

CHAPTER I

MORTALITY PATTERNS OF CHRONIC DISEASES OF LIFESTYLE IN SOUTH AFRICA

Dr Debbie Bradshaw, Mr David Bourne, Ms Michelle Schneider, Mr Rauf Sayed

INTRODUCTION

In populations undergoing demographic transition there is a decline in mortality followed by a drop in fertility generally resulting from improved socio-economic conditions. During this transition, the age/sex structure of the population changes from a pyramid shape to a more columnar shape. The South African population is clearly in a transitional phase with subgroups at different stages. The black population has a relatively high fertility and a high proportion of children (see Fig. 1). The white South Africans have moved further into the demographic transition and have a low fertility and correspondingly higher proportion of aged people (see Fig. 2). The age structures of the coloured and Asian South Africans reflect that these subgroups are demographically in between the other two groups. The coloured population structure is more similar to the black and the Asian closer to the white. The demographic differences between the race groups reflect the socio-economic disparities arising from the apartheid policies. Factors such as income, education, employment status and occupation universally shape the age and sex patterns of populations through their impact on both fertility and mortality.

The population age structure and corresponding cause of death patterns during the demographic transition are largely a function of the decline in fertility. As fertility declines, the population ages, which is then reflected in the profile of the causes of death. In addition, with industrialisation and urbanisation, a decline occurs mainly in the mortality of infectious diseases among the younger age groups. This selective process then results in a growing number of survivors exposed to the risk of chronic, degenerative diseases. The consequent shift in the cause of death profile to chronic diseases, forms part of what has been called the epidemiological transition. The epidemiological transition together with the demographic transition have become known as the health transition.

The epidemiological transition has been broadly described as referring to the complex long-term changes (over decades or even centuries), in the patterns of health and disease as communities transform their social, economic and demographic structures. The theory was initiated by Omran¹ who posited a set sequence of stages or eras of epidemiological transition. Usually the sequence starts with a preponderance of infectious diseases in the population and this is reflected in the cause of death profiles. It follows on to an era when chronic and degenerative ailments predominate. A specific era is identified by important socio-economic changes that effect the presenting dominant pattern of mortality and morbidity. Omran argued that each stage is more desirable than the preceding one as it reflects progress in development.¹

Debbie Bradshaw (M.Sc., D.Phil. (Oxon)) is Division Head at CERSA, MRC doing research in the area of health information. Her main interests have been the evaluation and analysis of mortality data.

David E Bourne (B.Sc., B.Phil. (Environmental Science)) is a Chief Research Officer at the Department of Community Health, University of Cape Town, with a special interest in vital statistics.

Michelle Schneider (B.A., B.Sc. (Epidemiol. Hons)) is a Research Assistant working at CERSA, MRC, in the area of health information concerning mortality and vital statistics.

A Rauf Sayed (B.Sc. (Hons), M.Sc. (Statistics)) is a Senior Biostatistician in the Department of Community Health, University of Cape Town. His main interests include birth defects surveillance and mortality studies.

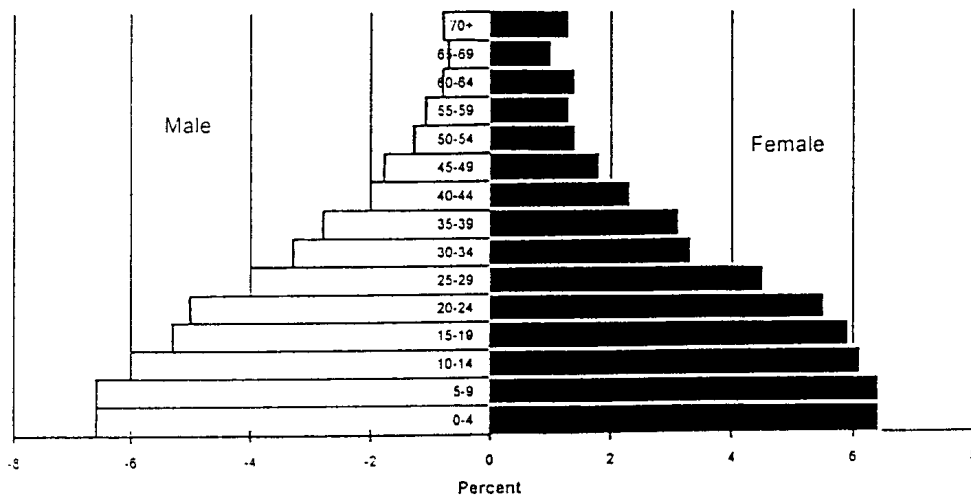


Figure 1. The age and sex distribution for South African blacks (1993). Source: Mazur R²

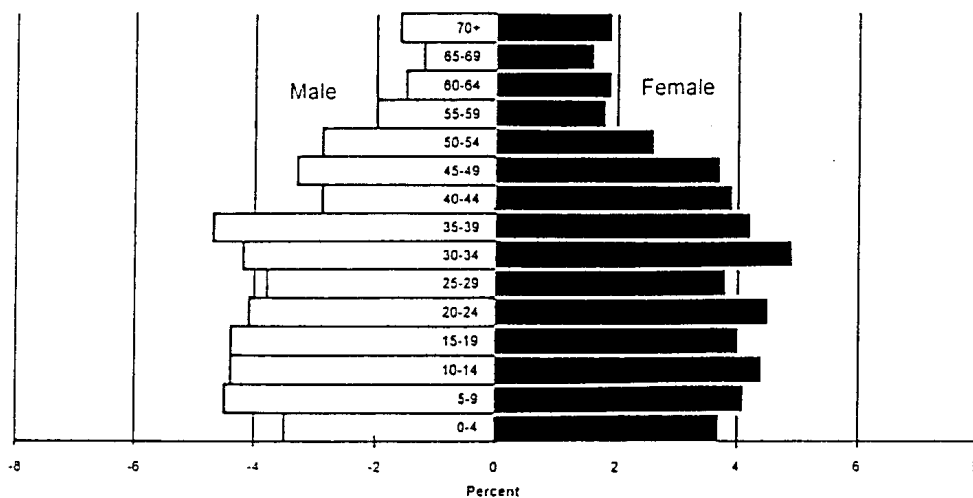


Figure 2. The age and sex distribution for South African whites (1993). Source: Mazur R²

Ironically, the rise of non-communicable diseases, such as heart disease, stroke and cancer in developing countries are seen by some as more advanced causes of death and disability than the various infectious diseases and malnutrition. However, Frenk, *et al.* have argued that "Many of the emerging illnesses are a result of a defective process of industrialisation that has placed more value on economic growth rather than on human welfare."³

Omran,¹ acknowledging the heterogeneity of social and economic development among countries, suggested three models of epidemiological transition, the main differences in these models being the timing and pace of change. However, based on observations from some large middle-income populations, Frenk, *et al.* have proposed modifications to Omran's theory, with the protracted-polarised model of epidemiological transition.³ This model is characterised by the coexistence of infectious and non-communicable diseases in the same population, persisting for a long time.

In developing countries the unequal distribution of wealth and health service coverage results in the widening of the gap in the health status among social classes and geographical regions. Omran⁴ noticed as a general pattern, irrespective of the epidemiological transition model, that mortality decline starts among the higher social classes with the lower classes eventually catching up. In the protracted model, better off sections of the population would have completed the transition while economically disadvantaged groups continue to suffer from pretransitional pathologies. Epidemiological polarisation has been incorporated in other models of transition but in the protracted model, polarisation goes on for longer periods.

Considering the inequitable distribution of wealth in South Africa, which largely overlaps with race, it could be expected that the bipolar model would apply. Despite severe inadequacies of the data, detailed analyses of the 1985 South African mortality reflected the bipolar (infectious & non-communicable) nature of mortality patterns in this country.⁵ Furthermore, there was evidence of high levels of traumatic causes of death such as violence, homicide and motor vehicle accidents. This can be seen in Fig. 3, which reflects the composite mortality pattern for the RSA in 1990.⁶ It shows a high proportion of ill-defined and infectious diseases. The latter include 'other respiratory', 'certain perinatal conditions' and 'TB'. Among the leading causes of death are also chronic diseases such as 'cerebrovascular disease' (CVA) and 'ischaemic heart disease' (IHD). 'Other violence' and 'homicide' are causes of death, which reflect political upheaval and add considerably to the health burden of the nation. While childhood survival has been improving, the combined effect of infectious, non-communicable and violent causes of death has led to high levels of adult mortality. Faechem, *et al.*⁷ estimate that adult mortality in sub-Saharan Africa is among the highest in the world. Bradshaw, *et al.*⁸ show that South African levels of adult mortality are similar to those of sub-Saharan Africa. They estimate that in South Africa, on average 38,4% of 15-year-old men could expect to die before the age of 60, while 25,4% of 15-year-old women could expect to die before the age of 60.⁵ Their analysis also indicated that the different race groups were at different stages of the transition, in broad accordance with their levels of socio-economic development. Evidence of the triple burden of disease (including injuries) was particularly noticeable in the coloured population.

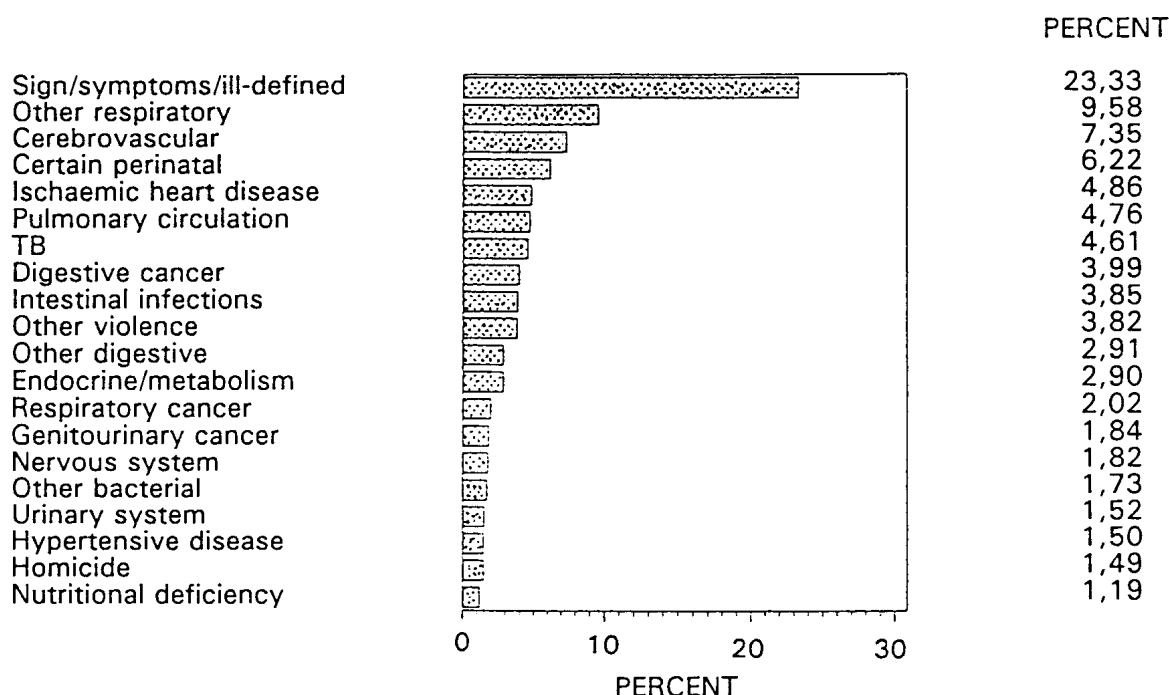


Figure 3. The top twenty causes of death in South Africa, 1990 (Total = 199 537 deaths)

A twentieth century world-wide phenomena has been long-term declines in mortality levels. This has also been observed in adult mortality trends in South Africa.⁸ Transition theory, as it stands, does not explain how social and economic changes are related to health transformation. Murray and Chen⁹ have proposed that the three established theories of mortality changes viz, the income and food

theory, the dissemination of modern technologies and sociocultural change that includes changing beliefs and health behaviour, explain some aspects of this general mortality decline in an interactive way. Infectious diseases are generally the first to decline, and unfortunately in most societies where this occurs there is a concomitant increase in chronic diseases as the population ages. This is a consequence of the population acquiring an unhealthy pattern of living. Habits such as smoking tobacco, consuming an unhealthy, typical Western diet and following a sedentary lifestyle, are acquired at a very early age. This risky behaviour results in the emergence of a range of risk factors, which include tobacco addiction, being hypertensive, diabetic, hyperlipidaemic or obese and are often undiagnosed. The presence of these risk factors over many decades leads to ever increasing numbers of patients presenting with chronic diseases of lifestyle (CDL) such as IHD, (heart attacks and angina) and CVA (strokes), smoking-related diseases and a whole range of related conditions. These complex interactions between an unhealthy lifestyle, the resulting risk factors and the ultimate range of CDL with its major impact on mortality is represented in the colour diagram on page 9.¹⁰ The co-existence of lifestyle-related ailments was also noted by Kark¹¹ in the urban setting and he coined the term "Community syndrome of hypertension, atherosclerosis and diabetes (CHAD)". It has been estimated that CHAD together with certain cancers, accounts for 24,5% of the reported deaths in South Africa¹⁰ and 28,5% in the 35-64-years age group in 1988. This latter proportion represents the most economically productive sector of the population. The loss of such a large fraction of the economically active age group through premature death or disability resulting from CDL can hardly be accommodated by the South African economy at this important time of transition. It has been estimated that the proportion of deaths due to chronic diseases has been increasing for adults.⁸

Table I shows the most common causes of death in South Africa by province as estimated in 1990.⁶ Categories, which include diseases influenced by lifestyle factors are highlighted. It should be noted that these categories also include diseases caused by other factors such as those of genetic or environmental origin. However, it is clear there is a wide discrepancy in the mortality patterns across the provinces. CDL accounts for higher proportions of the mortality in the Western Cape and Northern Cape and in Mpumalanga and the Northern Transvaal the respective proportions are the lowest.

Similarly, Table II shows the 10 most common causes of death in the economically active age group, 25-64 years, for the country as a whole and for the 9 provinces.⁶ Categories that include CDL are again highlighted. The higher and lower proportions of CDL-related mortality are similar to those provinces in Table I.

These data clearly indicate the enormous overall contribution of CDL to the burden of disease in South Africa. The data also highlight those provinces where CDL-related deaths are very high, and where the economically active age group is unnecessarily and prematurely being depleted. Provinces with high proportions of CDL show what could be anticipated in the other provinces if no appropriate interventions are put in place to protect these populations against the emergence of CDL within a few decades.

Mann¹² has argued that the varied population composition of this country provides a "South African window" of opportunity to undertake epidemiological research examining the relationship between lifestyle and chronic diseases. According to him the cross-cultural contrast in both lifestyle and disease profile make it possible to study the relationship between them. It could be argued that there is an extension of this "window" created by the contrast in urban and rural lifestyles. The geographical distribution of chronic diseases would be important to analyse. Since high proportions of the white and Asian populations are already urbanised, the geographical patterns of chronic diseases experienced by the coloureds and blacks would be of particular interest. The lack of reliable data for the blacks¹³ hinders the full utilisation of these opportunities and attention should focus on the trends in the geographical distribution of mortality due to chronic diseases in the coloured population. The changes between 1970 and 1985 in the pattern of mortality due to selected causes are analysed in this chapter.

Previous studies of secular trends in the cardiovascular mortality rates⁷ in developed countries have

	Western Cape	Northern Cape	North West	Gauteng	Orange Free State	Eastern Cape	KwaZulu Natal	Mpumalanga	Northern Transvaal
Signs, symptoms and ill-defined conditions	9.53	8.35	13.11	26.08	18.77	21.86	25.61	37.74	57.41
Other diseases of the respiratory system *	10.13	15.09	12.09	8.39	12.46	10.68	7.96	7.88	3.98
Cerebrovascular diseases *	10.45	9.73	7.66	6.87	8.79	7.48	5.61	5.58	4.59
Certain conditions originating in the perinatal period	5.18	6.5	7.73	6.05	7.33	8.02	5.44	5.17	2.22
Ischaemic heart disease *	11.84	6.94	3.33	5.05	3.13	3.45	4.81	2.34	.81
Disease of the pulmonary circulation and other heart diseases *	5.08	4.01	5.22	5.42	4.49	4.97	4.26	4.27	3.04
Tuberculosis	4.78	5.84	6.13	2.63	4.99	7.64	2.97	3.57	2.81
Malignant neoplasms of the digestive organs *	6.07	4.7	3.67	3.68	3.09	4.87	3.09	3.02	2.54
Intestinal infections	2.04	6.57	8.06	1.54	8.95	4.47	2.55	3.91	1.62
Violent deaths not purposely inflicted	-	1.44	2.85	5.56	1.68	-	10.69	2.99	3.27
Other digestive diseases *	2.64	2.76	3.47	3.28	3.04	2.32	2.91	3.28	2.8
Endocrine and metabolic diseases *	3.86	2.67	2.52	3.27	2.48	2.79	2.8	2.46	2.01
Malignant neoplasms of the respiratory system *	4.15	2.41	1.42	1.99	1.08	2.37	1.59	1.04	.76
Malignant neoplasms of genito-urinary organs *	2.42	2.59	2.03	2.0	1.7	1.78	1.48	1.43	1.17
Diseases of the nervous system	1.8	2.19	2.72	1.61	1.92	2.21	1.44	1.33	.88
Other bacterial diseases	2.4	1.62	1.79	1.91	1.37	1.93	1.29	1.17	1.14
Diseases of the urinary system	1.53	1.64	2.06	1.49	1.53	1.45	1.51	1.42	1.06
Hypertensive diseases *	1.56	2.3	2.55	1.29	2.79	1.28	-	1.11	-
Homicide	1.58	1.96	-	2.14	-	-	3.15	-	-
Nutritional deficiencies	-	1.7	2.14	-	2.22	1.45	1.23	1.31	.63
Malignant neoplasms of bone	1.66	-	-	-	-	.85	1.14	-	-
Transport accidents	1.64	-	-	1.22	-	-	-	1.77	1.10
Viral diseases	-	-	1.76	-	-	-	-	-	-
Other accidental deaths	-	-	-	-	1.0	-	-	-	.89
Unspecified malignant neoplasms	-	-	-	-	-	1.12	-	-	-
TOTAL FOR 20 MOST COMMON CAUSES: % OF ALL DEATHS	90.34	90.81	92.31	91.47	92.81	92.99	91.53	92.79	94.73
* ALL DEATHS IN CATEGORIES WHICH INCLUDE CDL	58.2	50.33	41.44	41.2	40.57	39.2	31.71	29.95	19.69

Table II. Comparison of the 10 most frequent causes of all deaths (%) in the 25 -64 year age group reported for the whole country and the provinces as estimated in 1990

	Western Cape	Northern Cape	North West	Gauteng	Orange Free State	Eastern Cape	Kwazulu Natal	Mpumalanga	Northern Transvaal	Whole country
Signs, symptoms and ill-defined conditions	7.48	5.05	10.57	25.47	17.75	20.62	24.37	33.66	48.21	21.59
Other diseases of the respiratory system *	9.69	15.06	11.46	7.56	11.53	10.39	6.5	9.27	3.99	8.81
Tuberculosis	8.95	11.24	10.59	4.35	9.1	12.6	4.74	-	3.95	7.64
Cerebrovascular diseases *	9.38	10.09	9.47	6.88	10.11	7.11	5.5	-	5.29	7.45
Other violent causes of death	-	-	5.23	8.83	2.92	-	15.69	10.24	5.44	6.23
Disease of the pulmonary circulation and other heart diseases *	5.74	4.85	7.43	5.65	6.56	5.84	4.52	1.95	3.99	5.61
Malignant neoplasms of the digestive organs *	7.2	6.64	5.45	4.24	4.6	7.42	3.92	-	3.18	5.28
Ischaemic heart disease *	11.19	7.27	4.23	4.2	3.85	3.49	4.74	-	-	4.76
Other digestive diseases *	3.72	4.57	5.37	4.45	5.33	3.73	3.9	3.9	4.58	4.33
Endocrine and metabolic diseases *	3.96	-	3.05	3.37	3.34	3.15	-	1.95	2.8	3.32
Malignant neoplasms of the respiratory system *	5.9	3.58	-	-	-	3.59	-	-	-	-
Malignant neoplasms of genito-urinary organs *	-	3.3	-	-	-	-	-	-	-	-
Hypertensive diseases *	-	-	3.27	-	-	-	-	-	-	-
Homicide	-	-	-	-	-	-	4.78	-	-	-
Transport accidents	-	-	-	-	-	-	-	7.8	2.05	-
Diseases of the nervous system	-	-	-	-	-	-	-	7.32	-	-
Intestinal infections	-	-	-	-	-	-	-	4.39	-	-
Other accidental deaths	-	-	-	-	-	-	-	2.44	-	-
TOTAL	73.21	71.65	76.12	75.0	75.09	77.94	78.67	82.92	83.48	75.04
* ALL DEATHS IN CATEGORIES WHICH INCLUDE CDL	56.78	55.36	49.73	36.35	45.32	44.72	29.09	17.07	23.83	39.58

shown these rates to have peaked around the late 60s, early 70s and thereafter some decline has been noted. Data from developing countries are scarce. The mortality rate due to lung cancer has increased dramatically in the past 50 years reflecting (with a delay of at least 20 years) the uptake of tobacco smoking.¹⁴ The available evidence would confirm that developing countries are also experiencing an epidemiological transition. However, within this transition, it is not clear whether there is an absolute increase in the mortality due to non-communicable diseases or whether the transition is only an increase in its relative importance.

It would be valuable to investigate the secular trends experienced in South Africa. A comprehensive analysis of mortality trends in South Africa is unfortunately not possible. While vital statistics have been collated by the Government since 1949, the political policies have severely compromised their availability and quality. Prior to 1978, mortality data for blacks were only collected in 34 selected magisterial districts (mostly urban based). Full details of these were not published, nor were reliable population data available. The collection of mortality data for blacks was extended to the whole Republic in 1978. However, this excluded the so-called independent homelands of TBVC. Data are available for the analyses of trends in mortality for the whites, coloureds, and Asian population groups for the period 1949-1990. Analyses are therefore restricted to subgroups of the South African population.

Sources of data

The mortality data by cause were obtained from the series of statistical reports on deaths published by the Central Statistical Services. For a complete bibliography of the reports covering the period studied, see Bourne (1995).¹⁵ The period 1949-1985 covers the use of several revisions of the International Classification of Diseases (ICD), the 6th (ICD-6) was in use from 1949 to 1958, the 7th (ICD-7) from 1959 to 1967, the 8th (ICD-8) from 1968 to 1977 and the 9th (ICD-9) from 1978 onwards. Dates given refer to years when the particular ICD revisions were in use in South Africa. The ICD codes are outlined in Appendix I.¹⁶⁻¹⁹

In order to provide a consistent age-specific population in intercensal years and also to allow for corrections to census undercounts, the HSRC's reconstruction of the South African population for the period 1946 to 1985 was used.²⁰ Where age-specific data were given for quinquennia, linear interpolation was used to obtain data for the intervening years.

Wyndham²¹ has argued that to avoid any distortion in cancer mortality rates due to the high childhood mortality in coloureds and blacks, resulting in the consideration of survivor population bias, only adult data should be used. Grounds for this are not substantiated and all ages have been considered. Age-standardised rates have been calculated using the world age standard.²²

Quality of data

Mortality studies are compromised by the difficulties arising from misclassification. These are particularly marked in the case of diabetes, which is often a risk factor for IHD. Its co-existence with heart disease leads to substantial under-reporting of diabetes as an underlying cause when deaths are categorised by single cause.²³ In South Africa, there is extensive under-reporting of death in the rural areas and extensive misclassification of the cause with high proportions of ill-defined cause of death. Secular trends in cause-specific mortality need to be interpreted carefully in the light of deaths coded as ill-defined. Mortality rates for rural blacks have not been included for analyses due to the paucity and poor quality of available data.

In 1990, the signs, symptoms and ill-defined category accounted for 23% of the deaths. The proportion was highest for blacks and lowest for white South Africans as shown in Table III.

The age-specific rates for ill-defined conditions for the period 1984-86 are shown in Figs. 4 and 5, and comprise both childhood and adult deaths. This suggests the ill-defined category could be a combination of infectious and chronic diseases, and is consistent with findings from other countries.²⁴

There are differences according to race and sex. The rates for males are generally slightly higher than those for females while rates for urban blacks are substantially higher than those for coloured, followed by Asians and whites.

Table III. The proportion of deaths in the signs, symptoms and ill-defined category by population group (1990)

Race	Ill-defined
Blacks	29,9%
Whites	10,5%
Coloureds	11,0%
Asians	16,1%

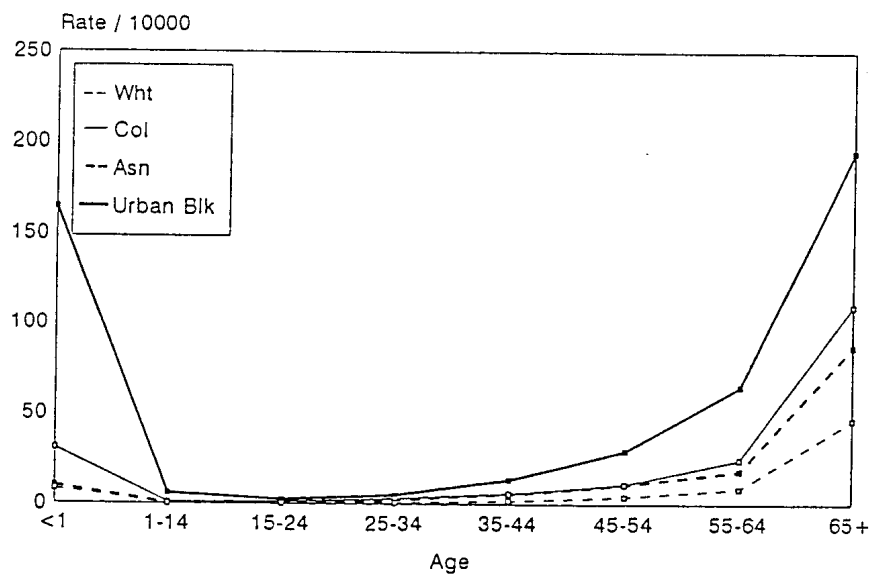


Figure 4. Age-specific death rates for ill-defined conditions in South African males for the period 1984-86

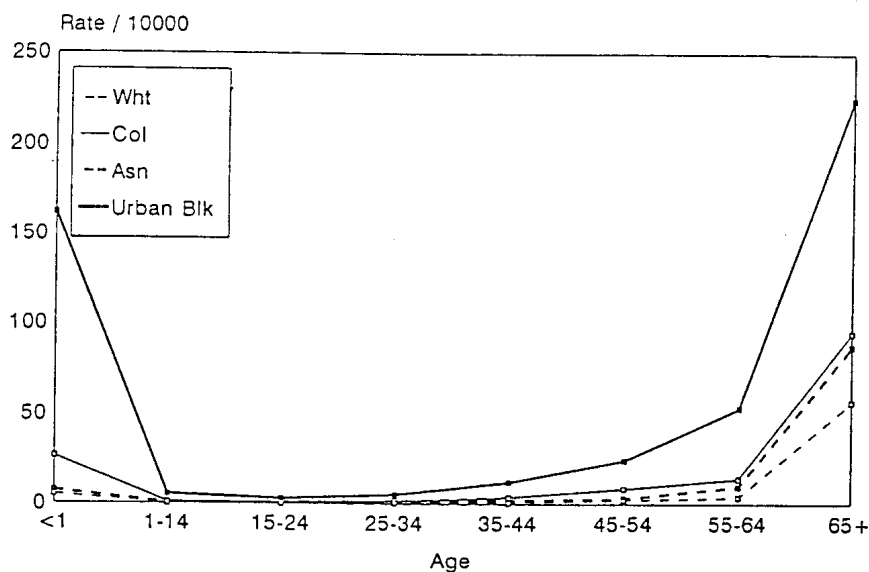


Figure 5. Age-specific death rates for ill-defined conditions in South African females for the period 1984-86

Hypertension, Atherosclerosis and Diabetes (CHAD)

The mortality due to these co-existing conditions varies according to race and sex. The age-specific rates for 1984-86, reflecting an age distribution that could be expected of chronic diseases are shown in Figs. 6-13. The age-standardised rates for the same period are presented in Table IV. The rates are exceedingly high for Asians who experienced consistently high mortality due to hypertension, stroke (CVA), IHD and diabetes mellitus. An example is the highest overall IHD rates for Asians, approximately double the rate for the coloureds.

Although the ill-defined category includes infectious diseases, considering the very high rates of ill-defined deaths in the urban blacks, the actual rates of each CHAD-related disease in this group is likely to be considerably higher. However, it is unlikely that the relative profile of the causes of death in this group would differ. These profiles of all the groups are consistent with the epidemiological transition. In the case of urban blacks, stroke has the highest mortality followed by hypertension and diabetes and then IHD. The reverse is true for white and Asian South Africans where IHD is the highest followed by stroke, diabetes and then hypertension. Coloured South Africans have high mortality for stroke and IHD followed by diabetes and hypertension.

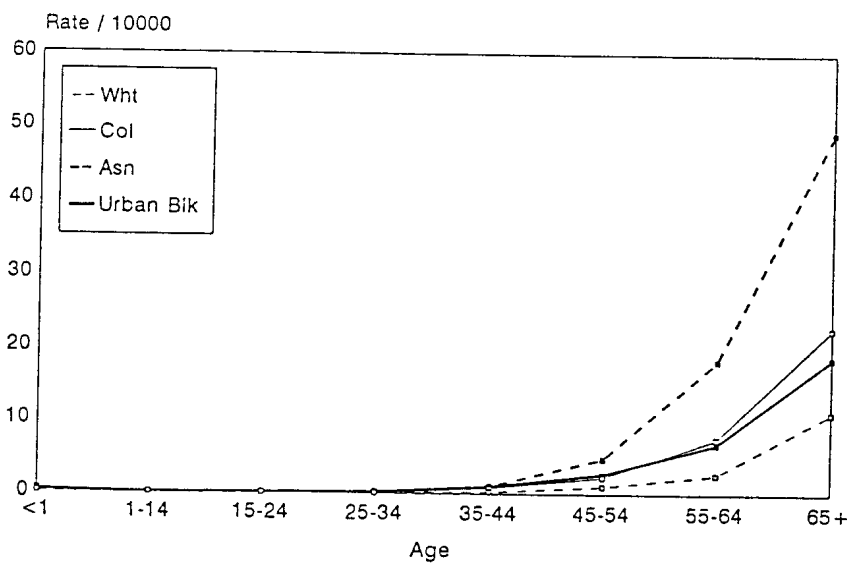


Figure 6. Age-specific death rates for hypertension in South African males for the period 1984-86

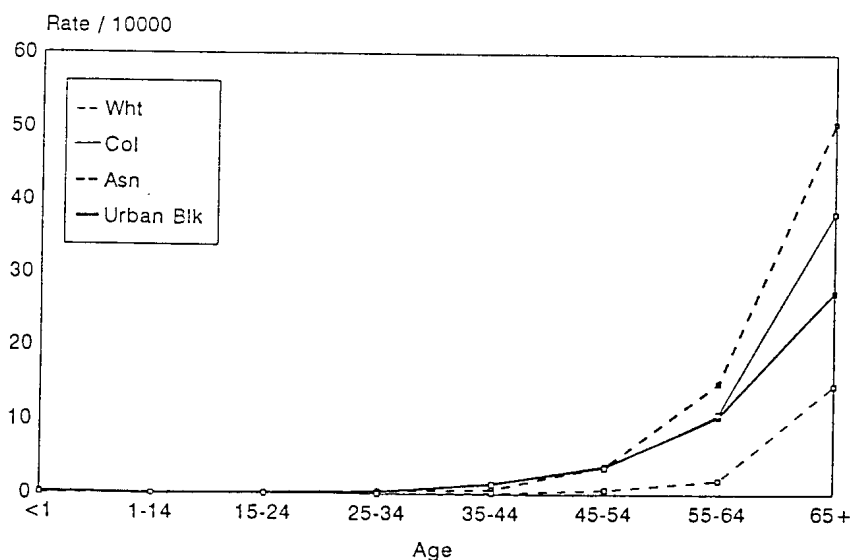


Figure 7. Age-specific death rates for hypertension in South African females for the period 1984-86

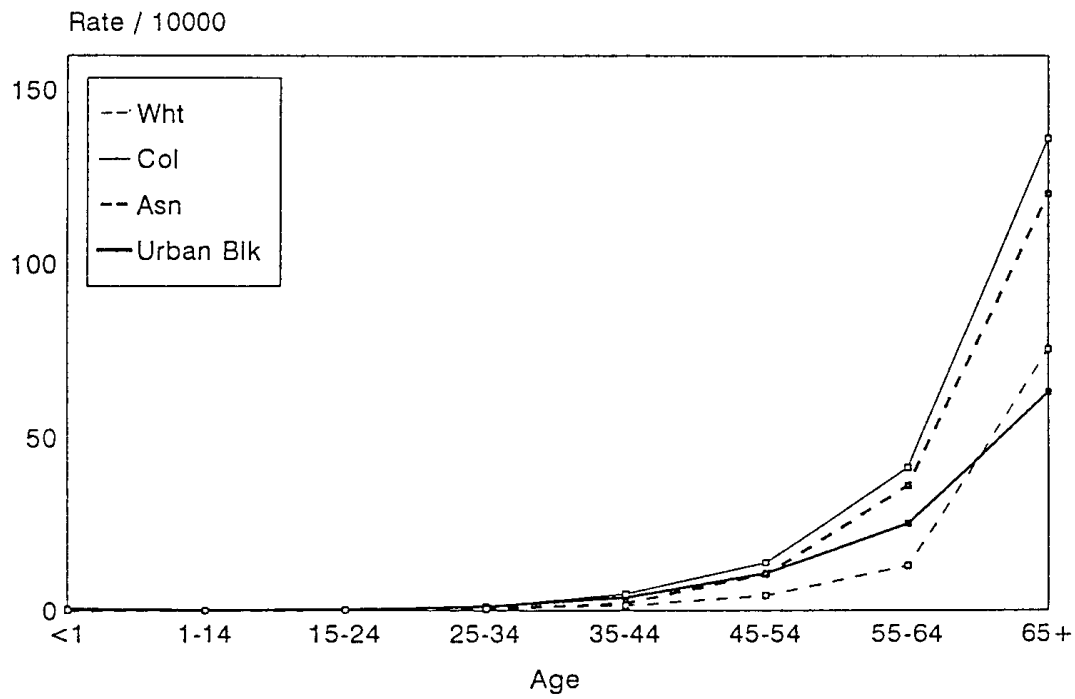


Figure 8. Age-specific death rates for CVA in South African males for the period 1984-86

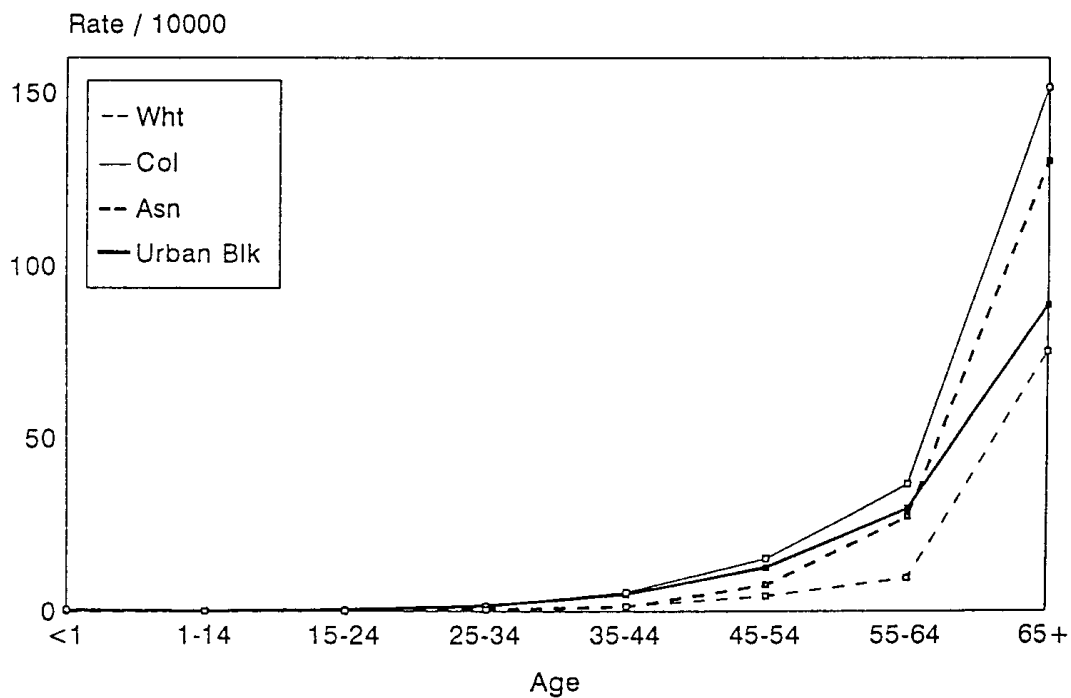


Figure 9. Age-specific death rates for CVA in South African females for the period 1984-86

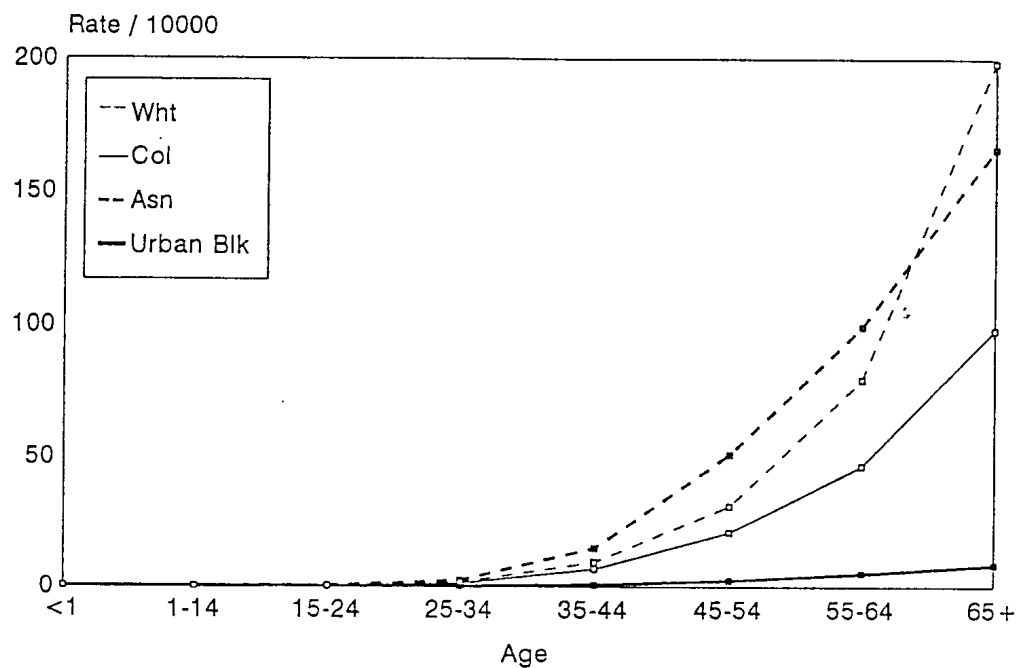


Figure 10. Age-specific death rates for IHD in South African males for the period 1984-86

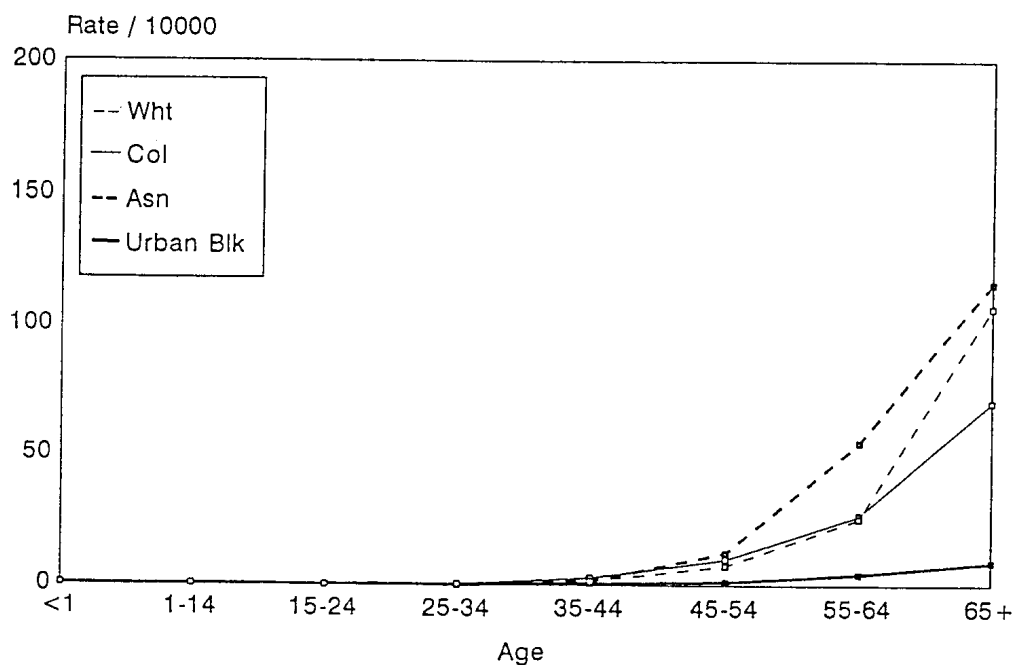


Figure 11. Age-specific death rates for IHD in South African females for the period 1984-86

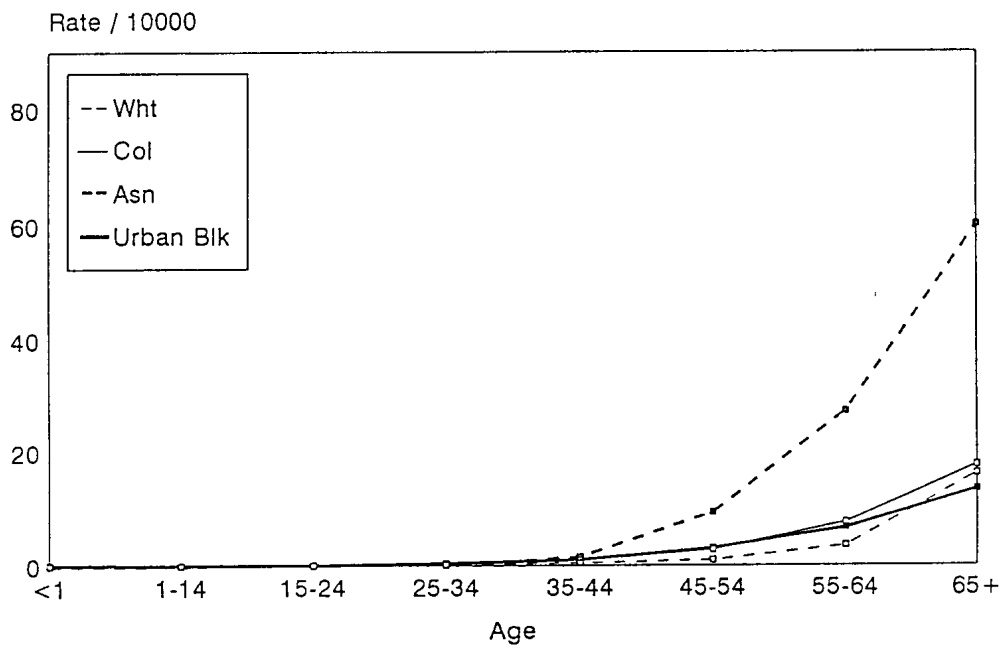


Figure 12. Age-specific death rates for diabetes in South African males for the period 1984-86

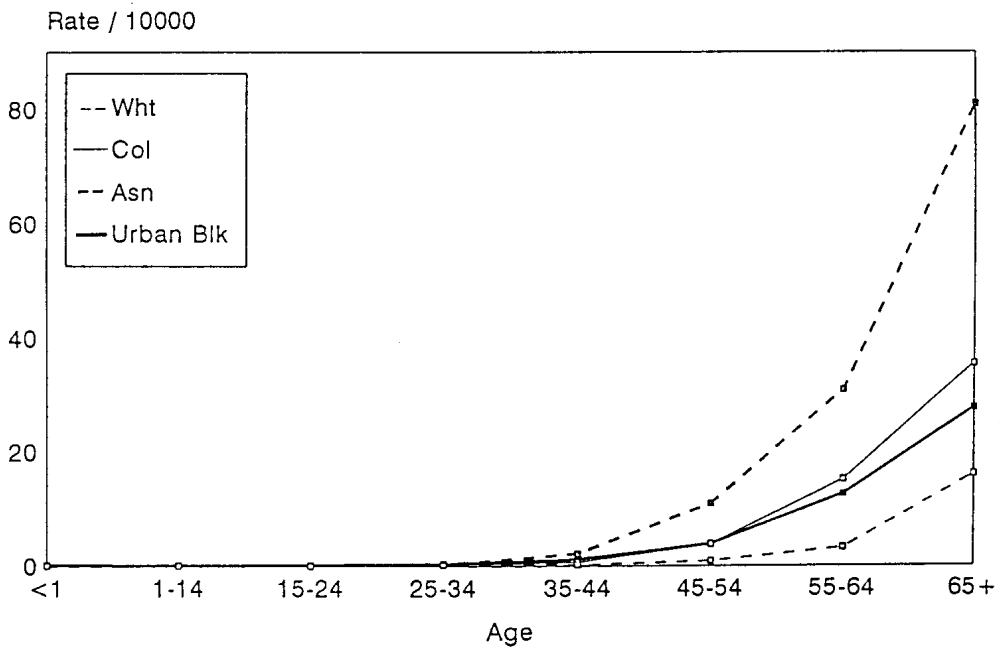


Figure 13. Age-specific death rates for diabetes in South African females for the period 1984-86

Table IV. Age-standardised mortality rates (1984-86) per 100 000 population per annum for CHAD-related and ill-defined causes of death (World Standard Population)

Cause of death	Blacks	Whites		Coloureds		Asians	
	Urban	Urban	Rural	Urban	Rural	Urban	Rural
Hypertension	28,3	12,1	12,7	35,5	34,1	53,2	59,8
Stroke	96,4	68,7	71,4	139,7	176,4	123,9	141,7
IHD	13,1	162,7	187,9	118,7	101,0	206,9	194,6
Diabetes	28,1	15,3	17,2	43,1	26,4	90,0	73,9
Ill-defined	306,1	53,8	41,3	123,3	107,8	96,4	64,6

The age-standardised rates for males and females are presented in Appendix II and the male to female ratio in Table V. Females tend to have higher mortality due to hypertension and diabetes but lower mortality due to IHD when compared to males. Mortality due to stroke does not appear to have a consistent difference between males and females.

Table V. Male to female ratio of age-standardised mortality rates for 1984-86

Cause of death	Blacks	Whites		Coloureds		Asians	
	Urban	Urban	Rural	Urban	Rural	Urban	Rural
Hypertension	0,67	0,92	0,85	0,64	0,59	1,10	0,83
Stroke	0,77	1,04	1,03	1,08	0,82	1,04	0,99
IHD	1,14	2,36	2,47	1,37	1,53	1,92	2,11
Diabetes	0,55	1,07	0,95	0,62	0,48	0,82	0,65
Ill-defined	0,99	1,13	0,81	1,30	1,24	1,26	1,35

Comparing urban and rural rates (Table VI), it would seem as if the rates were reasonably similar between whites and Asians, but that stroke was higher for rural coloureds than for urban coloureds and diabetes was higher for urban coloureds than for rural coloureds. Similar urban/rural trends were observed in males and females separately (Appendix III).

Table VI. Urban to rural ratios of age-standardised mortality rates for 1984-86

Cause of death	Whites	Asians	Coloureds
Hypertension	0,95	0,89	1,04
Stroke	0,96	0,87	0,79
IHD	0,87	1,06	1,18
Diabetes	0,89	1,22	1,63
Ill-defined	1,30	1,49	1,14

The secular trends from 1949 - 1985 in stroke, IHD and diabetes mortality are shown in Figs. 14-19 against the trends in the ill-defined category. While there are clear anomalies in the reported data (e.g. IHD mortality for coloured males from 1959-1967), it is possible to identify major trends.

Similar to the experience in developed countries there appears to have been a rise and fall in stroke and IHD mortality in the three race groups, although the peak (often flattened) occurs at differing times for the different race/sex groups. The rise and fall of IHD mortality in these groups have been demonstrated previously,²⁵⁻²⁸ as well as the pattern of a downward trend in stroke mortality.²⁵ However, it can be seen from the graphs that the downward trends often accompany upward trends in the ill-defined category. Lancaster²³ has suggested that there is evidence that the transfer of some causes of death from one ICD class to another, as well as changes in the prevailing ideas of etiology and diagnosis have contributed to the downward trends observed in the United States of America and the United Kingdom. It is possible that CHAD-related mortality in white, coloured and Asian South Africans is remaining at much the same level and that the downward trends are artefacts of the classification of causes of death.

Diabetes is generally underestimated when a single cause of death is coded as in the case of South Africa. It is interesting to note that despite the increase in the ill-defined category, the diabetes mortality rates have increased. However, these increases are also consistent with the possibility of changing practices in diagnosis and coding with a shift from IHD to diabetes as the underlying cause. This phenomenon has been experienced in the United States of America in the last few years.²⁹

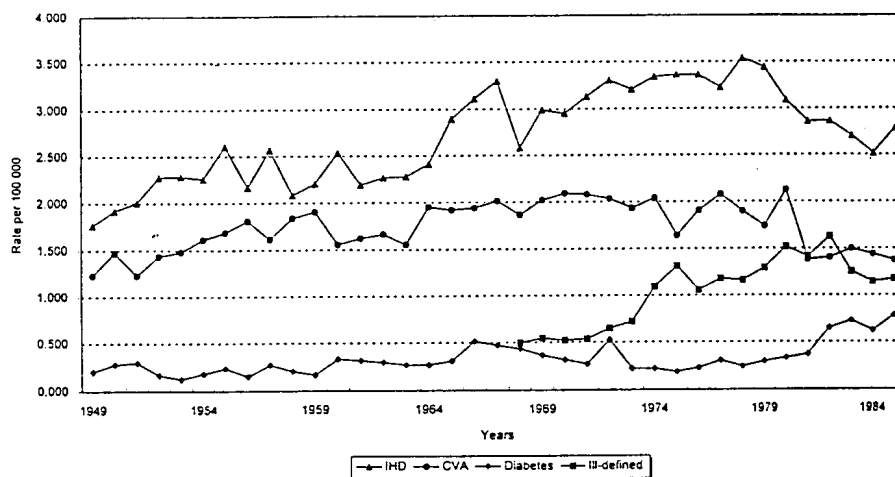


Figure 14. Age-standardised mortality rates for CHAD-related diseases in Asian males 1949-85

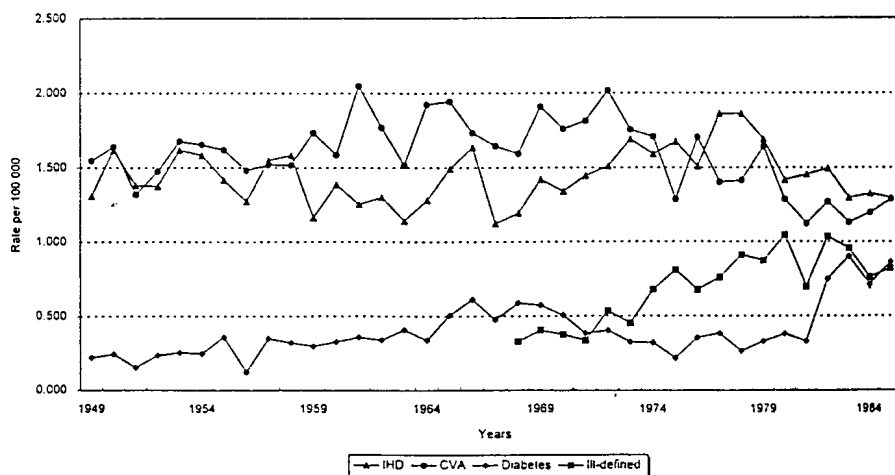


Figure 15. Age-standardised mortality rates for CHAD-related diseases in Asian females 1949-85

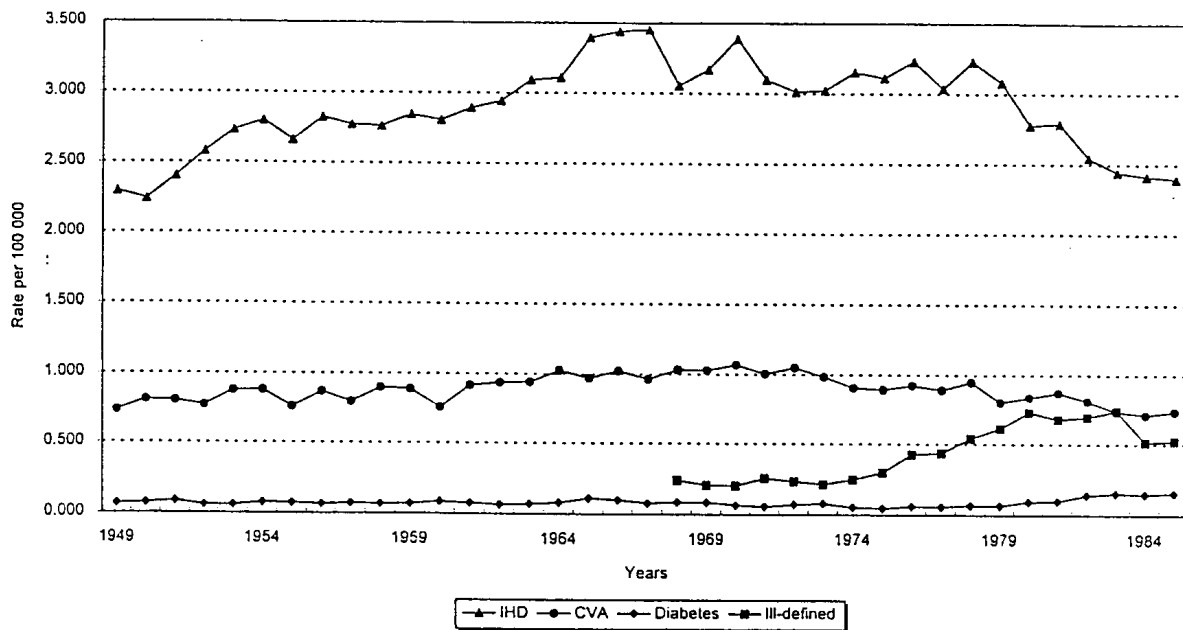


Figure 16. Age-standardised mortality rates for CHAD-related diseases in white males 1949-85

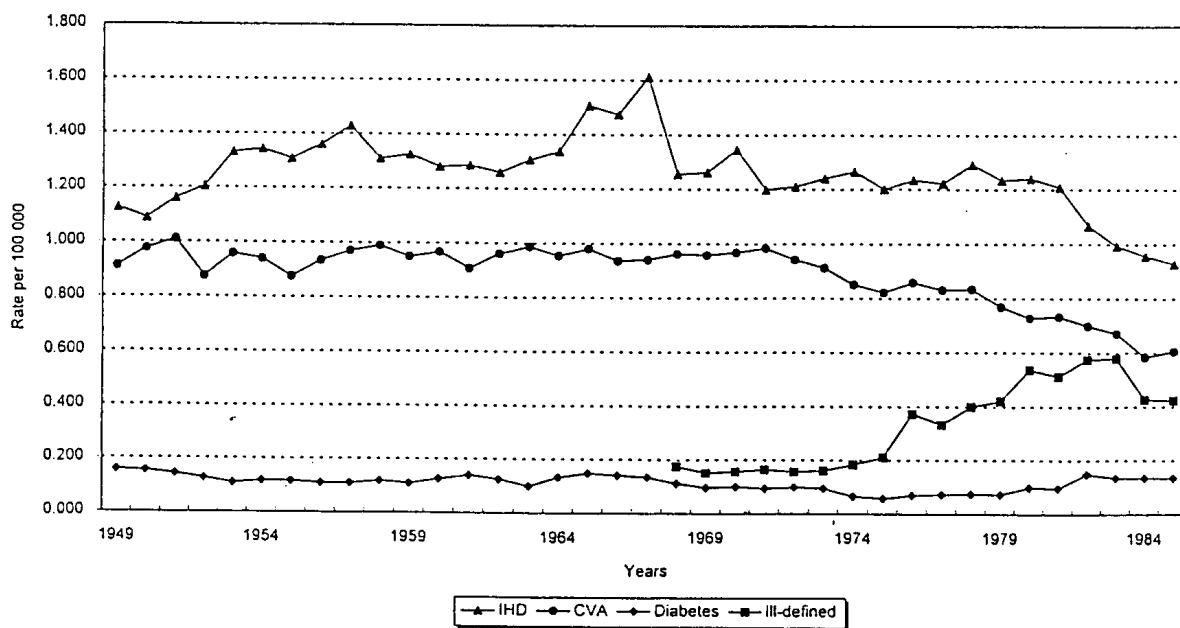


Figure 17. Age-standardised mortality rates for CHAD-related diseases in white females 1949-85

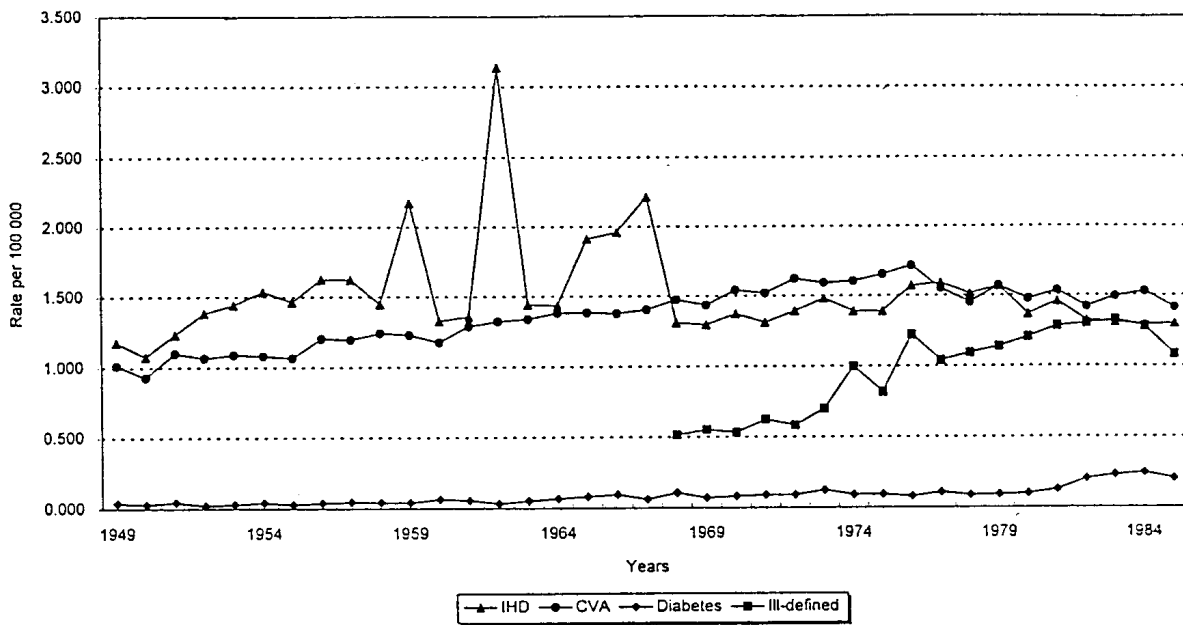


Figure 18. Age-standardised mortality rates for CHAD-related diseases in coloured males 1949-85

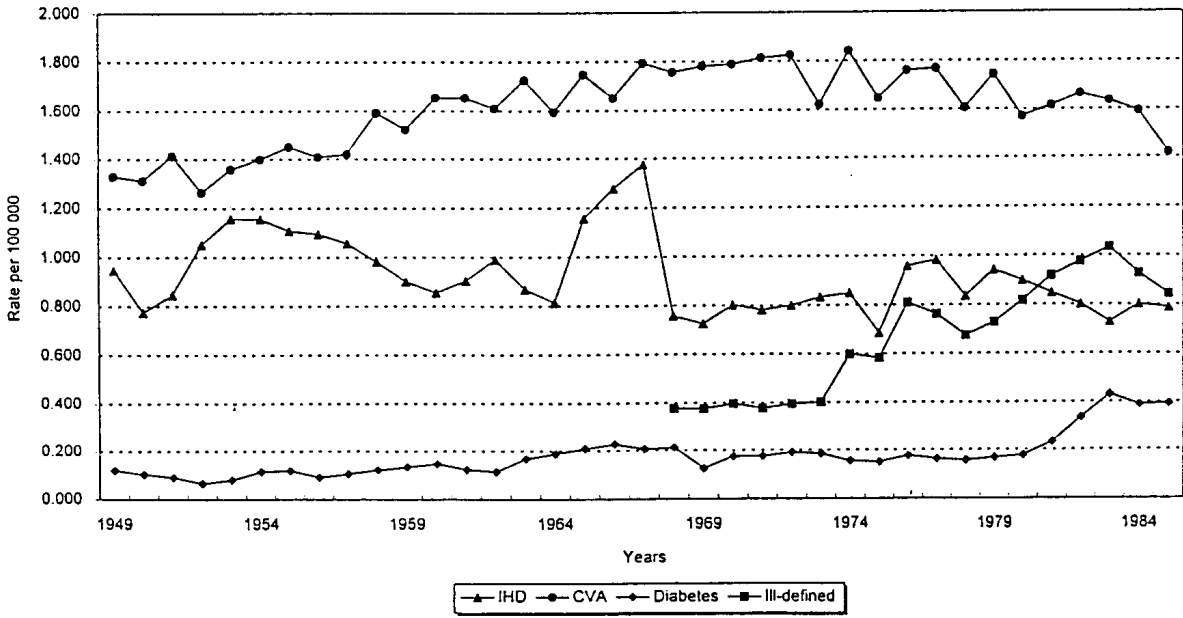


Figure 19. Age-standardised mortality rates for CHAD-related diseases in coloured females 1949-85

The geographic distribution of the relative levels of mortality based on the Standardised Mortality Ratios (SMRs) for stroke (CVA) and IHD for 1970 and 1985 for coloureds are presented in the maps on pages 24 and 25. The maps indicate the districts with statistically significant differences from the average mortality rate for the whole country. Districts where the expected number of deaths were fewer than 10 have not been indicated so as to reduce the effects of random fluctuations. For CVA very similar patterns are shown for males and females. The CVA maps on page 24 show significantly high CVA rates occurred in non-urban areas. This high CVA mortality in the rural areas of the Western Cape specifically among females, fits in with the disease profile experienced earlier in the health transition. IHD on the other hand is more of an urban phenomena and fits the later transition disease profile, occurring in subsections of the population further along the health transition path. From the IHD maps, it can be seen that there are statistically significant high mortality rates for IHD for both sexes for 1970 and 1985 in the Cape Peninsula. IHD was statistically significant (95%) in Cathcart (Eastern Cape) and Belfast (Mpumalanga) in 1985. When comparing the 1985 patterns with those of 1970 it appears that the risk factors for IHD are not remaining limited to the urban areas but could be spreading to rural areas. In 1985 the significantly high SMRs for both diseases fell in non-urban and peri-urban areas, and were not only confined to the urban areas.

There is some evidence of a similarity between the spatial trends in stroke and IHD. Areas, such as Williston (Northern Cape), Vryburg and Klerksdorp (North-West), had statistically high SMRs in 1985 for both diseases and sexes. Except for coloured females in 1985, Bethlehem (Orange Free State) and Albert (Eastern Cape) were significantly high for IHD and CVA for males and females for 1985.

The relatively high stroke mortality in the southern Cape region and Gordonia (Northern Cape) among females is not found in the males nor in the IHD patterns.

The long latency period for the development of these diseases implies that the temporal changes in the geographical distribution would result from changes in the risk factors that occurred during an earlier period. However, one factor that would have a more immediate impact would be migration.

The coloured population comprises approximately one-eighth of the total population, who mainly live in the Western, Eastern and Northern Cape. Approximately 25% live in the non-urban areas. Zietsman³⁰ found that during 1975 and 1980 there was clear evidence of depopulation from the central Cape areas as well as a shifting from the Cape to areas in the Transvaal. Cilliers and Raubenheimer³¹ also observed a relative increase in the number of coloured people in parts of the Orange Free State and the Transvaal during this period.

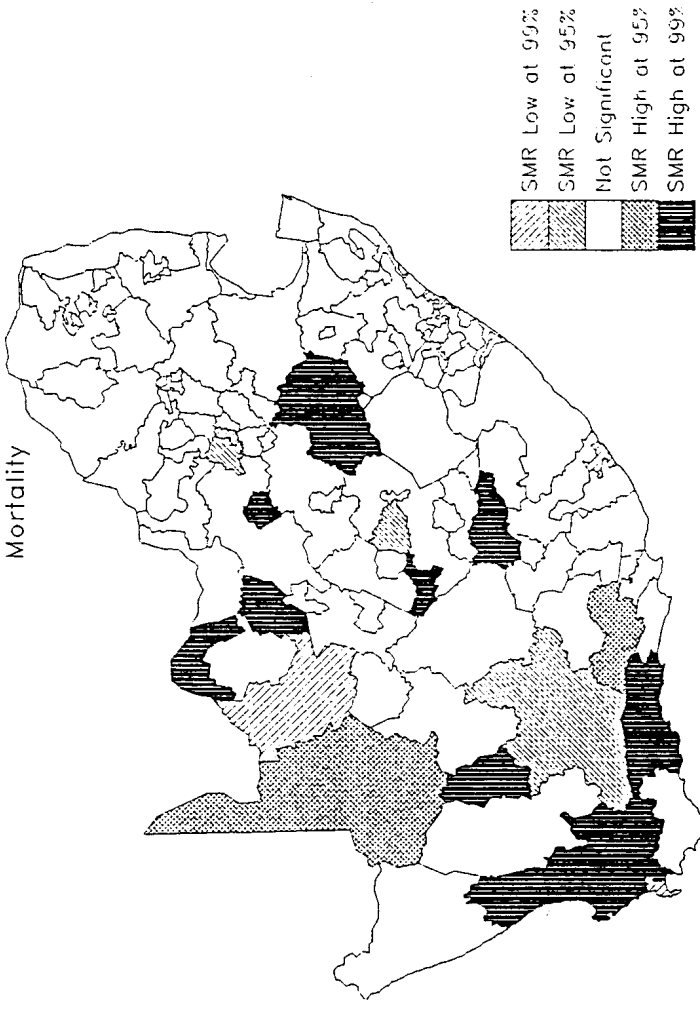
The overall SMR patterns as depicted on the maps are generally consistent with the migration pattern of the coloured population in South Africa. One anomaly being the highly significant IHD rate for coloured males in 1970 for Bethlehem (Orange Free State) which persists for 1985. The SMR for Kimberley (Northern Cape) is highly significant for IHD for both males and females in 1970, but not significant for both sexes in 1985. An interpretation of this is difficult.

Some lifestyle-related cancers

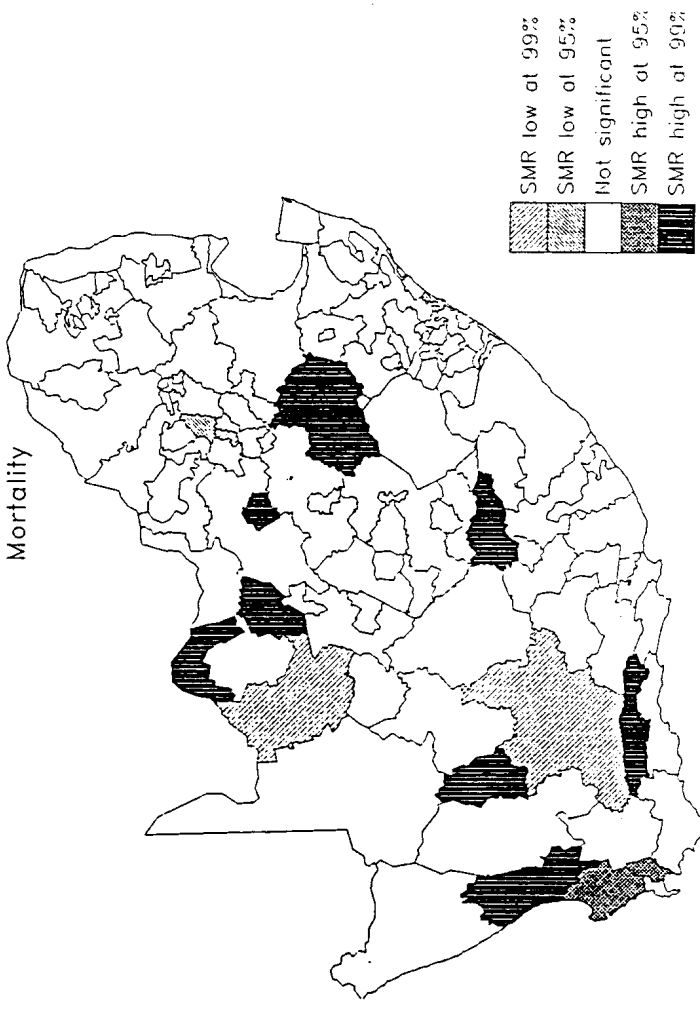
The most obvious cancer related to lifestyle is lung cancer, which has been clearly demonstrated to be associated with cigarette smoking. Other cancers that were examined are breast cancer, possibly associated with nutrition and smoking, and cervical cancers, which may be linked to sexual behaviour. The age-standardised rates for these are shown in Figs. 20-23 for 1984-86. In several cases the age distribution follows an "S" shape rather than the progressive increase with age, usually seen for degenerative diseases. This "S" shape would be consequent to an exposure being introduced at a certain age resulting in a more sudden increase with age. This is particularly noticeable in lung cancer in coloured males, and cervical cancer in coloured females.

The age-standardised rates are represented in Table VII along with the ill-defined category. While Doll³² has argued that cancers are less likely to fall into this category or to be undetected, it is likely that the extent of cancers is underestimated for the urban blacks and that some of the cancer deaths are classified as ill-defined.

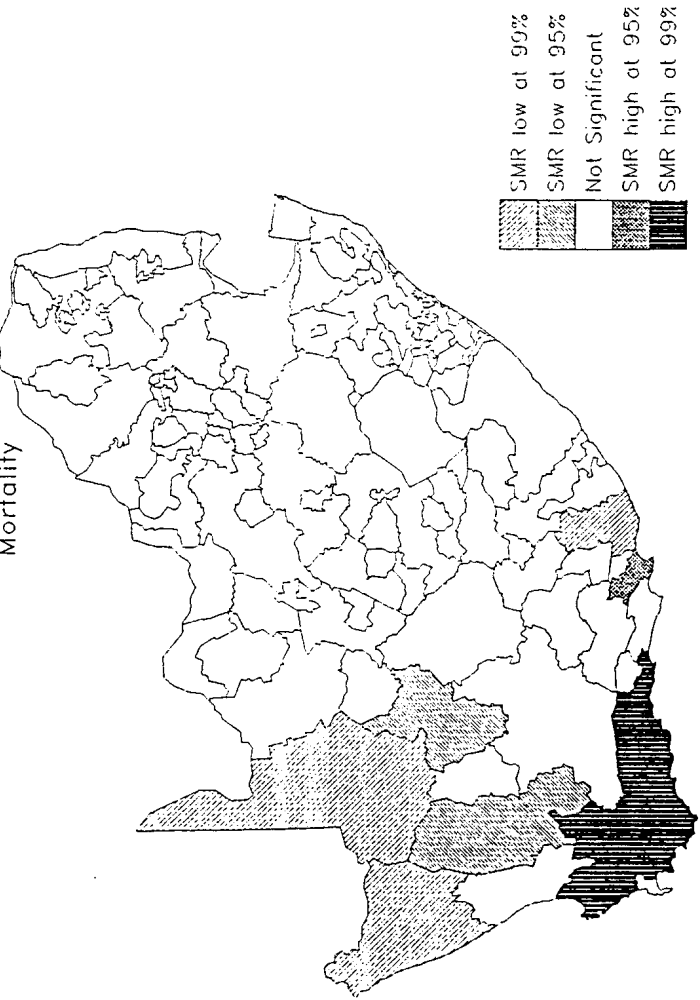
CVA - Coloured Females - 1985
Mortality



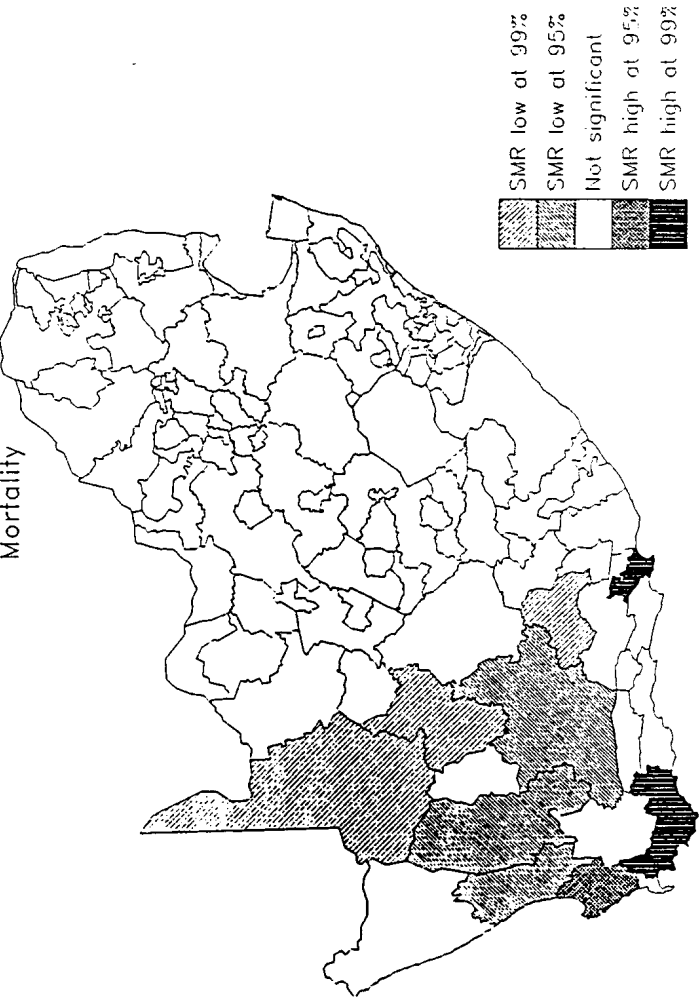
CVA - Coloured Males - 1985
Mortality



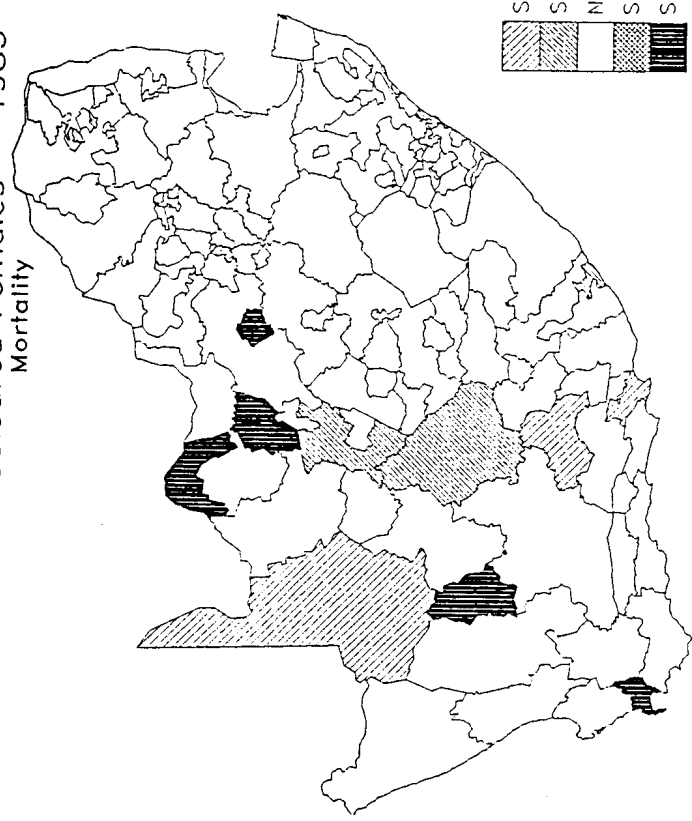
CVA - Coloured Females - 1970
Mortality



CVA - Coloured Males - 1970
Mortality

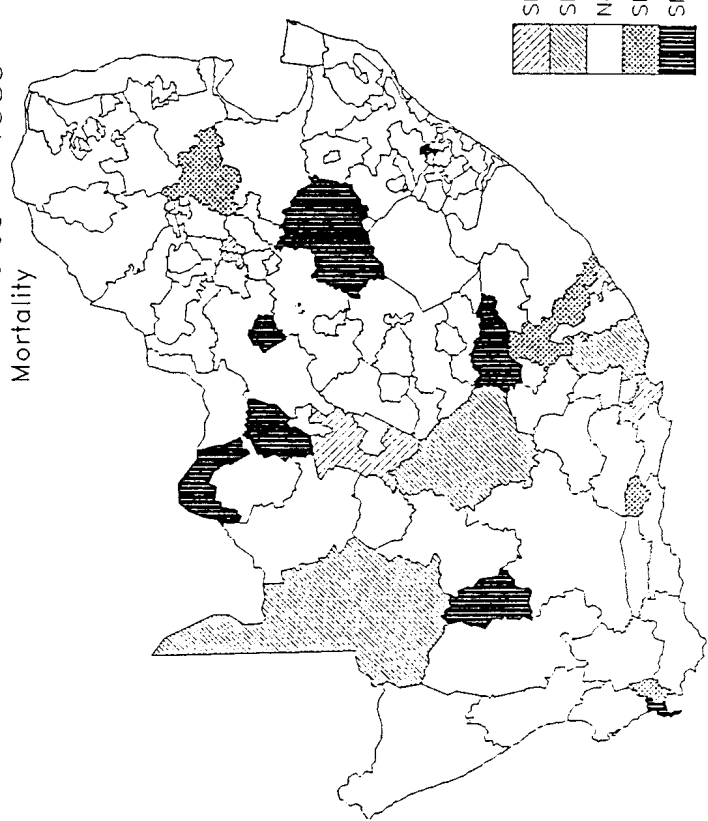


IHD - Coloured females - 1985
Mortality



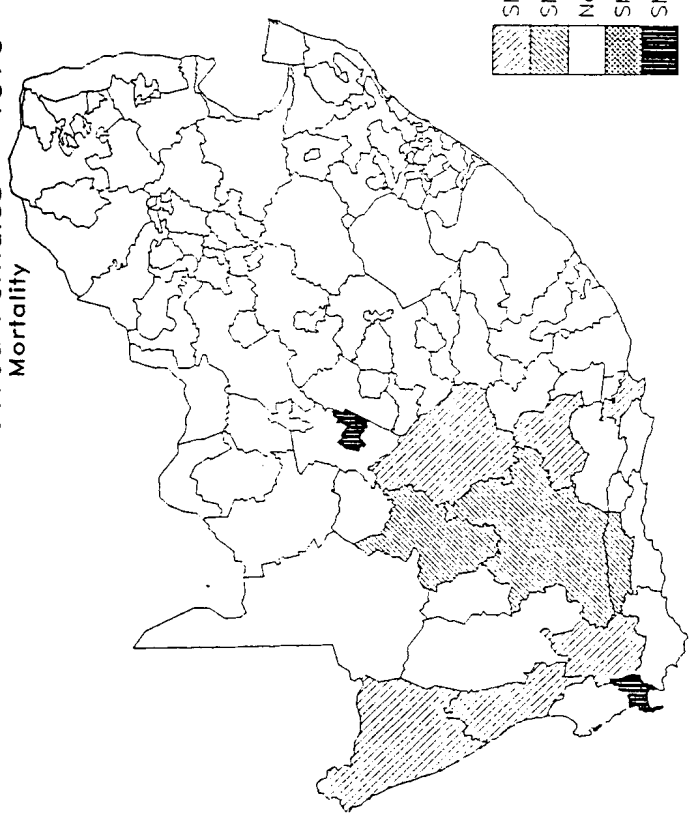
SMR low at 99%
SMR low at 95%
Not Significant
SMR high at 95%
SMR high at 99%

IHD - Coloured Males - 1985
Mortality



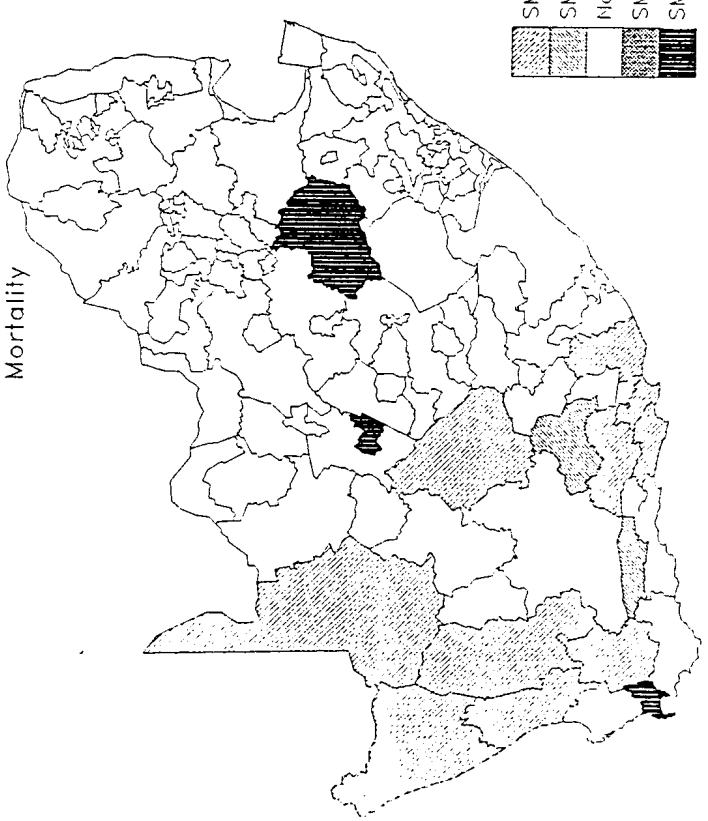
SMR Low at 99%
SMR Low at 95%
Not Significant
SMR High at 95%
SMR High at 99%

Mortality



SMR low at 99%
SMR low at 95%
Not Significant
SMR High at 95%
SMR High at 99%

IHD - Coloured Males - 1970
Mortality



SMR low at 99%
SMR low at 95%
Not significant
SMR high at 95%
SMR high at 99%

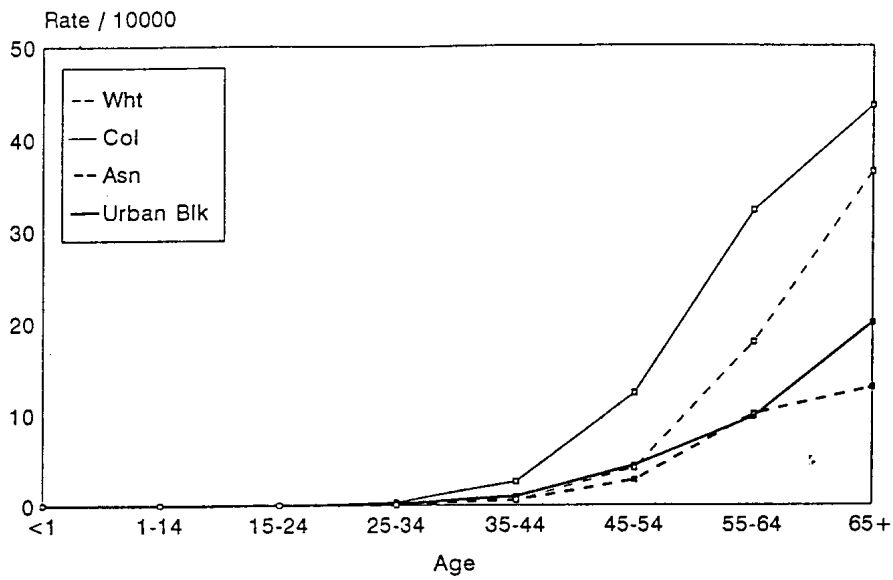


Figure 20. Age-specific mortality rates for lung cancer in South African males for the period 1984-86

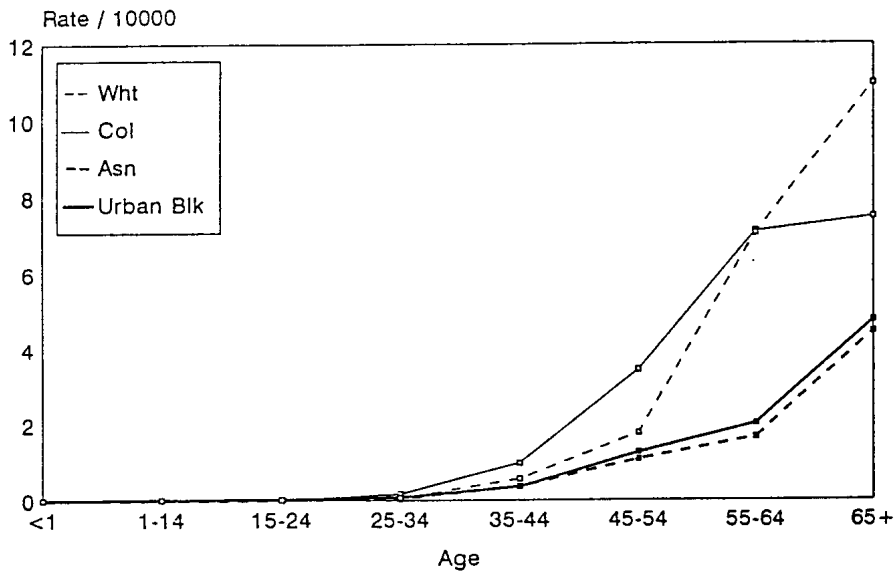


Figure 21. Age-specific mortality rates for lung cancer in South African females for the period 1984-86

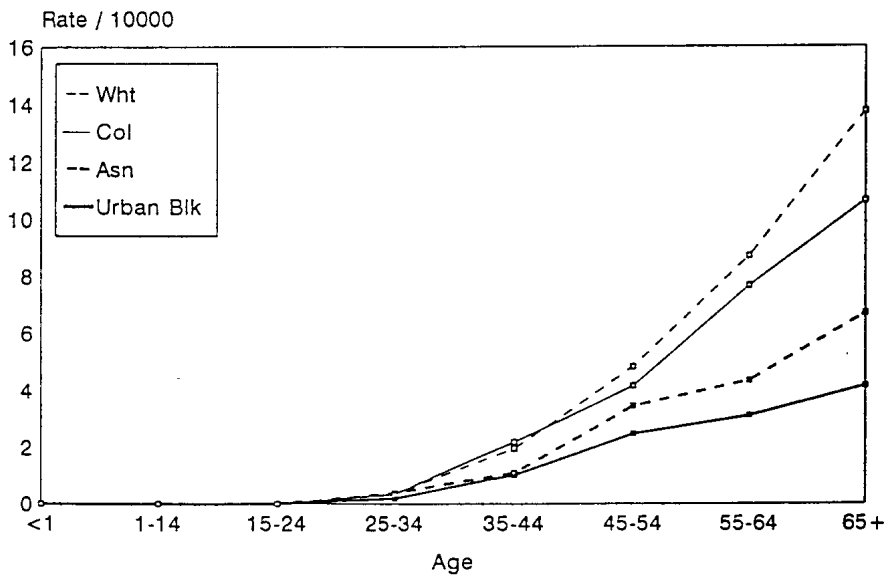


Figure 22. Age-specific mortality rates for cancer of the breast for the period 1984-86

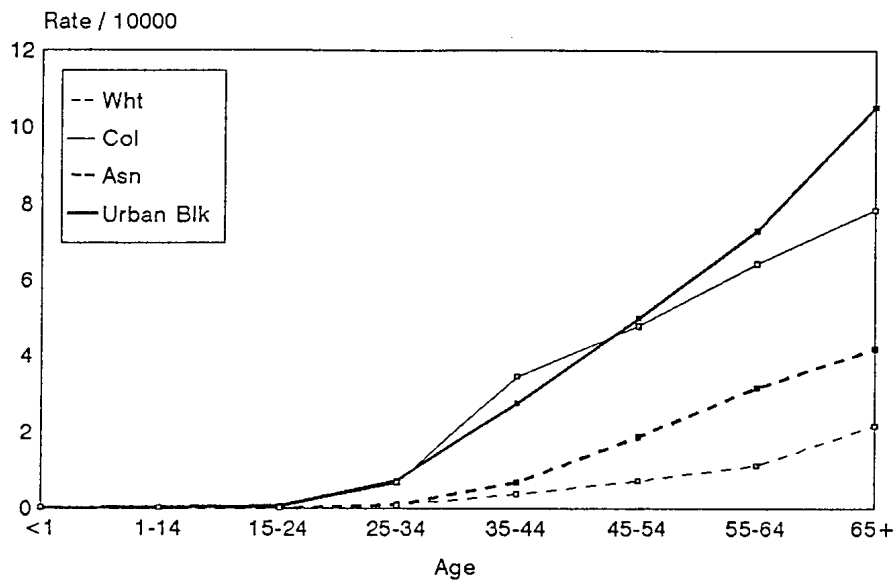


Figure 23. Age-specific mortality rates for cervical cancer for the period 1984-86

VII. Age-standardised mortality rates (1984-86) per 100 000 population per annum due to selected cancers (World Standard Population)

Cause of death	Blacks	Whites		Coloureds		Asians	
	Urban	Urban	Rural	Urban	Rural	Urban	Rural
Lung	18,1	30,8	23,8	47,1	36,7	13,5	11,6
Breast	9,6	26,0	21,8	26,4	15,7	14,6	9,2
Cervical	23,1	3,8	3,5	18,0	24,5	8,9	6,0
Ill-defined	306,1	53,8	41,3	123,3	107,8	96,4	64,6

The age-standardised lung cancer mortality rates for males and females as well as the male to female ratios are shown in Table VIII and urban rural ratios for the selected cancers are shown in Table IX. The rates for coloured males stand out as being particularly high for whom the urban rural differences are more marked. Secular trends are shown in Figs. 24-27. Lung cancer mortality rates demonstrate alarming increases, particularly for the coloured males. This contrasts with other cancers being fairly constant throughout the period.³³

Table VIII. Age-standardised lung cancer mortality rates (1984-86) per 100 000 population per annum for males and females (World Standard Population)

Gender	Blacks	Whites		Coloureds		Asians	
	Urban	Urban	Rural	Urban	Rural	Urban	Rural
Males	27,9	48,7	37,3	88,4	61,1	21,8	16,4
Females	7,0	17,5	12,8	17,7	14,6	6,0	6,9
Male:Female	4,0	2,8	2,9	5,0	4,2	3,6	2,4

Table IX. Urban to rural ratios of age-standardised mortality rates for 1984-86

Cause of death	Whites	Coloureds	Asians
Lung male	1,3	1,4	1,3
Lung female	1,4	1,2	0,9
Breast	1,2	1,7	1,6
Cervical	1,1	0,7	1,5

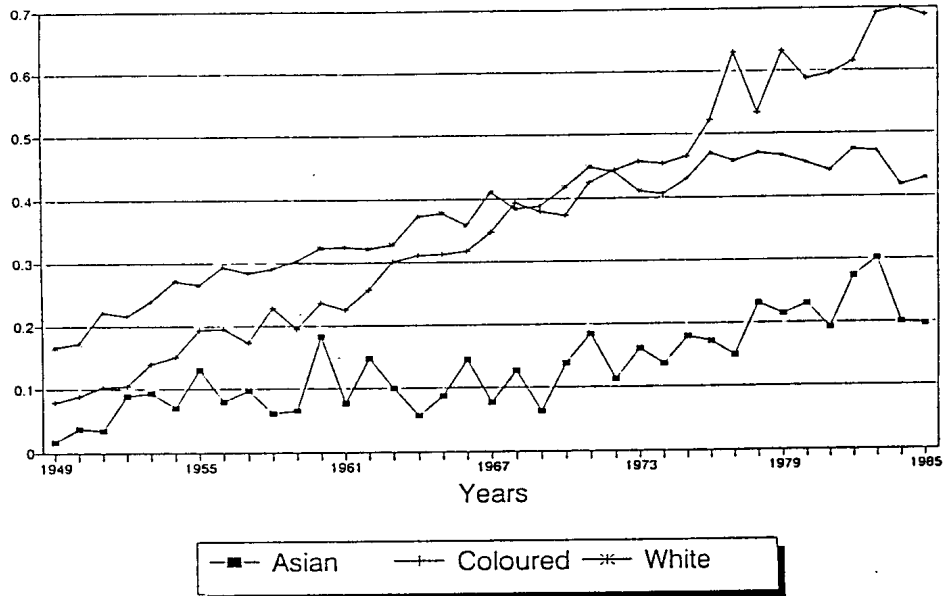


Figure 24. Age-standardised mortality rates for lung cancer in males 1949-85

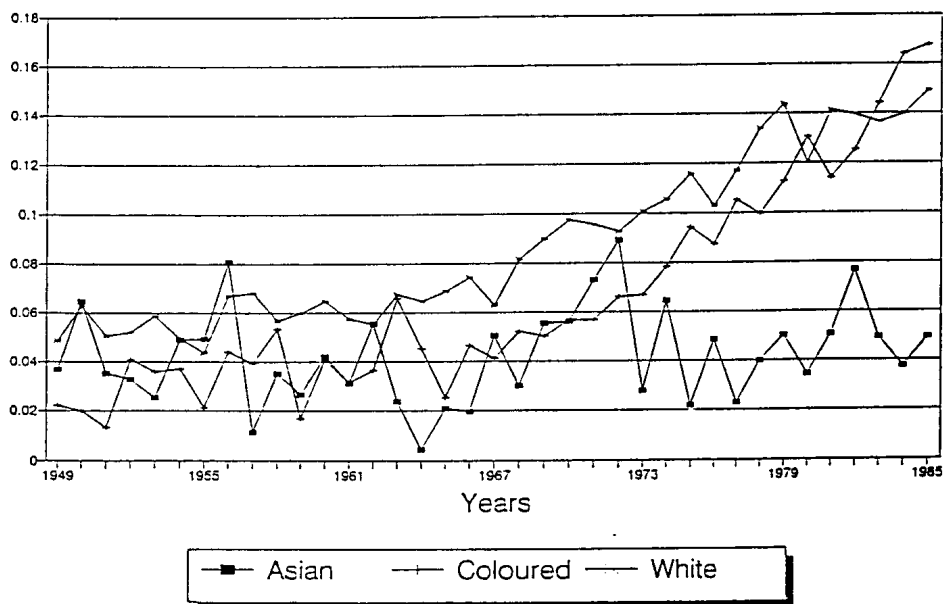


Figure 25. Age-standardised mortality rates for lung cancer in females 1949-85

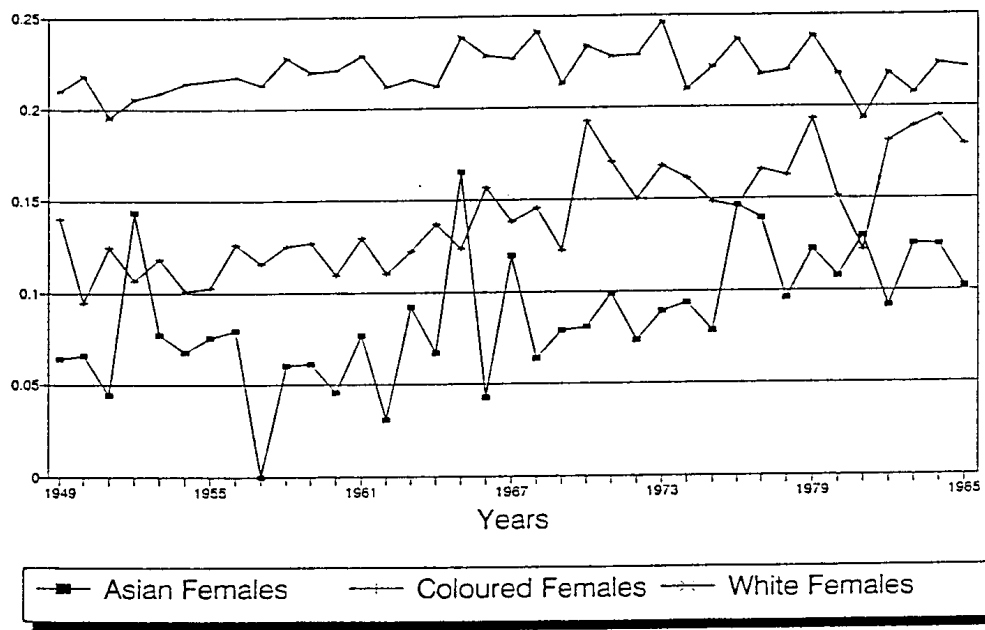


Figure 26. Age-standardised mortality rates for cancer of the breast 1949-85

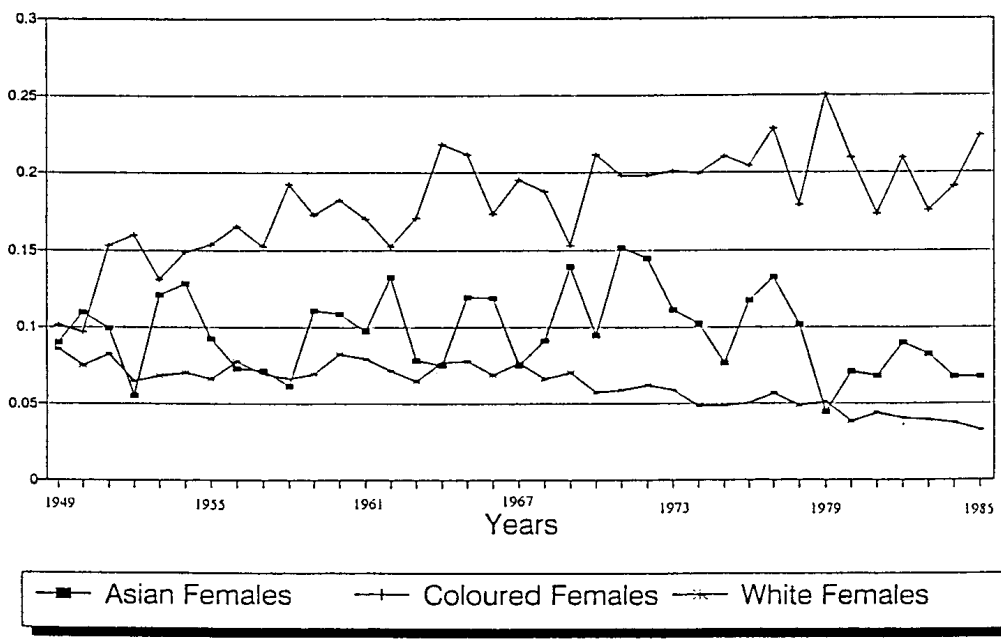


Figure 27. Age-standardised mortality rates for cervical cancer 1949-85

CONCLUSION

In South Africa, chronic disease presents a complex configuration both within and across the different population groups for various stratifications. When examining mortality, urban blacks have high rates of hypertension and stroke relative to IHD together with a very large percentage of deaths classified as ill-defined. IHD mortality rates are very high for Asians and whites. The data suggest that previous evidence of the apparent decline in IHD could be the result of changes in the coding system. Both IHD and stroke are high for coloureds with no conclusive evidence of a decline due to these causes. In addition there are very high lung and breast cancer mortality rates especially for coloured South Africans. The increase in lung cancer is particularly marked for this group. Cervical cancer rates are high for black and coloured women.

The mortality patterns clearly suggest that South Africa is also in the process of epidemiological transition. There is evidence of bipolarisation and it will be critical that the RDP succeeds in order to avoid extended protraction of the pre-transitional health problems. The World Development Report 1993³⁴ and others advocate investing in health as a means of accelerating development. It is argued that good health increases the productivity of individuals and therefore the economic growth rates of countries. Investment in health leads to economic upliftment affecting factors such as income, education, employment status and occupation that impact on fertility and mortality trends. However, economic recession and inequalities would result in the re-emergence of the communicable diseases.

In South Africa where, for historical reasons, socio-economic status and race tend to overlap, the population groups appear to be at different stages of the health transition spectrum in terms of the espoused protracted polarised health transition. Unfortunately, the available data do not allow clear classification of the economic differences within the groups and consequent variation in the health transitional stage.

Genetic factors may play a role in the health transition and should be taken into account when analysing trends. If one wants to influence the progression of the health transition, important variables to take into consideration are the environment, lifestyle and access to health care (both curative and preventive). Access to health care is a particularly relevant variable in South Africa, with the apartheid policies of the past having distorted access to health services. For example, the declining trends of cervical cancer in white women may be related to better access to health services and health education.

Health policy in South Africa is in a profound state of transition during this period of democratisation. Emphasis is appropriately being placed on the primary health care approach. In other developing countries, primary health care has tended to focus on strategies aimed at improving maternal and child health and preventing infectious diseases. While South Africa must address these priorities, the mortality patterns demonstrate that in the longer run it is crucial that cost-effective interventions to prevent, treat and manage CDL must be incorporated into a comprehensive primary health care strategy alongside the other specific aspects of health in South Africa such as violence/trauma and HIV/AIDS. Unlike intervention strategies to promote child health, strategies to promote adult health are more complex, take longer to become effective and require complex intersectoral and political support.³⁵ The comprehensive health plan must also take cognisance of the fact that the proportion of CDL-related mortality differs across the nine provinces and that some provinces are further ahead in the health transition.

When considering health policy related to chronic diseases, the escalating health care costs associated with increasing levels of chronic disease make it imperative to emphasise health promotion and the prevention of disease. This must be at the level of attempting to prevent the very emergence and establishment of lifestyles associated with elevated risk of disease through timely health education. At the same time it is crucial to provide good management of the chronic diseases at the primary care level in order to reduce complications. This would include early detection of chronic disease conditions. Health policy should be broadened so as to encompass the healthy population

and aim at keeping it healthy, and the importance of improving the quality of life of those with disabling chronic conditions should be an acknowledged goal for health care.

Understanding the mortality pattern experienced in South Africa is fraught with limitations due to the paucity of data. The collection and collation of vital statistics must receive urgent attention, particularly in the rural areas so that comprehensive mortality analyses may be undertaken. Adult mortality levels should be monitored regularly alongside the generally accepted childhood mortality indicators. The risk of a 15-year-old dying before the age of 60 years (45Q15) provides a very useful indicator for adult health and this should be included in the health information system being set up to monitor progress in the health sector.

The main problems of death registration that need to be addressed are those of under-reporting and misclassification. The large catch-all category of ill-defined for underlying cause of deaths needs to be drastically reduced. Data on multiple causes of death need to be recorded from death certificates in order to allow the emergence of a clearer picture of mortality patterns of chronic diseases in South Africa.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the technical assistance of Dr Christine Selvey, Mr Richard Matzopoulos, Ms Aneleh Midgley and Dr Anita Heeren. We also appreciate the contribution made by Dr Krisela Steyn.

REFERENCES

1. Omran A. "The Epidemiologic Transition: A Theory of the Epidemiology of Population Change." *Milbank Memorial Fund Quarterly* 1971;**49**:509-538.
2. Mazur RE. *Population Structure, Fertility and Childhood Mortality in South Africa: Lessons to Be Learned From Analysis of the Poverty Survey*. Parowvallei: CERSA, 1995.
3. Frenk J, Bobadilla JL, Sepúlveda J, Cervantes LM. Health transition in middle-income countries: new challenges for health care. *Health Policy and Planning* 1989;**4**(1):29-39.
4. Omran AR. The Epidemiologic Transition Theory: A preliminary update. *J Trop Pediatr* 1983;**29**:305-316.
5. Bradshaw D, Dorrington RE, Sitas F. The level of mortality in South Africa in 1985 - what does it tell us about health? *SAMJ* 1992;**82**:237-240.
6. Bradshaw D, Laubscher R, Schneider M. *Estimated Cause of Death Profiles for the Nine New Provinces Based on 1990 Data*. A technical report of the Centre for Epidemiological Research in Southern Africa, the Medical Research Council. February 1995.
7. Faechem RGA, Kjellstrom T, Murray CJ, Over M, Philips MA. *The Health of Adults in the Developing World*. New York: Oxford University Press, 1992.
8. Bradshaw D, Dorrington RE, Sitas F. *Trends in adult mortality in South Africa, 1920-1985*. Paper presented at the 5th African Regional Meeting of the IEA, 1994.
9. Murray CJL, Chen LC. In search of a contemporary theory for understanding mortality change. *Soc Sci Med* 1993;**36**(2):143-155.
10. Steyn K, Fourie J, Bradshaw D. The impact of chronic diseases of lifestyle and their major risk factors on mortality in South Africa. *SAMJ* 1992;**82**:227-231.
11. Kark SL. *The Practice of Community-Oriental Primary Health Care*. USA: Prentice Hall International, 1989.
12. Mann GV. Lifestyle and Disease: The South African window. *SAMJ* 1982;**61**:962-965.
13. Botha JL, Bradshaw D. African Vital Statistics - a black hole? *SAMJ* 1985;**67**:977-981.
14. Barnum H, Greenberg ER. Cancers. In: Jamison DT, Mosely WH, Measham AR, Bobadilla JL, eds. *Disease Control Priorities in Developing Countries*. New York: Oxford University Press, 1993.
15. Bourne DE. Sources of South African Mortality Data 1910-1992. *SAMJ* 1995;(in press).
16. World Health Organisation. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*. Sixth Revision of the International Lists of Diseases and causes of Death, adopted 1948. Geneva: WHO, 1948.
17. World Health Organisation. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*. Based on Recommendations of the Seventh Revision Conference, 1955, adopted by the 9th World Health Assembly. Geneva: WHO, 1957.
18. World Health Organisation. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*. Based on Recommendations of the Eighth Revision Conference, 1965, adopted by the 19th World Health Assembly. Geneva: WHO, 1969.
19. World Health Organisation. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*. Ninth Revision. Geneva: WHO, 1977.
20. Van Tonder JL, Mostert WP, Hofmeyer BE. *Rekonstruksie van die sensus ouderdom van die Suid-Afrikaanse Asier-, Blanke, en Kleurling bevolkings: 1946 tot 1985*. Pretoria: Human Sciences Research Council, 1987.
21. Wyndham CH. Comparison and ranking of cancer mortality rates in the various populations of the RSA in 1970. *SAMJ* 1985;**67**:584-587.
22. Doll R, Payne P, Waterhouse J. *Cancer Incidence in Five Continents*. Geneva: International Union Against Cancer by Springer-Verlag Berlin, Heidelberg, 1966.
23. Lancaster HO. *Expectations of Life: A Study in the Demographic Statistics and History of World Mortality*. New York: Springer-Verlag, 1990.
24. Preston SH. *Mortality Patterns in National Populations: With Special Reference to Recorded Causes of Death*. New York: Academic Press, 1976.
25. Wyndham CH. Trends with time of cardiovascular mortality rates in the populations of the RSA for the period 1968-1977. *SAMJ* 1982;**61**:987-993.
26. Balfe DL, Steinberg WJ, Küstner HGV. Comparison of the decline in the ischemic heart disease mortality rate in the RSA with that in other Western Countries. *SAMJ* 1988;**74**:551-553.
27. Department of National Health and Population Development. Ischaemic heart disease mortality in South Africa, 1985-1989. *Epidemiological Comments* September 1992;**19**(9).
28. Walker ARP, Adam A, Küstner HGV. Changes in total death rate and in ischaemic heart disease death rate in interethnic South Africans populations, 1978-1989. *SAMJ* 1993;**83**:602-605.
29. Progress in Chronic Disease Prevention. Trends in Diabetes Mellitus Mortality. *MMWR* 1988;**37**(50):769-773.
30. Zietsman HL. Regional patterns of migration in the Republic of South Africa. *S Afr Geogr J* 1988;**70**(2):85-99.
31. Cilliers SP, Raubenheimer LP. Pattern of Migration and Settlement in Rural South Africa, Occasional Paper No. 5; Department of Sociology, Stellenbosch University.
32. Doll R. *Methods of Geographical Pathology*. Oxford: Blackwell, 1959.
33. Bradshaw E, Harington JS. The changing pattern of cancer mortality in South Africa, 1949-1979. *SAMJ* 1985;**66**:455-464.
34. The World Bank. *World Development Report 1993: Investing in Health - World Development Indicators*. New York: Oxford University Press, 1993.
35. Yach D. *Health transition in South Africa*. Paper presented at the Sugar and Health Symposium. Johannesburg: South African Sugar Association, 18-19 May 1995.

APPENDIX I

International classification of diseases (ICD) codes for selected causes of death: 6th, 7th, 8th and 9th revisions

Causes of Death	ICD-6 (1948)	ICD-7 (1955)	ICD-8 (1965)	ICD-9 (1977)
Malignant neoplasm of trachea, bronchus & lung	162	162	162	162
Malignant neoplasm of female breast	170	170	174	174
Malignant neoplasm of cervix uteri	171	171	180	180
Hypertensive disease	440-447	440-443	401-404	401-405
Cerebrovascular diseases (Vascular lesions affecting central nervous system 6th and 7th revisions)	330-334	330-334	430-438	430-438
Ischaemic heart disease (Arteriosclerotic and degenerative heart diseases 6th and 7th revisions)	420-222	420-422	410-414	410-414
Diabetes mellitus	260	260	250	250
Signs, symptoms and ill-defined conditions	780-789	780-789	780-796	780-799

APPENDIX II

Age-standardised mortality rates (1984-86) per 100 000 population per annum for CHAD-related and ill-defined causes of death for males and females

Cause of death	Blacks		Whites		Coloureds		Asians	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Males								
Hypertension	23,0	11,4	11,5	24,9	26,54	24,9	55,9	54,2
Stroke	84,1	70,2	72,7	158,0	146,1	158,0	126,1	141,2
IHD	12,8	238,7	276,4	123,5	156,7	123,5	275,2	264,8
Diabetes	20,2	15,9	0,95	16,9	31,5	16,9	80,6	58,1
Ill-defined	303,7	56,8	0,81	119,9	141,9	119,9	107,8	74,3
Females								
Hypertension	34,2	12,4	13,5	42,3	41,3	42,3	50,7	65,1
Stroke	109,7	67,2	70,4	192,7	137,7	192,7	121,7	142,1
IHD	12,1	102,2	111,7	80,6	90,2	80,6	143,5	125,6
Diabetes	36,5	14,8	17,5	34,9	50,9	34,9	98,6	89,5
Ill-defined	306,4	50,1	44,6	96,9	109,0	96,9	85,7	55,2

APPENDIX III

Urban to rural ratios of age-standardised mortality rates for 1984-86
for males and females

Cause of death	Whites		Coloureds		Asians	
	Males	Females	Males	Females	Males	Females
Hypertension	0,99	0,92	1,06	0,98	1,03	0,78
Stroke	0,97	0,95	0,92	0,70	0,89	0,86
IHD	0,86	0,92	1,27	1,12	1,04	1,14
Diabetes	0,95	0,85	1,86	1,12	1,39	1,10
Ill-defined	1,56	1,12	1,18	1,12	1,45	1,55