM..... DEPT..... WARD.....

DATE:..... AND TIME:..... A.M./P.M. PERFORMED BY:.....

INDICATIONS

1. (PRIMARY INDICATION) .....

2. .....

3. .....

CONDITION BEFORE DELIVERY

FOETUS	MOTHER
.....	.....
FOETAL HEART:..... REG./IRREGULAR.....	B.P...../..... PULSE:.....

FINDINGS AT VACUUM EXTRACTION

ALL OTHER DETAILS TO BE RECORDED UNDER "PROGRESS OF LABOUR" AT THE TIME OF VACUUM EXTRACTION.

VAGINAL EXAMINATION:

CERVIX — DILATION:..... EFFACEMENT:.....
APPLICATION:..... POSITION:.....

PRES. PART — PRESENTATION:..... POSITION:.....
FLEXION:..... STATION:..... SPINES
CAPUT:..... MOULDING:.....

CORD: FELT/NOT FELT:.....

PELVIC ASSESSMENT AND OTHER COMMENTS:.....

.....

.....

METHOD

ANAESTHETIC: GENERAL/LOCAL—DETAIL:.....

DRUGS USED WITH AMOUNTS:.....

SIZE OF CUP:..... CMS. APPLICATION: EASY/DIFFICULT/VERY DIFFICULT:.....

TOTAL NO. OF PULLS REQUIRED:..... STRENGTH OF TRACTION:..... DID CUP SLIP: NO/YES..... NO. OF TIMES.....

FINAL POSITION OF VERTEX:..... APPLICATION — DELIVERY INTERVAL:..... MINS.

DELIVERY COMPLETED BY V.E.: YES/NO — IF NOT DESCRIBE PROCEDURE ON APPROPRIATE FORM:.....

CONDITION OF INFANT AT BIRTH:..... APGAR AT 3 MINS.....

REMARKS AND POST-OPERATIVE INSTRUCTIONS

.....

.....

.....

.....

SIGNATURE

Ace C.T.5/70/30 Pads

9. APPENDIX B

This appendix contains the three forms used in the coding of the patients

1.	Computer Coding Form	G.S.H.444
2.	Obstetric Summary Sheet	G.S.H.445
3.	Paediatric Summary Sheet	G.S.H.445a

TO BE GUMMED ONTO OBSTETRIC RECORD

36. Third Stage Complications [ ] 95
37. Duration of Third Stage in Minutes [ ][ ] 96–97
98 = 98 and over 99 = Unknown
38. Puerperal Complications [ ] 98
39. Other Operations [ ] 99
*40. Result Mother 1 = Alive 3 = Dead Delivered [ ] 100
2 = Still in Hospital 4 = Dead Undelivered
*41. Number of Infants [ ] 101
*42. Attendant Delivering [ ] 102
0 = None 4 = House Surgeon
1 = Student Midwife 5 = Registrar
2 = Midwifery Sister 6 = Consultant
3 = Medical Student 7 = Other
8
9 = Other or unknown

Checked by Registrar (Full Signature) Consultant Date:

B 1st INFANT HOSPITAL NUMBER .....

*43. Sex. 1 = Male 2 = Female 9 = Unknown [ ] 103
*44. Weight in Grammes (9999 = Unknown) [ ][ ][ ][ ] 104–107
45. Gestational Age (Completed Weeks) [ ][ ] 108–109
46. Resuscitation [ ] 110
47. Heart Rate at One Minute [ ][ ][ ] 111–113
48. Apgar at 5 minutes [ ] 114
49. Congenital Malformations [ ][ ] 115–116
50. Birth Trauma [ ] 117
51. Neonatal Infection [ ][ ] 118–119
52. Infective Agent [ ] 120
53. Jaundice [ ] 121
54. Respiratory Distress [ ] 122
55. Metabolic Disturbances [ ] 123
56. Haematological Problems [ ] 124
57. Neurological Malfunction [ ] 125
58. Result [ ] 126
59. Cause of Death [ ] 127
60. Necropsy [ ] 128
61. Procedures [ ] 129

C. 2nd INFANT HOSPITAL NUMBER .....

*62. Sex. 1 = Male 2 = Female 9 = Unknown [ ] 130
*63. Weight in Grammes (9999 = Unknown) [ ][ ][ ][ ] 131–134
64. Gestational Age (Completed Weeks) [ ][ ] 135–136
65. Resuscitation [ ] 137
66. Heartrate at One Minute [ ][ ][ ] 138–140
67. Apgar at 5 Minutes [ ] 141
68. Congenital Malformations [ ][ ] 142–143
69. Birth Trauma [ ] 144
70. Neonatal Infection [ ] 145
71. Infective Agent [ ] 146
72. Jaundice [ ] 147
73. Respiratory Distress [ ] 148
74. Metabolic Disturbances [ ] 149
75. Haematological Problems [ ] 150
76. Neurological Malfunction [ ] 151
77. Result [ ] 152
78. Cause of Death [ ] 153
79. Necropsy [ ] 154
80. Procedures [ ] 155

81. Research Projects [ ][ ] 156-157
[ ][ ] 158-159
[ ][ ] 160-161

82. Duration in Hospital [ ][ ] 162-163
83. Placental Weight [ ][ ][ ] 164-166
84. Intra-uterine Growth [ ] 167

Checked by Paediatric Registrar (Full Signature) Consultant Date:

PENINSULA MATERNITY SERVICES — UNIVERSITY OF CAPE TOWN

G.S.H. 444
McMaster, CT/13986/8/72/18,000

COMPUTER CODING FORM AND SUMMARY

A. MOTHER SURNAME..... FORENAMES..... DATE OF DISCHARGE.....

*1. Name [| | | | | | | | | | | | | | | | | | | |] 1–20

*2. Hospital or District [ ] 21
1 = G.S.H. 4 = M.M.H. Dist. 7 = S.H. Dist.
2 = G.S.H. Dist. 5 = P.M.H. 8 = S.M.H. and Dist.
3 = M.M.H. 6 = S.H. 9 = Other or unknown

*3. Hospital Number [| | | | | |] 22–27

*4. Date of Delivery [| | | | | |] 28–33

*5. Age [|] 34–35

*6. Race 1 = White 3 = Asiatic [ ] 36
2 = Coloured 4 = Bantu 9 = Other or unknown

*7. Booking Status 0 = Not booked 2 = Booked District [ ] 37
1 = Booked Hospital 9 = Other or unknown

*8. Number of Antenatal Visits 00 = None (No A.N. care) [|] 38–39
98 = A.N.C. Elsewhere 99 = Unknown

9. Date of L.M.P. (Day/Month) [| | | |] 40–43

10. Indicator for L.M.P. 1 = Date Certain [ ] 44
2 = Date Estimated

*11. Pregnancy Number 9 = Unknown [ ] 45
8 = 8 and over

*12. Parity 9 = Unknown [ ] 46
8 = 8 and over

13. Previous Obstetric History { [ ] 47 / [ ] 48

*14. Height (in cm) [| | |] 49–51

*15. Weight at Booking (kg) [| | |] 52–54

*16. Blood Group 1 = O Pos. 5 = B Pos. [ ] 55
2 = O Neg. 6 = B Neg.
3 = A Pos. 7 = AB Pos.
4 = A Neg. 8 = AB Neg.
9 = Other or unknown

*To be completed by Clerical Staff.

*17. W.R. Result 1 = Neg. 2 = Pos. 9 = Unknown [ ] 56

*18. Pap. Result 1 = Neg. 2 = Atypical 3 = Pos. 9 = Unknown [ ] 57

*19. Lowest Antenatal Haemoglobin (gm) [| |] 58–60

*20. Admission Details [ ] 61
0 = None (Not admitted) 5 = Emer. Adm.—Postnatal
1 = Admitted in Normal Labour 6 = Flying Squad—In Labour
2 = Admitted Antenatally 7 = Flying Squad—Antenatal
3 = Emer. Adm.—In Labour 8 = Flying Squad—Postnatal
4 = Emer. Adm.—Antenatal 9 = B.B.A.

21. Antenatal Diseases and Tumours { [ ] 62–63 / [ ] 64–65

22. Hypertension and Proteinuria [ ] 66

23. Other Antenatal Complications { [ ] 67–68 / [ ] 69–70

24. Maximum Systolic Blood Pressure [| |] 71–73

25. Maximum Diastolic Blood Pressure [| |] 74–76

26. Termination of Pregnancy (under 1000 g Birth Weight) [ ] 77
(If 1 or 2 then rest of Form is blank except 39 and 40)

27. Onset of Labour [ ] 78

28. Principal Indication for Induction or C/S [|] 79–80

29. Duration of Labour in Hours (up to Delivery) [|] 81–82

30a. Presentation at Delivery or C/S [ ] 83

30b. Presentation at Delivery or C/S (2nd Twin) [ ] 84

31a. Method of Delivery [ ] 85

31b. Method of Delivery (2nd Twin) [ ] 86

32. Triplets or higher number [ ] 87

33. Complications of Labour { [ ] 88 / [ ] 89

34. Type of Anaesthesia [ ] 90

35a. Blood Loss (ml : 10) [| |] 91-93

35b. Blood Transfusion (Units) [ ] 94

G.S.H. 445A

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PENINSULA MATERNITY SERVICES — UNIVERSITY OF CAPE TOWN

PAEDIATRIC SUMMARY SHEET

MOTHER'S NAME..... HOSPITAL NUMBER.....

45. GESTATIONAL AGE (COMPLETED WEEKS)—if unknown code as 99 [ ][ ]

46. RESUSCITATION

0 None (spontaneous breathing)
1 Oxygen only
2 Oxygen and stimulants
3 Face mask ventilation
4 Intubation
5
6
7
8
9 Unknown

47. HEART RATE AT ONE MINUTE — if unknown code as 999. [ ][ ][ ]

48. APGAR AT 5 MINUTES (if died code 0; if Apgar 8, 9 or 10 code 8; if unknown code 9) [ ]

49. CONGENITAL MALFORMATIONS

00 None
01 Bones and Joints
02 Cardiac
03 Central Nervous System
04 Chromosomal abnormalities
05 Endocrine system
06 Eyes
07 Gastro-intestinal tract
08 Genito-urinary tract
09 Multiple systems
10 Recognised syndromes
11 Respiratory system
12 Skin and appendages
13 Tumours
14 Vascular
99 Unknown

50. BIRTH TRAUMA

0 None
1 Cephalhaematoma
2 Subaponeurotic haemorrhage
3 Subdural effusion
4 Intracranial haemorrhage
5 Fractures
6 Nerve palsies
7 Soft tissue injury
8
9 Unknown

51. NEONATAL INFECTION

00 None
01 Cardiac
02 Enteritis
03 Eye
04 Hepatic
05 Meningitis
06 Mouth
07 Multiple system
08 Osteitis
09 Peritonitis
10 Respiratory
11 Septicaemia
12 Skin
13 Umbilicus
14 Urinary
15 Other
99 Unknown

52. INFECTIVE AGENT

0 None (no infection)
1 Not cultured
2 Cultured—no growth
3 Gram positive
4 Gram negative
5 Viral
6 Protozoal
7 Fungal
8 Spirochaetal
9 Unknown

53. JAUNDICE

0 None
1 Idiopathic hyperbilirubinaemia
2 Idiopathic hyperbilirubinaemia and exchange
3 Rhesus
4 Rhesus and exchange
5 A.B.O.
6 A.B.O. and exchange
7 Infection
8 Other
9 Unknown

54. RESPIRATORY DISTRESS

0 None
1 H.M.D.
2 Meconium aspiration
3 Pneumonia
4 N.D.A.
5 Pneumothorax
6 Cardiac Failure
7 Other
8
9 Unknown

55. METABOLIC DISTURBANCES

0 None
1 Hypoglycaemia
2 Hypocalcaemia
3 Hypomagnesaemia
4 Hypothermia
5 Endocrine malfunction
6 Inborn error metabolism
7
8
9 Unknown

56. HAEMATOLOGICAL PROBLEMS

0 None
1 Acute blood loss
2 Other anaemias
3 Purpura
4 Polycythaemia
5 Transfusion syndrome
6 Haemorrhagic disease
7 Thrombosis
8
9 Unknown

57. NEUROLOGICAL MALFUNCTION

0 None
1 Convulsions — cause unknown
2 — traumatic
3 — anoxia
4 — metabolic
5 Convulsions — infection
6 — kernicterus
7 Intraventricular haemorrhage
8
9 Unknown

58. RESULTS

1 Alive — normal
2 Alive — classifiable condition
3 Stillbirth — before labour
4 Stillbirth — during labour
5 Neonatal death — 0–48 hours
6 Neonatal death — 2–7 days
7 Neonatal death — 8–28 days
8
9 Unknown category

59. MAIN CAUSE OF DEATH

0 None (not dead)
1 Perinatal anoxia
2 Immaturity
3 Respiratory distress
4 Infection
5 Metabolic causes
6 Birth trauma
7 Congenital malformation
8 Blood disorder
9 Unknown

60. NECROPSY 0 None 1 Yes 9 Unknown

61. PROCEDURES

0 None
1 Phototherapy
2 I.V.F.
3 Phototherapy + I.V.F.
4 Other (e.g. L.P.)
5
6
7
8
9 Unknown

81. RESEARCH PROJECTS (Not more than 3 projects to be coded)

N.B. 00 = None (No research project)

01 = Ultrasonography

02 = Amniocentesis

Code | | |

82. DURATION IN HOSPITAL (Days) | |

83. PLACENTAL WEIGHT (Grams)
— If not weighed code as 999 | | |

84. INTRA-UTERINE GROWTH

1 A.G.A.
2 S.G.A. (below 10th percentile)
3 L.G.A. (Above 90th percentile)
9 Unknown

DATE: SIGNED:

G.S.H. 445

McMaster, CT/15689/8/73/100 Pads

PENINSULA MATERNITY SERVICES — UNIVERSITY OF CAPE TOWN

OBSTETRIC SUMMARY SHEET

PATIENT'S NAME:..... HOSPITAL NO.:.....

9. DATE OF L.M.P. (Day and Month) | | | | |

10. INDICATOR FOR L.M.P.
1 Date certain 2 Date estimated

13. PREVIOUS OBSTETRIC HISTORY (Not more than 2 codes to be ringed)
0 None
1 No abnormality
2 Previous reprod. failure (S.B., N.N.D. or low birth-weight infant)
3 Previous reprod. failure and hypertension
4 Previous hypertension
5 Previous congenital malformations
6 Previous Caesarean Section
7 Previous A.P.H.
8 Recurrent abortions, subfertility
9 Other or unknown

21. ANTENATAL DISEASES AND TUMOURS (Not more than 2 codes to be ringed)
00 None
01 Cardiac disease
02 Clinical diabetes
03 Acute renal disease
04 Chronic renal disease
05 Pulmonary disease (excluding TB)
06 Endocrine disorders
07 Alimentary disease
08 Iron deficiency anaemia
09 Megaloblastic anaemia
10 Other blood tissue
11 Bone disease
12 Epilepsy
13 Other C.N.S. Disorders
14 Collagen diseases
15 Liver disease
16 Protozoal infections
17 Skin diseases
18 Tuberculosis
19 Rubella
20 Other viral infections
21 Benign genital tumours
22 Malignant tumours (any site)
99 Other unclassified conditions or unknown

22. HYPERTENSION AND ALBUMINURIA (Please ring appropriate item)
0 None
1 Pre-eclampsia (hypertension only)
2 Essential hypertension only
3 Pre-eclampsia, or essent. hypertension + albuminuria
4 Hypertension, late pregnancy, unclassified
5 Albuminuria, late pregnancy, unclassified
6 Ht. and Alb., late pregnancy, unclassified
7 Intrapartum and/or postpartum hypertension only
8 Intrapartum and/or postpartum Ht. and Alb.
9 Other or unknown

23. OTHER ANTENATAL COMPLICATIONS (Not more than 2 codes to be ringed)
00 None
01 A.P.H. — type unknown
02 A.P.H. — accidental
03 A.P.H. — placenta praevia
04 Contracted pelvis
05 Eclampsia
06 False labour
07 Hydramnios
08 Hyperemesis
09 Prem. ruptured membranes
10 Rhesus incompatability
11 Surgery in pregnancy
12 Threatened abortion
99 Other or unknown

24. MAXIMUM SYSTOLIC BLOOD PRESSURE— if unknown code as 999 | | | |

25. MAXIMUM DIASTOLIC BLOOD PRESSURE— if unknown code as 999 | | | |

26. TERMINATION OF PREGNANCY (UNDER 1000 G BIRTHWEIGHT)
0 No 1 Ectopic or Spontaneous Abortion. 2 Therapeutic Abortion
(If pregnancy is terminated, remainder of form is blank except for 39 and 40.)

27. ONSET OF LABOUR
0 None (Elective C/S)
1 Spontaneous
2 Artificial rupt. of membranes (A.R.M.)
3 A.R.M. and I.V. Pitocin
4 A.R.M. and buccal Pitocin
5 I.V. Pitocin
6 Buccal Pitocin
7 Buccal and I.V. Pitocin
8 Prostaglandins
9 Other or unknown

28. PRINCIPAL INDICATION FOR INDUCTION OR C/S
00 None (spontaneous onset of labour)
01 A.P.H.
02 Contracted pelvis
03 Abnormal uterine action
04 Diabetes
05 Failed forceps and/or V.E.
06 Fetal or maternal distress
07 Hypertension and/or albuminuria
08 I.U.D. or fetal deformity
09 Malpresentation or unstable lie
10 Plac. insufficiency
11 Previous C/S
12 Prolapsed cord
13 Prolonged pregnancy
14 Rh. incompatability
99 Other or unknown

29. DURATION OF LABOUR (UP TO DELIVERY) — if unknown code as 99 [ ][ ] Hours

30 (a) PRESENTATION AT DELIVERY OR C/S

1 O.A.
2 O.P. or O.L.
3 Face
4 Brow
5 Breech
6 Transverse or Oblique
7
8
9 Other or unknown

30 (b) PRESENTATION — SECOND TWIN CODE (0 if singleton) [ ]

31 (a) METHOD OF DELIVERY

1 Spontaneous cephalic
2 Forceps
3 Breech
4 Lower segment C/S
5 Classical C/S
6 Vacuum extraction
7
8
9 Other or unknown

31 (b) METHOD OF DELIVERY—SECOND TWIN CODE (0 if singleton) [ ]

32. TRIPLETS OR HIGHER NUMBER

0 None
1 Yes

33. COMPLICATIONS OF LABOUR (Not more than 2 codes to be ringed)

0 None
1 Failed forceps or failed V.E.
2 Prolapse or presentation of cord
3 Dysfunctional uterine action
4 Cephalo-pelvic disproportion
5 Obstructed labour (not C.P.D.)
6 Ruptured uterus
7 Fetal distress
8 Maternal distress
9 Other or unknown

34. TYPE OF ANAESTHESIA (PREGNANCY, LABOUR OR PUERPERIUM)

0 None
1 General
2 Local abdominal
3 Spinal
4 Epidural
5 Caudal
6 Pudendal block
7 Perineal infiltration
8 Paracervical block
9 Other or unknown

35A. BLOOD LOSS
ml : 10 [ ][ ][ ]

35B. BLOOD TRANSFUSION — AMOUNT

0 None
1 1 unit
2 2 units
3 3 units
4 4 units
5 5 units
6 6 units
7 7 units
8 8 or more units
9 amount unknown

36. THIRD STAGE COMPLICATIONS

0 None
1 P.P.H. and Atonic Uterus
2 Retained placenta
3 P.P.H. and retained placenta
4 Trauma
5 P.P.H. and Trauma
6 P.P.H. — cause unknown
7 P.P.H. and coagulation defect
8 Inversion of uterus with/without P.P.H.
9 Other or unknown

37. DURATION OF THIRD STAGE IN MINUTES (if over 98 code as 98) — if unknown code as 99 [ ][ ]

38. PUERPERAL COMPLICATIONS

0 None
1 Genital tract infection
2 Urinary tract infection
3 Mastitis
4 Other infection
5 Thrombophlebitis
6 Other throm., incl. pulm. embolus
7 Secondary P.P.H.
8 Psychosis
9 Other or unknown

39. OTHER OPERATIONS

0 None
1 Shirodkar suture
2 Repair of ruptured uterus
3 Hysterectomy or myomectomy
4 Ovar. cystectomy or Salpingo-ooph
5 Appendicectomy
6 Postp. D & C
7 Tubal ligation
8
9 Other or unknown

81. RESEARCH PROJECTS (Not more than 3 projects to be coded)

N.B.: 00 = None (no research project)

01 = Ultrasonography

02 = Amniocentesis

Code [ ][ ] [ ][ ] [ ][ ]

Registrar's Signature:..... Date .....

10. APPENDIX C

This appendix contains the form used in the analysis of still-births and neonatal deaths for 15,251 deliveries during 1972.

DEPARTMENT OF OBSTETRICS : STUDY OF STILLBIRTHS AND NEONATAL DEATHS

1.	Surname:	.....	
2.	Hosp. Number:	------	1-6
3.	Age:	--	7-8
4.	Race: 1=White; 2=Col.; 4=Bantu	-	9
5.	Marital Status: 1=Single; 2=Married; 3=Other	-	10
6.	Maternal Height in cms.:	---	11-13
7.	Maternal Weight in Kgs.:	---	14-16
8.	Parity	-	17
9.	Prenatal Care: 0=Non B/Del. Hosp. 1=B Hosp/Del.Hosp 2=B Home/Del.Hosp. 3=B Home/Del.Home	-	18
10.	W.R.: 0=Neg. 1=Positive	-	19
*11.	Duration of Pregnancy at 1st Visit (Weeks)	--	20-21
12.	Number of A.N. Visits	--	22-23
13.	Lowest A.N. Haemoglobin	---	24-26
14.	Past Obstet. History: 1=2; 2=5; 3=6; 4=3±4; 5=8	-	27
15.	Maternal Disease: 1=01 Cardiac; 2=02 Diabetic; 3=03,04 Renal	-	28
*16.	Hypertension: 1=2 Ess.Hyper; 2=PET ±Alb before 20/52 3=Hyper ± Alb of late pregnancy after 20/52	-	29
17.	A.N. Complications: 1=01 A.P.H.Unknown; 2=02 Acc.Haem. 3=03 Placenta Praevia; 4=09 Prem.Rupt.Memb.	-	30
18.	Gestational Assessment by Dubowitz or True G. Age	--	31-32
*19.	Intra-uterine Growth: 1=Certain; 2=Estimated	-	33
	1=Appropriate G.A.; 2=S.G.A.; 3=L.G.A.	-	34
20.	Onset of Labour: 0=Elective C/S; 1=Spontaneous; 2=Induced	-	35
21.	Duration of Labour in Hours:	--	36-37
*22.	Duration of 2nd Stage in Hours + Decimal: If more than 1 hour code 8	-	38
23.	Method of Delivery: 1=S.V.D.; 2=Forceps; 3=Breech; 6=V.E.; 7=Elective C/S; 8=C/S in Labour	-	39
24.	Failed Forceps/Vacuum: 0=No; 1=Yes	-	40
25.	Baby - Sex: 1=Male; 2=Female	-	41
	- Wt. in grams	----	42-45
	- Result: 1=3 S.B. before labour; 2=4 S.B. during labour; 3=5+6 N.N.D.0-7 days	-	46
26.	Apgar:* - 1 Min.	-	47
	- 5 Mins.	-	48
*27.	Placenta: Weight in grams	---	49-51
	Feto-placental weight ratio	--	52-53

*28.	If pre-term/Feto-plac.Inadequacy: 0=Not applicable; 1= No Episiotomy; 2=Episiotomy	-	54
*29.	Hyaline Membrane Disease: 0=No; 1=Yes	-	55
*30.	If Accidental Haem.: Size of clot cc.	----	56-59
*31.	If A.P.H.: Warning bleed: 0=N/A; 1=No; 2=Yes 1; 3=Yes 2 or more	-	60
*32.	If P.E.T./Hypertension: Rx: 0=N/A; 1=No; 2=Yes	-	61
	Was this effective: 0=N/A; 1=No; 2=Yes	-	62
	Duration of Rx (Days)	-	63
*33.	Clinico-pathological cause of death	--	64-65
34.	Primary Necropsy: 0=Not done; 1=Yes	-	66
35.	Length of the fetus in cms.	--	67-68

*Additional information extracted from clinical folder which was not available from the computer form.

11. APPENDIX D

In this appendix appear all the Tables not displayed in the Results (Chapter 3) followed by all the figures not displayed in the text.

Appendix Table 11.1.

The S.B. Rate, N.N.D. Rate and P.N.M. Rate in the Peninsula Maternity Services 1947 - 1972

Year	S.B. Rate*	N.N.D. Rate	P.N.M. Rate*
1947	-	-	92,7
1958-59	38,2	28,5	65,0
1961	36,6	25,8	62,4
1962	32,6	26,2	64,9
1964	35,7	27,4	63,2
1966	31,8	23,0†	53,0
1967	25,1	19,9†	45,2
1968	25,2	21,6†	46,5
1969	26,4	19,4†	45,5
1970	21,7	17,2†	38,1
1971	-	-	37,0
1972	22,6	12,9†	35,3

*Rate per 1000 total births

†Rate per 1000 live births

Appendix Table 11.2.

Number and Percentage of Stillbirths Before and During Labour in the 3 Ethnic Groups

Time of Stillbirth	Whites		Coloureds		Bantu	
	No.	%	No.	%	No.	%
Before labour	14	87	195	80	68	79
During labour	2	13	48	20	18	21
Total	16	100	243	100	86	100

Appendix Table 11.3.

Various Age Groups of Sample by Ethnic Group

Age in years	Whites			Coloureds			Bantu		
	Number	% Distribution		Number	% Distribution		Number	% Distribution	
<19	378	22		2486	22		585	25	
20-24	704	40		3704	33		709	31	
25-29	388	22		2296	21		427	19	
30-34	(176	10)		(1486	13)		(313	14)	
35-39	285 (81	5)	16	2700 (889	8)	24	580 (176	8)	25
40+	(28	2)		(325	3)		(91	4)	
Totals	1755			11186			2301		

Unknown age : 8 Coloureds, 1 Bantu

Table 11.4.

Perinatal Mortality at Various Age Groups by Ethnic Group

Age in years	Whites		Coloureds		Bantu	
	Number	Rate*	Number	Rate*	Number	Rate*
<20	7	19	82	33	27	46
20-24	9	13	112	30	20	28
25-29	9	23	79	34	22	52
30+	9	32	107	40	44	76

*Rate per 1000 total births

Table 11.5.

Various Parity Groups of Sample by Ethnic Group

Parity	Whites		Coloureds		Bantu	
	Number	% Distribution	Number	% Distribution	Number	% Distribution
0	838	48	4840	43	981	43
1	467	27	1985	18	408	18
2	212	12	1313	12	300	13
3	121	7	879	8	185	8
4	58	3	660	6	132	6
5	34	2	439	4	91	4
6	11	1	337	3	69	3
7+	10	1	704	6	124	5
Totals	1751		11149		2290	

Unknown: 4 Whites, 45 Coloureds, 12 Bantu

Appendix Table 11.6.

Perinatal Mortality at Various Parity Groups by Ethnic Group

Ethnic Group	Para 0			Para 1-3			Para 4+		
	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate
White	18	838	21	15	800	19	1	113	9
Coloured	150	4840	31	139	4177	33	86	2140	40
Bantu	34	981	35	57	893	64	31	418	74

*Rate per 1000 total births

Unknown: 4 Whites, 37 Coloureds, 10 Bantu

Appendix Table 11.7.

Various Age Groups by Parity Groups for Whites

Age	Para 0			Para 1-3			Para 4+		
	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate
<20	7	330	21	0	48	0	0	0	0
20-24	6	371	16	3	329	9	0	2	0
25-29	2	98	20	7	264	27	0	25	0
30+	3	39	77	5	159	31	1	86	12

*P.N.M. rate per 1000 total births

Unknown : 4 patients

Appendix Table 11.8.

Various Age Groups by Parity Groups for Coloureds

Age	Para 0			Para 1-3			Para 4+		
	P.N. deaths	Total births	P.N.M.* rate	P.N. deaths	Total births	P.N.M.* rate	P.N. deaths	Total births	P.N.M.* rate
<20	64	2164	30	14	312	45	0	3	-
20-24	55	1903	29	54	1704	32	5	92	54
25-29	20	585	34	41	1219	34	18	485	37
30+	11	188	59	33	943	35	63	1549	41

*P.N.M. rate per 1000 total births

Unknown: 47 patients

Appendix Table 11.9.

Various Age Groups by Parity Groups for Bantu

Age	Para 0			Para 1-3			Para 4+		
	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate	P.N. deaths	Total births	P.N.M* rate
<20	22	527	42	5	57	88	0	0	0
20-24	9	356	25	22	345	64	0	7	-
25-29	3	80	38	17	288	59	2	58	34
30+	1	18	56	13	203	64	29	350	83

*P.N.M. rate per 1000 total births

Unknown: 13 patients

Appendix Table 11.10.

Various Maternal Booking Weight Groups by Ethnic Group

Weight in Kg.	Whites				Coloureds				Bantu			
	Number	Per cent	P.N. deaths	P.N.M.* rate	Number	Per cent	P.N. deaths	P.N.M.* rate	Number	Per cent	P.N. deaths	P.N.M.* rate
<45	25	1	0	0	600	6	30	50	26	1	3	115
45-54	294	17	10	34	3453	34	95	28	267	14	8	30
55-60	640	38	10	16	3459	34	83	24	654	35	24	37
65-74	447	27	5	11	1513	15	40	26	494	26	19	38
75-84	170	10	4	24	584	6	16	27	217	12	4	18
85-94	64	4	1	16	241	2	10	41	111	6	3	27
>95	43	3	0	0	227	2	7	31	100	5	7	70
Totals	1683				10,077				1869			

*P.N.M. rate per 1000 total births

Unknowns: 72 Whites, 1117 Coloureds, 433 Bantu

Appendix Table 11.11.

Various Maternal Height Groups by Ethnic Group

Height cm.	Whites		Coloureds		Bantu	
	No.	% Dist.	No.	% Dist.	No.	% Dist.
<149	41	2	2119	21	280	15
150-154	157	9	4228	42	728	40
155-159	374	22	1776	18	387	21
160-164	563	33	1364	14	285	16
165-169	367	22	418	4	102	6
>170	197	12	144	1	32	2
	1699		10049		1814	

Appendix Table 11.12

Perinatal Mortality in Various Maternal Height Groups by Ethnic Group

Height cm.	Whites		Coloureds		Bantu	
	No.	PNM rate*	No.	PNM rate*	No.	PNM rate*
<149	1	24	82	39	12	43
150-154	2	13	111	26	27	37
155-159	8	21	47	26	10	26
160-164	9	16	37	27	15	53
165-169	7	19	7	17	1	10
>170	3	15	3	21	2	63

*PNM rate per 1000 total births

Appendix Table 11.13.

Perinatal Mortality in the Various Maternal Height Groups by Maternal Weight Groups in the Coloureds

Weight kg.	Height in cm. <145		145-149		150-154		155-159		160-164		>164	
	Total	PND	Total	PND	Total	PND	Total	PND	Total	PND	Total	PND
<45	154	5	166	7	180	9	34	0	18	1	1	0
45-54	404	15	592	19	1503	38	563	16	292	7	68	1
55-64	194	10	305	11	1474	28	686	18	565	12	196	3
65-74	66	0	96	4	588	16	307	8	278	11	155	3
75-84	23	0	36	2	229	8	108	3	122	2	56	1
85-94	5	0	8	0	106	4	33	1	52	2	32	2
>94	10	1	10	0	81	3	37	1	33	2	49	0

Height and/or Weight Unknown: 1279 patients

Appendix Table 11.14.

Past Obstetric History by Ethnic Group
(Number of patients)

	Whites	Coloureds	Bantu
Previous reproduction failure	107	1246	284
Previous hypertension	62	204	27
Previous Caesarian Section	61	459	154
Total sample size	1755	11,194	2302

Appendix Table 11.15.

Maternal Disease by Ethnic Group
(Number of cases)

Types of Disease	Whites		Coloureds		Bantu	
	No.	% Incid.	No.	% Incid.	No.	% Incid.
None	1610		10360		2149	
Cardiac	15	0,9	133	1,2	13	0,6
Diabetes	6	0,3	62	0,6	7	0,3
Renal	50	2,8	140	1,3	41	1,8
Others	74	4,2	499	4,5	92	4,0
Total	1755		11,194		2302	

Appendix Table 11.16.

Perinatal Mortality for Various Maternal Disease Groups by Ethnic Group

Types of Disease	Whites	Coloureds	Bantu
	P.N. deaths	P.N. deaths	P.N. deaths
None	26	350	118
Cardiac	1	4	2
Diabetes	0	2	1
Renal	2	8	1
Other	5	17	1

Appendix Table 11.17.

Prenatal Care by Ethnic Group - Distribution

	Whites		Coloureds		Bantu	
	No.	%	No.	%	No.	%
None	41	2	411	4	126	7
1 visit	52	3	413	4	61	3
2-4	169	10	1629	16	354	18
5-9	744	43	4786	46	978	50
10+	731	42	3247	31	418	22
Sub-total	1737		10486		1937	
Unknown	18		708*		365*	
Total	1755		11,194		2306	

*Many unknowns

Appendix Table 11.18.

Perinatal Mortality in Various Prenatal Care Groups by Ethnic Group

	Whites		Coloureds		Bantu	
	No.	PNM* rate	No.	PNM* rate	No.	PNM* rate
None	4	98	57	139	33	262
1 visit	2	38	40	97	5	82
2-4	6	36	99	61	35	99
5-9	15	20	96	20	20	20
10+	7	10	32	10	4	10

*P.N.M. rate per 1000 total births

Appendix Table 11.19.

Various Groups of Hypertension and Proteinuria by Ethnic Group - Distribution

Group	Whites		Coloureds		Bantu	
	No.	% Dist.	No.	% Dist.	No.	% Dist.
1. None	961	54,8	7548	67,4	1604	69,7
2. P.E.T. Hyper. L.P. - Prot.	248	14,1	1221	10,9	203	8,8
3. I.P. Hyper. - Prot.	483	27,5	1867	16,7	391	17,0
4. All hyper. - Prot.	706	40,2	3244	29,0	608	26,4
5. Ess.Hyper.	10	0,6	191	1,7	26	1,1
6. All Hyper. + Prot.	88	5,0	402	3,6	90	3,9
7. P.E.T. Hyper L.P. + Prot.	51	2,9	324	2,9	67	2,9

1 = No form of hypertension or proteinuria
2 = Pre-eclampsia and hypertension of late pregnancy, without proteinuria
3 = Intrapartum hypertension only, without proteinuria
4 = All forms of hypertension without proteinuria
5 = Essential hypertension
6 = All forms of hypertension with proteinuria
7 = Pre-eclampsia and hypertension of late pregnancy, with proteinuria.

Appendix Table 11.20.

Perinatal Mortality in Various Hypertension and Proteinuria Groups by Ethnic Group

Group*	Whites		Coloureds		Bantu	
	Number deaths	P.N.M. rate**	Number deaths	P.N.M. rate**	Number deaths	P.N.M. rate**
None	7	7	244	32	72	45
P.E.T. Hyper L.P. - Alb.	3	12	49	40	10	49
I.P. Hyper. - Alb.	8	17	47	25	20	51
All hyper. - Alb.	7	10	106	33	33	54
Ess.Hyper.	0	0	11	58	4	154
All Hyper. + Alb.	5	57	31	77	7	78
P.E.T. Hyper. L.P. + Alb.	5	98	28	86	6	90

*Groups as Appendix Table 11.19.

**Rate per 1000 total births

Appendix Table 11.21.

Antepartum Haemorrhage by Ethnic Group

	Whites	Coloureds	Bantu
Number of patients	67	509	70
Incidence (% of total)	3,8	4,5	3,0
Number of deaths	4	98	18
P.N.M. rate*	60	193	257

* Rate per 1000 total deliveries

Appendix Table 11.22.

Perinatal Mortality by Ethnic Group in P.R.O.M. and Abruptio Placentae

	Whites			Coloureds			Bantu		
	No.	Deaths	P.N.M. rate*	No.	Deaths	P.N.M. rate*	No.	Deaths	P.N.M. rate*
P.R.O.M.	32	2	63	192	29	151	44	8	182
Accidental haemorrhage	13	3	231	132	70	530	19	13	684
Total sample	1755	34	19	11,194	381	34	123	23	53

*Rate per 1000 total births

Appendix Table 11.23.

Various Duration of Labour Groups by Ethnic Group - Distribution and Perinatal Mortality*

Duration labour in hours	Whites				Coloureds				Bantu			
	No.	% Dist.	Deaths	PNM rate	No.	% Dist.	Deaths	PNM rate	No.	% Dist.	Deaths	PNM rate
1 - 6	737	45	6	8	3872	38	67	17	617	31	14	23
7 -12	642	39	8	12	3650	36	53	15	680	35	18	26
13 -18	193	12	2	10	1707	17	23	13	431	22	13	30
19 -24	57	3,5	0	-	636	6	8	13	158	8	1	-
25+	7	0,5	0	-	231	2	2	9	78	4	0	-

*All Stillbirths occurring before labour are excluded

Unknown: 119 Whites, 1098 Coloureds, 438 Bantu

Appendix Table 11.24.

Various Methods of Delivery by Ethnic Group - Distribution and Perinatal Mortality

Method of delivery	Whites				Coloureds				Bantu			
	No.	% Dist.	Dead	PNM rate*	No.	% Dist.	Dead	PNM rate*	No.	% Dist.	Dead	PNM rate*
S.V.D.	1430	82	10	7	9008	84	107	12	1684	76	33	20
Forceps	117	7	3	26	546	5	12	22	90	4	5	56
Breech	11	0,5	2	182	31	0,5	170	182	36	1	8	222
C.S.	152	9	4	26	915	8,5	27	30	350	16	5	14
V.E.	27	1,5	0	0	204	2	3	15	59	3	2	34
	1737				10704				2219			
Unknown	4		1		155		5		16		3	

*PNM rate per 1000 total births

S.V.D. = Spontaneuous vertex delivery
C.S. = Caesarian Section
V.E. = Vacuum Extraction

Appendix Table 11.25.

Various Birth Weight Groups for Vaginal Breech Delivery by Ethnic Group*

Birth-weight gm.	Whites		Coloureds		Bantu	
	No. deaths	No. live	No. deaths	No. live	No. deaths	No. live
<1000	0	0	7	3	2	1
1000-2499	2	4	13	51	3	7
	2	4	20	54		
>2500	0	8	3	113	3	20

*Stillbirths occurring before labour excluded

Appendix Table 11.26.

Various Birth Weight Groups for Breech Delivered by Caesarian Section by Ethnic Group*

Birth-weight gm	Whites		Coloureds		Bantu	
	No. dead	No. live	No. dead	No. live	No. dead	No. live
<1000	0	0	0	0	0	0
1000-2499	0	1	7	17	0	4
>2500	0	22	0	82	1	20

*Stillbirths before labour and Caesarian Section excluded.

Appendix Table 11.27.

Various Clinico-Pathological Causes of Death by Ethnic Group - Distribution and Perinatal Mortality

Cause of death	Whites		Coloureds		Bantu	
	No.	% Dist.	No.	% Dist.	No.	% Dist.
Congenital malformation	5	15,7	19	5,4	9	7,6
Iso-immunisation	3	9,4	1	0,3	0	0
Mechanical problems	2	6,2	34	9,6	18	15,1
Cause of death Uncertain TERM	2	6,2	44	12,4	18	15,1
Cause of death PRETERM	10	31,3	102	28,7	34	28,6
Fetoplacental inadequacy	5	15,6	43	12,1	16	13,5
Accidental haemorrhage	4	12,5	66	18,6	13	10,9
Maternal Disease	1	3,1	43	12,1	10	8,4
Unclassified	0	0	3	0,8	1	0,8
Total	32	100	355	100	119	100

Appendix Table 11.28.

Congenital Malformations - Various Age Groups by Ethnic Group

	Age Groups						
	<19	20-24	25-29	30-34	35-39	40+	
Whites	2	0	2	1	0	0	5
Coloured	5	7	1	2	2	2	19
Bantu	4	1	2	1	0	1	9
Total	11	8	5	4	2	3	

	<19	20-29	30+
Total	11	13	9
Total deliveries	3449	8228	3565

No significant difference in age distribution for congenital malformation, as compared to all other deliveries ($\chi^2 = 3,2$).

Appendix Table 11.29.

Congenital Malformations - Various Parity Groups by Ethnic Group

	Parity Group		
	0	1-3	4+
Whites	3	2	0
Coloureds	7	9	3
Bantu	3	5	1
Total	13	16	4
Total deliveries	6659	5870	2661

$\chi^2 = 1,5$ Not significant

Appendix Table 11.30.

Cause of Death Uncertain - TERM Group -
Various Maternal Weight Groups by Ethnic Group

	Maternal WEight Groups in Kg.						
	<45	45-54	55-64	65-74	75-84	85-94	>95
Whites	0	1	1	0	0	0	0
Coloureds	1	14	8	10	3	0	2
Bantu	1	0	2	2	2	1	2
Total	2	15	11	12	5	1	4

	<55	55-74	>75
Total	17	23	10
Total deliveries	4665	7207	1757

No significant difference in various maternal weight group in cause of death Uncertain - TERM group ($\chi^2 = 2,0$).

Appendix Table 11.31.

Cause of Death Preterm (HMD Group excluded) - Various Forms of Hypertension by Ethnic Group

	None	Ess.Ht.	P.E.T.	Hyper.late preg.
Whites	6	0	0	0
Coloureds	58	0	8	12
Bantu	26	0	1	3
Total	90	0	9	15

None = No form of hypertension

Ess.Ht. = Essential hypertension

P.E.T. = Pre-eclampsia

Hyper. late preg. = Hypertension of late pregnancy unclassified

Appendix Table 11.32.

Cause of Death - PRETERM (HMD Group Excluded) P.R.O.M. by Ethnic Group

	P.R.O.M.	No.
Whites	1	5
Coloureds	12	69
Bantu	7	23
Total	20*	97
All	268	14983

*Significantly more P.R.O.M. in Cause of death - PRETERM (HMD excluded) group than in sample as a whole (χ^2 = 161 $p<0,001$)

P.R.O.M. = Premature rupture of membranes.

Appendix Table 11.33.

Accidental Haemorrhage Group Associated with S.G.A. Infants by Ethnic Group

	Accidental Haemorrhage	
	S.G.A.	Non-S.G.A.
Whites	0	4
Coloureds	12	51
Bantu	1	12
All accidental haemorrhage	13*	67
All deaths	88	318

*Accidental haemorrhage group did not contain significantly more S.G.A. infants than the total sample of deaths.
Unknowns excluded (χ^2 = 1,2).

Appendix Table 11.34.

Various Forms of Hypertension by Time of Death

	S.B. before labour	S.B. during labour	N.N.D.
Essential hypertension	7	2	6
Pre-eclampsia	29	4	8
Hypertension L.P. unclassified	45	13	17
Total	81	19	31
All deaths	262	70	174

Significantly less N.N.D's and more S.B.'s before labour ($\chi^2 = 9,4$ $p<0,01$)

Appendix Table 11.35.

Various Forms of Hypertension Associated With Fetal Death by Ethnic Group

	Ess. hyper.	P.E.T.	Hyper. late preg.	Total	All deliveries
Whites	0	2	6	8	1755
Coloureds	11	35	51	97	11194
Bantu	4	4	18	26	2302
Total	15	41	75	131	

Ess. Hyper. = Essential hypertension

P.E.T. = Pre-eclampsia

Hyper. late preg. = Hypertension of late pregnancy unclassified

Appendix Table 11.36.

Various Forms of Hypertension Associated With Fetal Death by Maternal Age

	Age in years		
	<19	20-29	30+
Essential hypertension	2	4	9*
Pre-eclampsia	12	19	10
Hypertension of late pregnancy	17	34	24
Total	31	57	43
All deliveries	3449	8228	3565

*Significantly more essential hypertension in over 30 year old. $\chi^2 = 7,8$ $p<0,05$

Appendix Table 11.37.

Various Forms of Hypertension Associated With Fetal Death by Parity

	0	1-3	4+
Essential hypertension	4	3	8*
Pre-eclampsia	22	13	6
Hypertension of late pregnancy	28	27	20
Total	54	43	34
All deliveries	6659	5870	2671

*Significantly more high parity associated with essential hypertension $\chi^2 = 6,6$ $p<0,05$

Appendix Table 11.38.

Various Forms of Hypertension Associated with Fetal Death by Past Obstetric History

	None	Prev. Reprod. Failure	Prev. C.S.	Prev. Hyper.
Essential hypertension	8	2	1	4
Pre-eclampsia	31	8	0	2
Hypertension of late pregnancy	55	12	5	3
Total	94*	22	6	9
All deliveries	12644	1637	674	293

*Significantly more previous reproductive failure associated with all forms of hypertension ($\chi^2 = 23$ $p<0,001$)

Prev. reprod. Failure = Previous reproductive failure
Prev. C.S. = Previous Caesarian Section
Prev. Hyper. = Previous hypertension

Appendix Table 11.39.

Various Forms of Hypertension Associated With Fetal Deaths by Prenatal Care

	Booked	Unbooked
Essential hypertension	15	0
Pre-eclampsia	41	0
Hypertension of late pregnancy	44	31
Total hypertensive group	100	31*
Total deliveries	13582	578

*Significantly more unbooked patients in group of fetal deaths associated with hypertension than in the total sample (χ^2 = 129 p<0,001)

	Booked	Unbooked
All hypertension	100	31**
All fetal deaths	339	167

**Significantly less unbooked fetal deaths associated with hypertension than unbooked fetal deaths not associated with hypertension (χ^2 = 7 p<0,01)

Appendix Table 11.40.

Various Forms of Hypertension Associated With Fetal Death by Induction of Labour*

	Induced	Not
Essential hypertension	0	6
Pre-eclampsia	2	9
Hypertension of late pregnancy	6	20
Total	8	35
Total deliveries	2226	12225

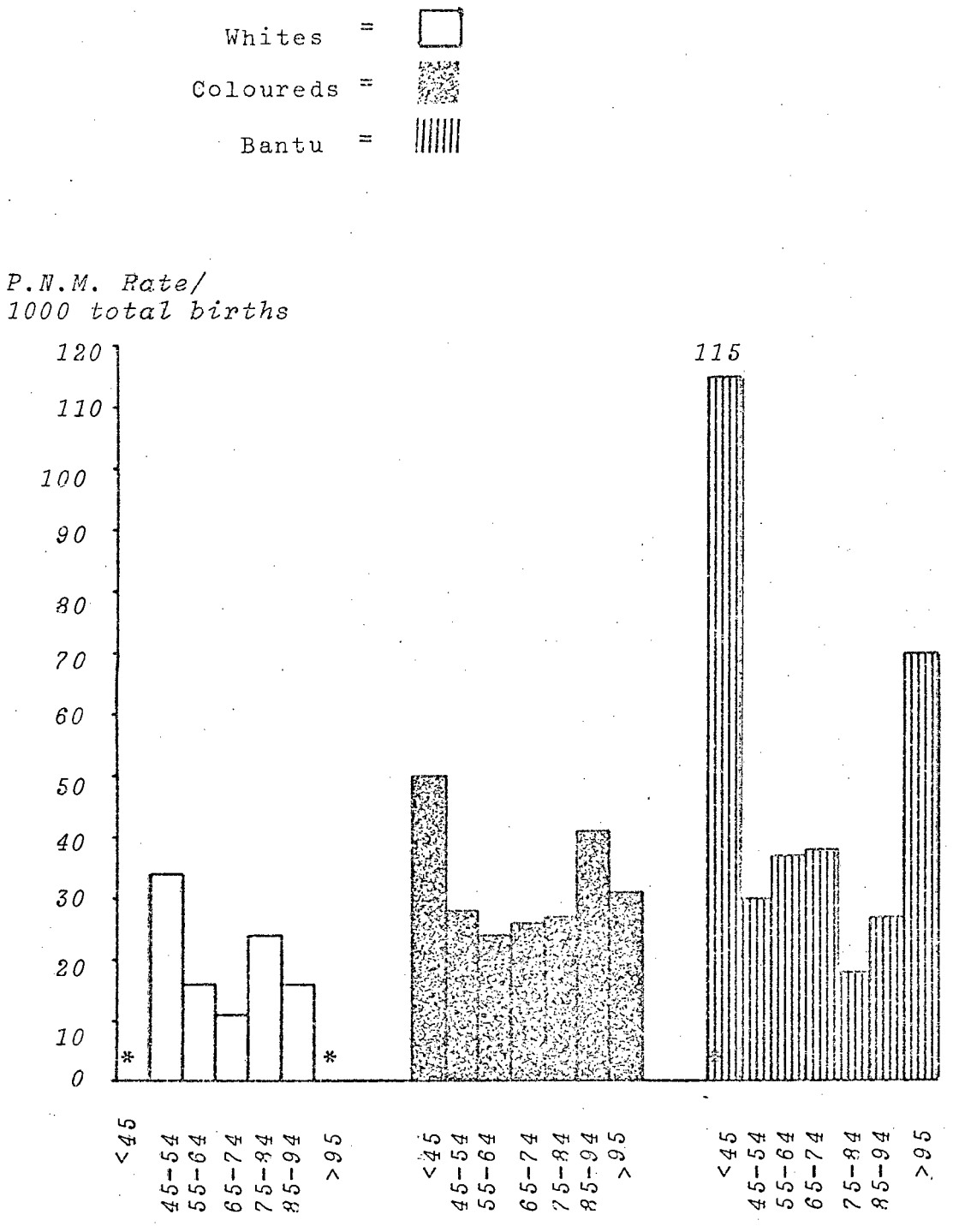
*Stillbirths before labour and elective Caesarian Sections excluded

Appendix Table 11.41.

Various Forms of Antepartum Haemorrhage by Small for Gestational Age (S.G.A.)

	S.G.A.	Non S.G.A.	Unknown
Antepartum haemorrhage unknown	8	23	2
Accidental haemorrhage	13	67	0
Placenta praevia	2	11	0
All forms antepartum haemorrhage	23*	101*	2
All deaths	101	385	20

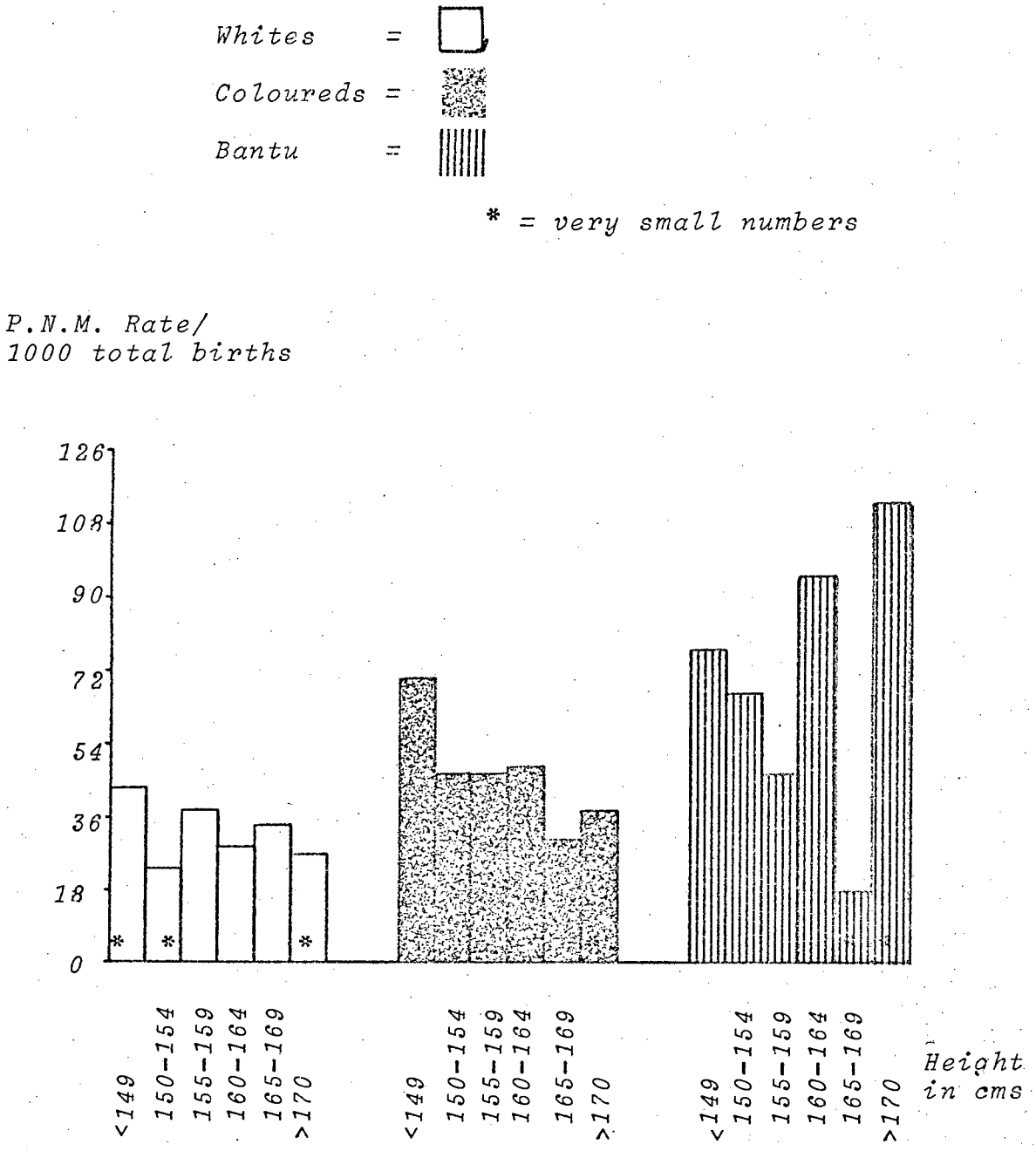
*No significant difference between number of S.G.A. in Antepartum Haemorrhage group and non-Antepartum Haemorrhage group (χ^2 = 0,3)



Appendix Figure 11.1.

Perinatal mortality at various maternal booking weights by ethnic group.

**Numbers too small for significance*



Appendix Figure. 11.2. Showing the effect of various maternal heights on perinatal mortality rates in the three ethnic groups.

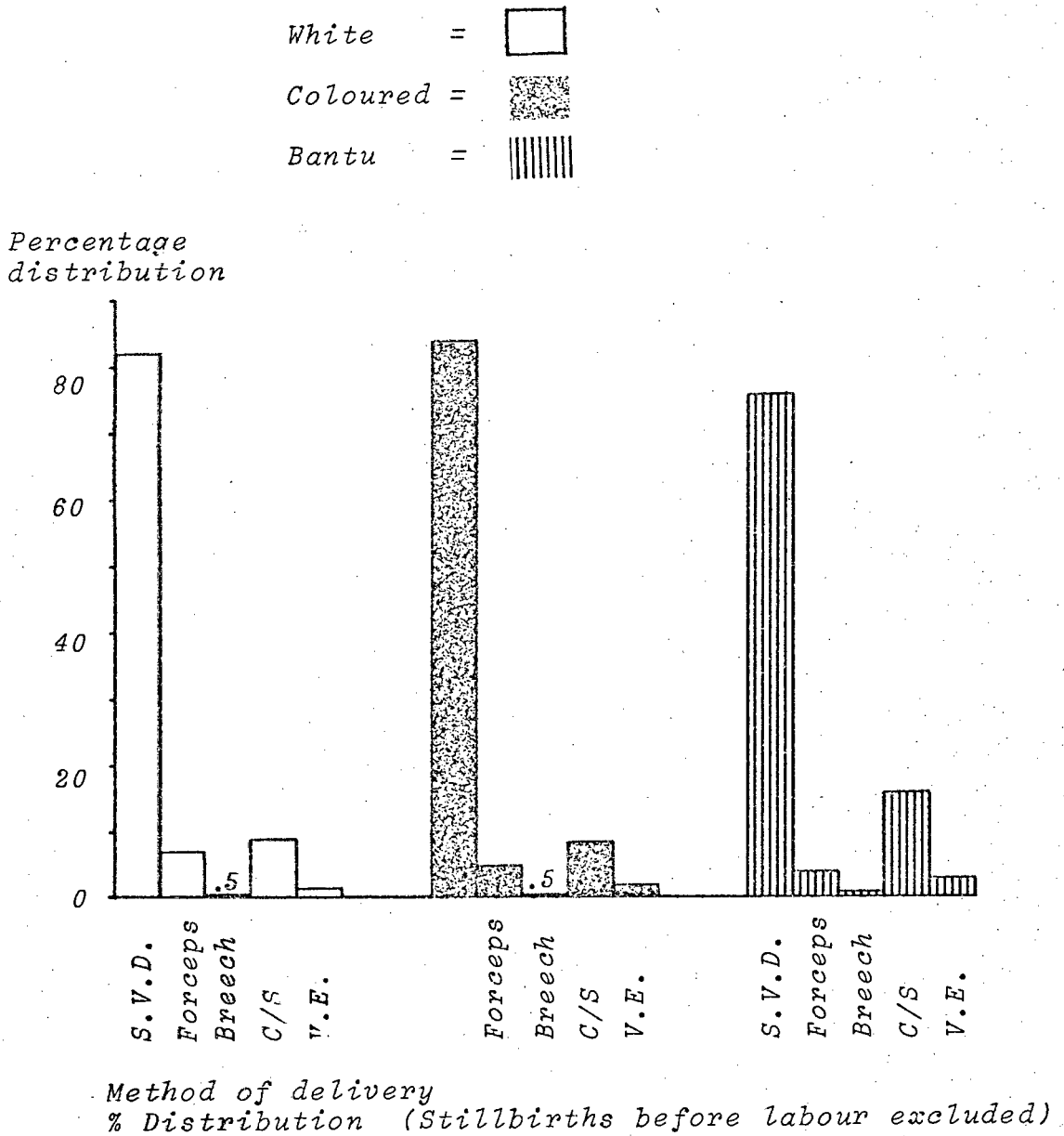


Figure 11.3.

Various methods of delivery by ethnic group - Distribution.

12. APPENDIX E

This appendix contains:

(i) the correlation between gestational age assessment and gestational age as calculated from the duration of pregnancy from the last menstrual period

(ii) the birthweight/gestational age chart used in this thesis (Lubchenco et al, 1972)

Correlation between gestational age assessment and duration of pregnancy calculated from the last menstrual period (L.M.P.)

Only patients whose date of L.M.P. was coded as "certain", were included in the samples. The difference in weeks between the gestational age assessment by Dubowitz score assessment and duration of pregnancy, as calculated from the last menstrual period, was ascertained for each patient. The patients were from randomly selected samples from the three ethnic groups under study.

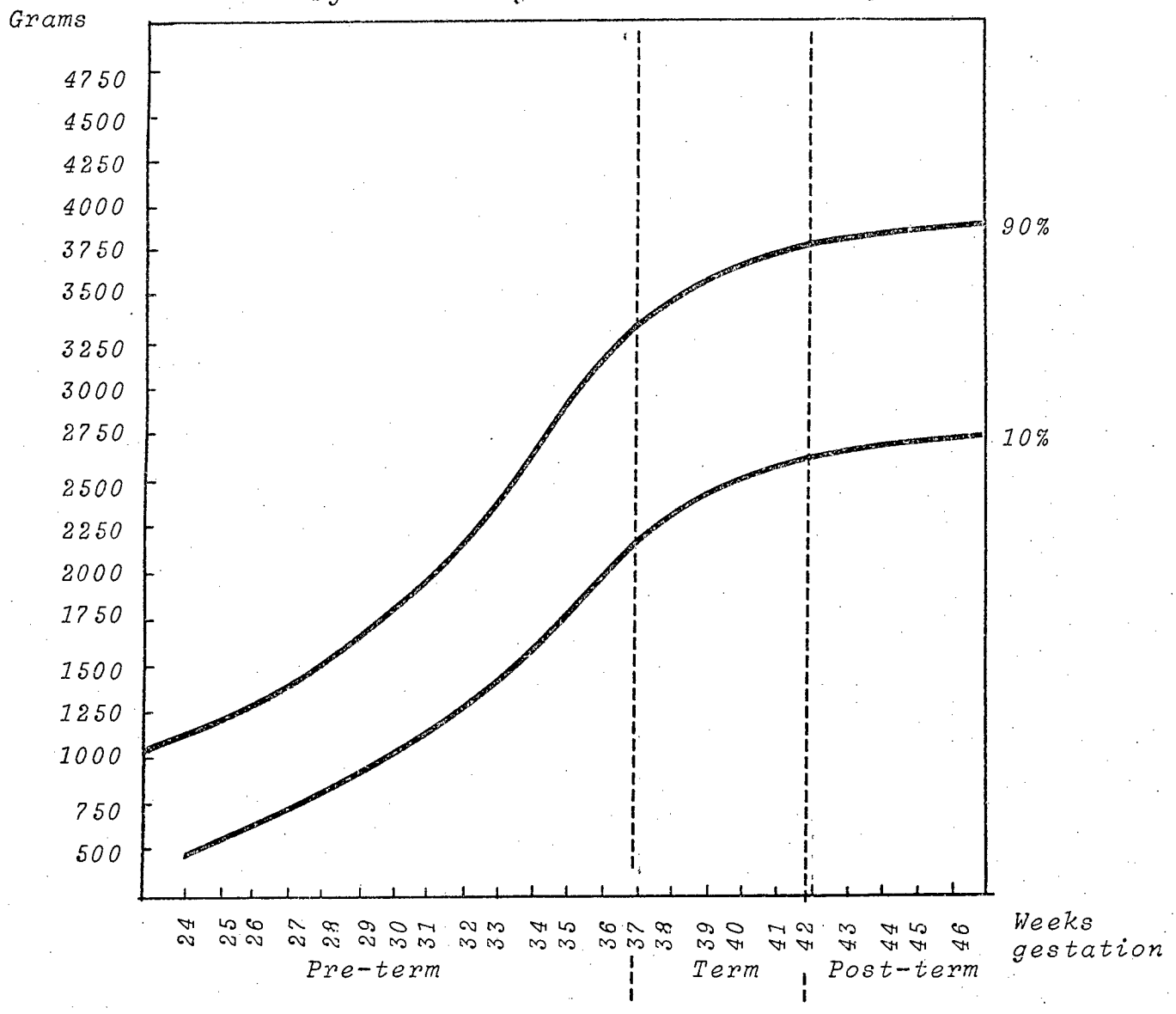
Results

The average difference was calculated as follows - the difference between the two gestational assessments regardless of direction, was calculated.

	Sample size	Correlation coefficient	Average difference (weeks)
Whites	112	0,71	1,0
Coloureds	159	0,83	1,4
Bantu	108	0,74	1,4

The average of all the differences for each sample was then calculated, i.e. the difference between the Dubowitz gestation age assessment and the calculated length of gestation, for Whites is one week, for Coloureds and Bantu 1,4 weeks.

Newborn Classification and Neonatal Mortality Risk by Birth Weight and Gestational Age



Birth weight by gestational age chart showing 10th Percentile and 90th Percentile.

(Reproduced from Lubchenco et al, 1972).