

HEART DISEASE IN SOUTHERN AFRICA WITH SPECIAL REFERENCE TO ISCHAEMIC HEART DISEASE*

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Diseases of the heart and circulation constitute the chief public-health problem of today. In the temperate zones, among Western races, where infectious diseases and malnutrition are largely controlled, a steady and progressive increase in cardiovascular disease has been recorded. This now accounts for at least half the annual deaths from all causes. Even in semitropical and tropical climates, among underdeveloped and less privileged societies, heart disease takes a steady toll. The prevalence of one or other form of heart disease, however, varies from race to race, and from country to country.

Epidemiological studies throughout the world tend to demonstrate that socio-economic factors play the major role in the distribution of heart disease.¹ It may be true that with the control of infectious diseases, more people reach old age, and therefore become liable to develop degenerative diseases. However, the rising incidence of complications of atherosclerosis, for instance, cannot entirely be attributed to an increase in age of the population. Nor can it be attributed to the more accurate recognition of cardiac disease, both during life and in the registration of the cause of death. We should seek the causes rather in the changes in our dietary habits, the stresses and strains of our modern age, alterations in exercise patterns and, probably most important of all, factors still to be discovered.

It is fitting that the problem of the racial prevalence of heart disease should be discussed in the 1970/71 Bronte-Stewart Memorial Lecture, since this was one of the professor's major interests. It had long been observed that a profound racial difference in the prevalence of heart disease existed in Southern Africa.²⁻⁴ Bronte-Stewart paid particular attention to serum cholesterol levels and dietary practices in the three racial groups in Cape Town.²⁻⁵ White subjects were found to have a far higher level of blood cholesterol than Bantu, with the level in Cape Coloureds inbetween. Electrocardiographic studies⁶ of patients attending Groote Schuur Hospital established that there was a definite racial difference in the prevalence of ischaemic heart disease in the three racial groups.

This paper is, therefore, devoted to an analysis of epidemiological data from the electrocardiographic unit at Groote Schuur Hospital, Cape Town, during the years 1952-1969 inclusive and involves over 170 000 tracings in more than 70 000 subjects. Experience obtained in other centres in Southern Africa will also be discussed.

In the Republic of South Africa there are at least five racial groups. The primitive aboriginal Bushmen of the Kalahari desert are now almost extinct and can be disregarded from the epidemiological point of view. They are probably related to the Central African Pygmies and survive mainly in a small area in South West Africa. The Hottentots are also a primitive race, probably a mixture

of Bushmen and Bantu, and they too, are virtually extinct (Fig. 1).

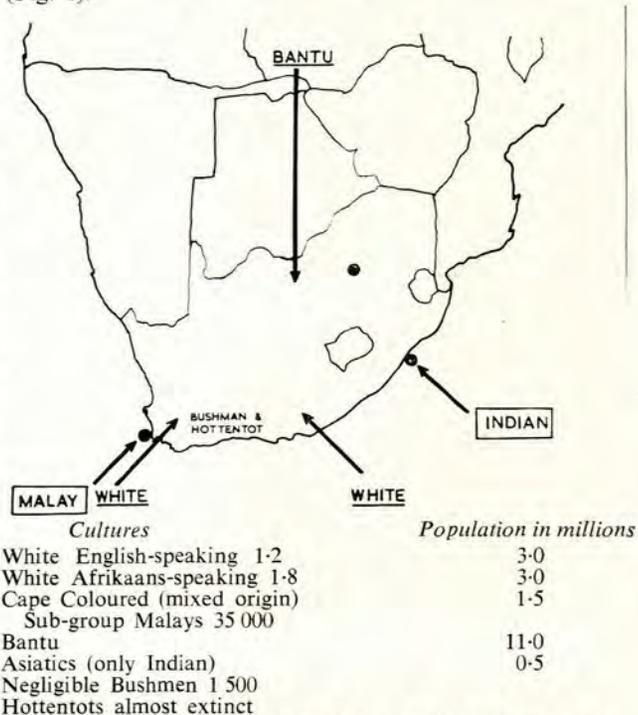


Fig. 1. Map of the Republic of South Africa showing the origins and constitution of the populations. The cities of Cape Town, Durban (on the coast), and Johannesburg are indicated by the dots.

The Cape Coloureds originated mainly from European, Hottentot and Malay stock, the Hottentots comprising the original indigenous population of the Cape. Only in the last few decades has any Bantu stock been added. The largest aggregation live in the Cape Province. Included in this group is a section of Cape Malays of Moslem faith who are assumed to be almost pure descendants of imported Malays. This group is distinct from Cape Coloureds because they have retained their customs, identity and religion.^{4,7} From the socio-economic point of view, the Cape Coloured population occupies an intermediate position between that of the White and the Bantu. They compete in the skilled and unskilled labour market. Compared with the Bantu, they have a far greater proportion of professional men although fewer than the Whites. They are mainly artisans, labourers and small tradesmen. They are relatively stable and nonmigratory. The urban population has increased considerably in number both from natural birth rate, which is higher than that of the Whites, and by drift from the country (Table I).

The Whites are the most highly developed section of the population and are mainly descended from immigrants from Great Britain, Holland and Germany. Their numbers

*The Bronte-Stewart 1970/71 Memorial Lecture, delivered at the University of Glasgow, October 1970.

TABLE I. POPULATION FIGURES OF MAGISTERIAL DISTRICTS CAPE TOWN, BELLVILLE, SIMONSTOWN AND WYNBERG

	Whites	Cape Coloureds	Bantu	Asiatics
1951	266 715	297 018	59 937	8 343
1960	305 155	417 881	75 100	8 975

have gradually increased by a normal rise in birth rate and from immigration (Table I). They have inhabited South Africa for over 300 years and are subdivided into English-speaking and Afrikaans-speaking groups (Fig. 1). The White section of the population is mainly responsible for the rapid development and industrialization of the country. The standard of living is as high as in any part of the world. Whites control commerce, industry, and mining, and constitute the professional and artisan classes almost entirely. There are still some, however, who are semi-skilled or unskilled but even they, the poorest of the community, generally earn more than the non-White population.

The Bantu form the lowest in the socio-economic scale, providing unskilled and heavy manual labour. By far the largest group (Fig. 1), they consist of a mixture of Negro Hamites, who migrated southwards from the Equator into the Republic. They are rapidly becoming urbanized though many still lead a primitive tribal existence. Unlike the Whites, their entrance into Cape Town is restricted and they are actively discouraged from settling in the Cape area. Often migrating from rural areas, their stay in the city is temporary—one or two years—during which time they tend to save money to meet their own needs and the needs of their families in the homelands. However, there are some who have lived most of their lives in the city or have been born there. These are closest to the Whites in education, employment and diet. Few, however, have reached professional class. Their numbers tend to fluctuate, the birth rate is high, the immigration of women-folk is definitely discouraged.

The Asiatics are predominantly Indian and are congregated mainly in Natal. They were imported into South Africa about 100 years ago to work in the sugar fields, and today are usually labourers or waiters. There is a small professional class and many traders. Many Indians are well-educated and highly westernized. They still retain the culture and religion of the East, however.

There is also a small number of Chinese in scattered communities throughout the country.

The physiological and genetic differences between the various racial groups are well recognized and need little amplification here.^{2,6,9} The diversity of disease patterns encountered in Southern Africa can clearly not be ascribed

to the variation in racial composition alone. There are large socio-economic, cultural, and dietary differences. Lastly, geographic factors may be important: there is a wide range of climatic conditions in the Republic, varying from semi-desert to tropical to Mediterranean. Furthermore, considerable altitude differences exist; Johannesburg, for example, is approximately 6 000 feet above sea level, whereas Cape Town and Durban are coastal cities.

This lecture is concerned mainly with ischaemic heart disease, since this is the most important current cardiac problem. Furthermore, the interracial and international differences in prevalence are the most striking. A precise estimate of the prevalence of ischaemic heart disease, by which is meant obstructive coronary atheroma and cardiac infarction, is extremely difficult to obtain. National vital statistics depend upon accurate death certification and take no account of the prevalence of disease in the living. Clinical estimates suffer in that errors in diagnosis are not uncommon, since the manifestations of the disease are varied—including as they do, widely differing syndromes such as angina pectoris, cardiac infarction, congestive cardiac failure, cardiac arrhythmias, and sudden death. Moreover, it is now appreciated that not only is silent coronary atheroma universally present after middle-age in Western races, but silent cardiac infarction is common.¹⁰⁻¹⁶

There is general agreement that a full electrocardiographic investigation is most helpful in establishing the diagnosis of ischaemic heart disease. This applies particularly to recent cardiac infarction. It is less helpful in healed infarction and in angina pectoris. Certain changes are characteristic of the condition, but often the tracing is abnormal because of underlying left ventricular hypertrophy or disturbances of conduction which mask the diagnostic changes produced by ischaemia. Furthermore, unless rigid criteria are imposed, observer error may be great.

Any conclusions arising out of a study of this kind naturally depend upon the nature of the population at risk.¹⁷ Ischaemic heart disease characteristically has a higher prevalence in the elderly and in males.¹⁸ If one group consists of a large number of middle-aged elderly males with a high prevalence of diabetes mellitus, and the other of young females, a great difference in the prevalence of the disease would be found. It is therefore necessary to study the population and the age distribution in racial groups attending Groote Schuur Hospital.¹⁹ The age, sex and race distribution of electrocardiographic investigations performed during the period under review are shown in Table II.

In an earlier study²⁰ it was shown that approximately

TABLE II. ECG'S PERFORMED 1952-1969: AGE, SEX, AND RACE DISTRIBUTION

Age group (years)	Whites		Cape Coloureds		Bantu		Total
	M	F	M	F	M	F	
0 - 9	1 197	1 035	1 177	1 123	220	180	4 935
10 - 19	1 258	1 262	1 578	2 127	273	392	6 890
20 - 29	1 352	1 525	1 800	3 221	442	604	8 944
30 - 39	2 303	2 105	2 715	4 587	799	669	13 178
40 - 49	4 528	4 022	4 379	6 214	1 149	714	21 006
50 - 59	7 101	6 604	5 365	6 818	1 017	529	27 434
60 - 69	7 272	7 345	3 985	4 719	516	265	24 102
70 +	5 204	6 075	1 827	2 157	185	136	15 584
Total	30 215	29 973	22 826	30 966	4 601	3 492	122 073

90% of the patients with cardiac infarction seen, lived in areas drained by our hospital. Taking into consideration that ischaemic heart disease is most common in patients over the age of 19 with a peak incidence between 50 and 70, there is a large White and Coloured population at risk. Whites outnumber the Coloureds especially in the older age groups. To offset this is the fact that the population attending the hospital is selected, because a means test prevents the wealthier and more privileged members of the community from attending. Most of the non-Whites are eligible, but only the less economically privileged Whites. It has been generally accepted that ischaemic heart disease occurs in the more privileged sections of the community.²¹ This appears to be the case in our community, so that the prevalence of ischaemic heart disease in the Whites at large, is underestimated by figures obtained at our hospital.⁷

The next factor requiring analysis is the attendance at Groote Schuur Hospital during the period under review. It was the main hospital serving the population of Cape Town and surrounding districts during the 18 years under review and provides over 1 000 beds, with approximately equal White and non-White admissions. It is also the main teaching hospital of the Faculty of Medicine, University of Cape Town.

During the 18 years, 1952 - 1969, the number of patients attending the General Outpatient Department at Groote Schuur Hospital was 7 872 589. This figure includes all attendances and does not refer to individual patients. About one-third of the visits were made by new patients. During the same period 482 017 patients were admitted to the wards. The proportion of White, Coloured and Bantu patients is shown in Table III. For most of the period, the 44 teaching beds at the New Somerset Hospital, which serves the non-White population only, were included in the electrocardiographic service so that the proportion of Coloured to White patients is greater than appears in Table II. An adequate number of Bantu attended the hospital in the age groups affected by ischaemic heart disease.¹⁷ The electrocardiographic service of the Cardiac Clinic, Groote Schuur Hospital, was available to all inpatients and outpatients of the hospital and for the 44 inpatient teaching

beds of the New Somerset Hospital.⁷

Electrocardiograms in all cases included the six limb leads and precordial leads V1 to V7. Since one observer, the author, interpreted more than three-quarters of all the tracings, any errors in the electrocardiographic interpretations were constant for all races. The same physicians and surgeons saw all patients of all races, and facilities for obtaining electrocardiograms were equal.

In the first instance, rigid criteria of transmural infarction were used in the diagnosis of myocardial infarction. These correspond very closely to those of Rose and Blackburn²² for the World Health Organization. The validity of these electrocardiographic criteria in our hospital has been shown to be at least 95%.⁷ It might be argued, however, that the pattern of through and through infarction occurs only in the severer forms of ischaemic heart disease, and that if patients with a lesser degree of electrocardiographic changes are excluded, a false idea of the true racial prevalence would be obtained. The differing racial prevalence might therefore be only one of lesser degree. Less rigid electrocardiographic criteria were therefore also adopted. In these patients, T-wave inversion without pathological Q waves over the anterolateral or diaphragmatic aspects of the left ventricle or bundle-branch block without significant Q waves, or S-T segment shift, was accepted, provided there was a history of angina pectoris, or of cardiac infarction. These electrocardiographic changes in themselves are not sufficiently diagnostic. The greatest difficulties were, of course, experienced in differentiating the changes of left ventricular hypertrophy from those of ischaemia, particularly when the two conditions co-existed.⁷ Patients with normal tracings were not considered in this analysis, even when effort tests were positive.

The racial prevalence of myocardial infarction, as determined by rigid criteria in 5 924 new patients over the age of 19 is shown in Fig. 2. Using less rigid criteria, the racial prevalence of ischaemic heart disease in 11 291 new patients over the age of 19 is shown in Fig. 3.

The difference noted in the prevalence of ischaemic heart disease in the three racial groups of Cape Town has confirmed previous studies.^{7,23-25} Attention is drawn to the

TABLE III. ATTENDANCE OF WHITE, COLOURED AND BANTU PATIENTS AT GROOTE SCHUUR HOSPITAL DURING 1952 - 1969

	Outpatients			Inpatients		
	Whites	Cape Coloureds	Bantu	Whites	Cape Coloureds	Bantu
1952	147 299	137 844	25 829	9 646	8 316	1 770
1953	153 860	146 556	26 101	10 036	9 211	1 810
1954	122 065	131 981	21 419	10 656	9 326	1 789
1955	129 889	140 008	22 402	10 875	9 432	1 893
1956	135 889	144 047	25 147	10 976	10 140	2 067
1957	127 673	133 934	24 603	10 311	9 880	2 111
1958	137 038	153 444	27 411	10 017	9 449	2 191
1959	155 315	176 668	30 971	10 414	9 941	2 120
1960	167 370	194 871	32 509	10 586	10 246	2 370
1961	172 896	202 386	37 179	10 965	10 776	2 473
1962	178 826	205 633	34 816	11 258	10 864	2 575
1963	196 927	216 877	35 227	11 575	11 218	2 616
1964	192 346	230 878	37 990	13 892	14 071	3 325
1965	220 247	293 800	43 011	13 636	14 666	3 627
1966	243 168	288 462	45 343	14 365	15 430	3 650
1967	267 744	320 975	52 946	15 204	17 721	4 083
1968	282 262	371 265	58 701	13 624	19 622	3 995
1969	291 462	413 693	64 386	13 535	21 543	4 129
Total	3 323 276	3 903 322	645 991	211 571	221 852	48 594

heart more frequently in White patients than in Cape Coloureds because of the greater prevalence of ischaemic heart disease: cardiac infarction occurs three times as commonly in the Whites as in the Cape Coloureds. The Bantu have an extremely low prevalence of ischaemic heart disease.

The age and sex distribution of cardiac infarction and ischaemic heart disease have also been analysed (Table IV). The peak age is between 50 and 69. The sex factor con-

firms general experience: during the reproductive years, between 20 and 49, males far outnumber females. This difference in the ratio is shown among all racial groups. With advancing age, females ultimately catch up with males, and after 70 the two sexes appear to be more equally affected.

Confirmatory data have been obtained from other centres in Southern Africa. In Johannesburg the pattern

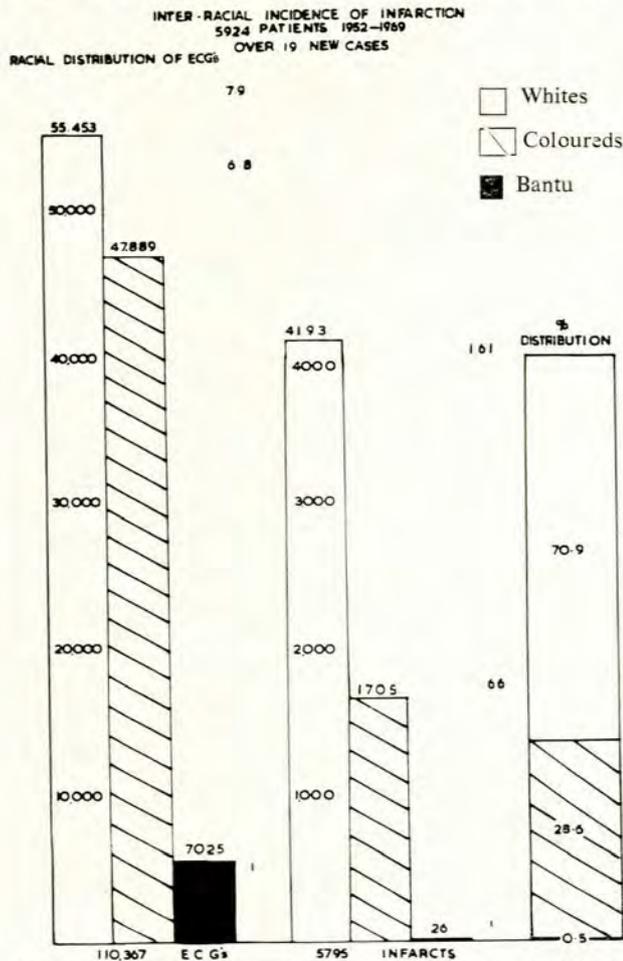


Fig. 2. Racial prevalence of infarction (rigid criteria) in new patients 1952-1969. The racial distribution of ECGs performed, Whites to Cape Coloureds to Bantu was 7.9 : 6.8 : 1. There were 4193 infarcts in Whites, 1705 in Cape Coloureds and only 26 in Bantu (161 : 66 : 1). 70.9% of all infarcts occurred in White subjects, 28.6% in Cape Coloureds and 0.5% in Bantu.

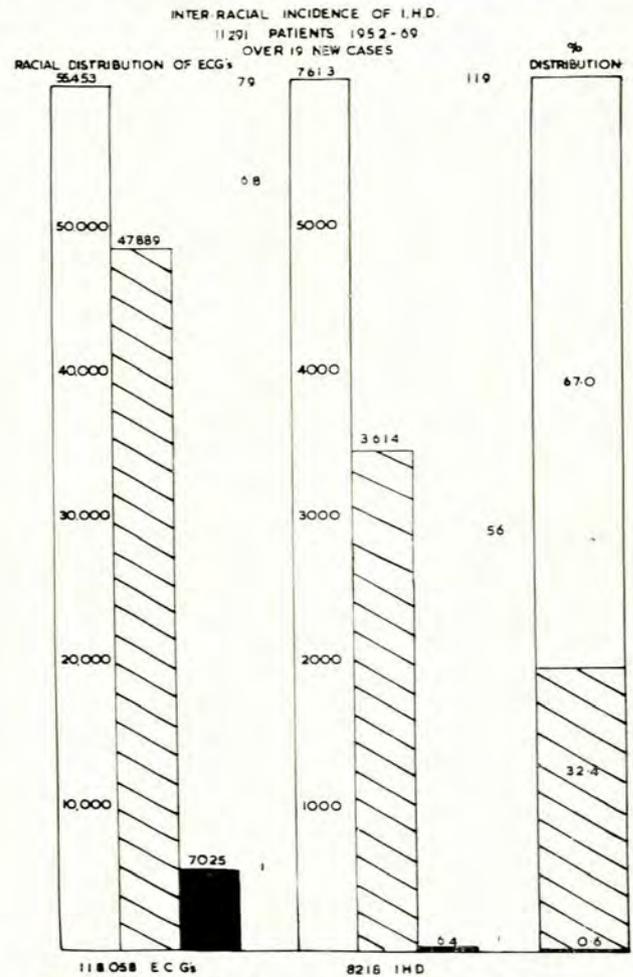


Fig. 3. Racial prevalence of cardiac ischaemia in new patients 1952-1969. The racial distribution of ECGs performed Whites to Cape Coloureds to Bantu was 7.9 : 6.8 : 1. There were 7613 White patients, 3614 Cape Coloureds and 64 Bantu (119 : 56 : 1). 67% of all patients with cardiac ischaemia were White, 32.4% Cape Coloureds, and 0.6% Bantu.

TABLE IV. AGE AND SEX DISTRIBUTION OF CARDIAC INFARCTION IN 4193 WHITE AND 1705 COLOURED PATIENTS

Age group (years)	Whites				Coloureds			
	M	F	M/F ratio	Total	M	F	M/F ratio	Total
Under 30	17	3	5.6/1	20	15	2	7.5/1	17
30-39	130	20	6.5	150	106	20	5/1	126
40-49	489	111	4.4	600	302	51	5.8	353
50-59	904	308	2.9	1212	385	139	2.8	524
60-69	871	403	2.2	1274	336	136	2.6	472
70+	566	371	1.5	937	123	90	1.4	213
Total	2977	1216	2.4	4193	1267	438	2.9	1705

of ischaemic heart disease in Whites approximates that of the United States; it certainly is no less common.^{9,26,27} A similar high prevalence has been noted in Southern Rhodesian Whites.²⁸ Even among the Whites, there is a striking difference in prevalence. Walker²⁹ has estimated that 1 in every 2 adult Jewish males and 1 in 3 females die of the effects of this disease. A high incidence in Jews has also been noted in Cape Town.⁵ The next most commonly afflicted are the Afrikaans-speaking, followed by the English-speaking section of the population.

A disproportionate prevalence appears to exist in young men below the age of 40 (Fig. 4). Between 25 and 44 years

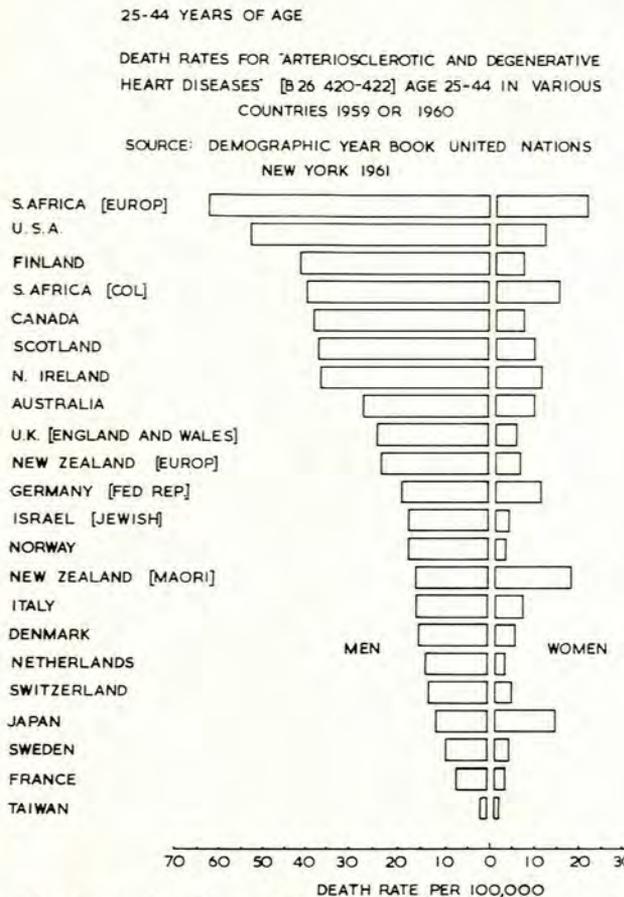


Fig. 4. South African Whites between 25-44 years of age appear to have the highest death rates for 'arteriosclerotic and degenerative heart disease'. (From the Demographic Year Book, United Nations, New York 1961.)

of age the death rate from 'arteriosclerotic and degenerative heart disease' appears to be the highest in the world. If serum cholesterol levels bear any relationship to the development of atherosclerosis, the observations of Du Plessis *et al.*³⁰ are of special value (Fig. 5). In a study of schoolchildren in Pretoria, the serum cholesterol values of young children between 7 and 11 years of age were measured. A striking difference in values was found between the Whites, Bantu, Indians and Coloureds. The levels were significantly higher in the Whites than in all other races and similarly strikingly lowest in the Bantu.

Over 35% of the Whites had cholesterol concentrations of 250 mg or more per 100 ml serum, compared to less than 5% of the Bantu. The fruits of atheroma are probably reaped by seed sown in childhood as reflected by the very high level of serum cholesterol in these young White children.

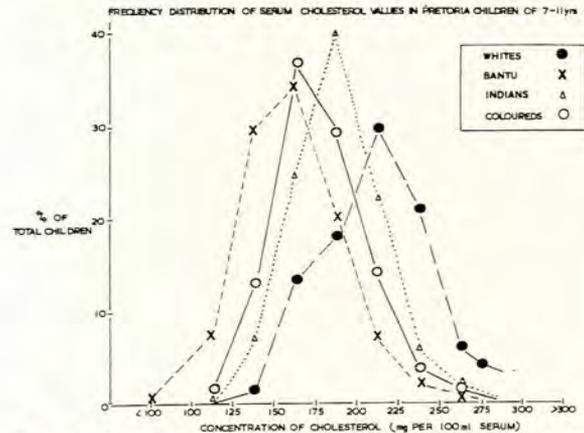


Fig. 5. The frequency distribution of serum cholesterol values in Pretoria children of 7-11 years. The highest levels are found in White children and the lowest in Bantu. (From Du Plessis, J.P., *et al.*, (Fig. 1))³⁰

Ischaemic heart disease in Natal is as prevalent among the Asiatics (Indians) as among the Whites, in striking contrast with the Bantu.^{31,32} Tables produced by the Actuarial Society of South Africa show an even higher mortality among the Indians compared with the Whites. The actual Indian deaths, based on South African 1956-1962 ultimate mortality for White lives, exceeded expected deaths at all ages over 35 and was particularly striking after 45 years of age. Wainwright³³ believes that cardiovascular disease is the major cause of this. He has provided figures from the Durban population (Table V) indicating that arteriosclerotic and degenerative heart disease is in fact higher in the Indians than in the Whites. Thus, between

TABLE V. DEATH DUE TO ARTERIOSCLEROTIC AND DEGENERATIVE HEART DISEASE IN DURBAN*

Age group (years)	Asiatics/Whites %	
	M	F
35 - 39	108	400
40 - 44	132	106
45 - 49	113	165
50 - 54	109	201
55 - 59	80	198
60 - 64	75	190
65 - 69	81	206

*Modified from Wainwright³³

the ages of 35 and 54 Indian males and Indian females at all ages have a higher prevalence of deaths due to arteriosclerotic degenerative heart disease. The difference was particularly striking in Indian women between 35 and 39 years of age who had four times the death rate compared with their White peers. If this disease seemed to have the highest prevalence rate in the world among young White South African men and women, as Fig. 4 would indicate, the palm must now go to the Natal Indian.

Certainly the Indian female between the ages of 35 - 39 is particularly vulnerable. Hypertension and diabetes mellitus, as Wainwright believes, are probably causally related.

Ischaemic heart disease undoubtedly occurs in the Bantu, but figures throughout Africa point to its extreme rarity.^{24,34-38} Finding a Bantu with cardiac infarction is almost an item for publication. Hence from time to time reports in the South African literature appear, just to remind us that this disease must be considered in diagnosis.^{39,40} Seftel *et al.*⁴¹ drew attention to the fact that at Baragwanath Hospital in Johannesburg, there was an annual admission rate of 30 - 50 000 Bantu, yet only 30 instances of cardiac infarction were recognized during an 11-year period. More than half of these occurred in the latter 4 years of their study period from 1961 - 1964. Cooks, teachers and highly-paid workers were disproportionately represented in their subjects. The highest incidence of ischaemic heart disease in the Bantu has been reported in Pietermaritzburg, Natal. But even these figures and those of Laurie *et al.*⁴² only underline the rarity of the condition. They were able to find 6 patients with this disease diagnosed clinically. Cosnett⁴³ in a series of 1 000 consecutive patients with heart disease amongst the Zulu, found only 6 male patients suffering from this disease. The racial prevalence of heart disease from several clinical series in Southern Africa and Uganda is shown in Table VI. The extremely low prevalence of ischaemic heart disease is a universal finding in the Bantu, contrasting sharply with the Whites and Coloureds. In Southern Rhodesia, Gelfand⁴⁴ encountered no case of coronary heart disease in 1 500 consecutive admissions to his Bantu hospital wards in 18 months. Baldachin⁴⁵ in 564 Bantu patients suffering from heart disease, likewise found no patient with coronary artery disease. Certain reports are of special interest. Gelfand⁴⁶, for example, studied a group of 70 Bantu of 60 years of age and over with heart disease, and failed to find a single instance of coronary atherosclerosis. Seftel *et al.*⁴⁷ in a study of 296 South African Bantu over 60 found a 1% prevalence of ischaemic heart disease compared with radiological evidence of aortic atherosclerosis of 20%. Serum cholesterol levels, hypertension, diabetes, obesity and high haematocrit levels did not differ significantly from White controls.

Confirmation of clinical epidemiological data are confirmed by pathology reports on sudden death and post-mortem evidence of atherosclerosis and of cardiac infarction. It is becoming more and more apparent that angina pectoris and cardiac infarction, sudden death, cardiac arrhythmias and heart failure are not necessarily related to coronary atherosclerosis. Only the first, angina pectoris, and some varieties of congestive cardiac failure are regu-

larly, but not exclusively, related to obstructive coronary artery disease (atheroma, with or without thrombosis). Sudden death, depending upon the definition, particularly in males, is usually attributed to atheroma of the coronary vessels.^{48,52} The more sudden the death, the less common it is to find actual occlusion of an artery. Death is generally thought to be due to a cardiac arrhythmia, ventricular fibrillation or cardiac standstill.

Sudden death from coronary artery disease is unfortunately only too frequent in our White population in Cape Town. An analysis of the first 125 patients admitted to our Intensive Coronary Care Unit in 1967 revealed a sudden death rate of 7%.³³ This compares with a 13% incidence in 255 patients prior to the establishment of the unit.⁵⁴ I have no personal record of sudden death in a Bantu from ischaemic heart disease in our hospital. Figures supplied by the Government Pathology Department confirm the rarity in the Bantu (L. E. Gellman, quoted by Schrire).⁵⁵ The Cape Peninsula, from which the material was drawn, consisted of just under 300 000 White, just over 400 000 Cape Coloured and 90 000 Bantu in 1961. In 1966, necropsies were performed on 991 subjects dying from natural causes. The prevalence of sudden death is underestimated in the more privileged White community, who generally have better medical attention. Doubtless many subjects in whom death occurred suddenly, received the requisite certification without necropsy examination. In spite of this underestimation, 81 of the sudden deaths were attributable to coronary artery disease in the Whites, approximately a quarter of whom had fresh coronary thrombosis or cardiac infarction. Sixty-two sudden deaths were attributed to coronary disease in the Cape Coloured, fresh lesions being present in at least 12%. There were 6 Bantu subjects in whom the disease was suspected. One died with extensive pneumonia, one died in congestive cardiac failure with cardiomegaly, and one had cardiomegaly with sudden death. Only 3 could be included, one with coronary thrombosis and a sarcoma of the skull and 2 with coronary atheroma.

Sudden death in the Bantu on the Witwatersrand is nearly always due to cardiovascular syphilis,⁵⁶ whereas in the White section of the population this is generally attributed to coronary atherosclerosis. In 9 069 consecutive necropsies reported by Kallichurum⁵⁷ in Durban there were 6 sudden deaths in Bantu patients. Four had cardiovascular syphilis and only one coronary atheroma with cardiac infarction. All 5 sudden deaths in 129 consecutive necropsies in Indians were due to coronary artery disease. These investigations were performed in a hospital environment, thus representing a very small proportion of the patients who die suddenly. Hannah,⁵⁸ working in

TABLE VI. RACIAL PREVALENCE OF ISCHAEMIC HEART DISEASE (CLINICAL SERIES)

Author	Area	Date	No. of cases	IHD %	Race
Wood ²⁴	London	1956		30	Whites
Schrire	Cape Town	1970	25 896	30	Whites
Schrire	Cape Town	1970	26 808	13	Coloureds
Schrire	Cape Town	1970	4 485	1.4	Bantu
Schwartz <i>et al.</i> ³⁷	Transvaal	1958	275	0.4	Bantu
Cosnett ⁴³	Natal	1962	1 000	0.6	Bantu
Powell and Wright ⁴²	Natal	1965	270	0	Bantu
Gelfand ⁴⁴	Rhodesia	1957	189	0	Bantu
Baldachin ⁴⁵	Rhodesia	1963	564	0	Bantu
Shaper and Williams ⁴⁴	Uganda	1960	712	1.3	Bantu

Northern Rhodesia (now Zambia), studied 22 White subjects at necropsy and reported coronary atheroma in all 22, the youngest subject being in his teens. Coronary atherosclerosis was regarded as the cause of death in 8. There were 42 Bantu in his series; in 35 the coronary arteries were completely atheroma-free, only 7 showed atheroma which was severe in only one case.

Necropsy evidence of cardiac infarction due to coronary atherosclerosis is equally rare. The Pathology Service of the University of Cape Town serves Groote Schuur and the New Somerset Hospitals. Routine necropsies are performed on all races. Cardiac infarction was found in only 2 Bantu subjects between 1952 and 1957.⁴⁰ Neither had coronary atheroma; hypertension and syphilis being associated respectively. In Whites, 119 of 758 subjects over the age of 10 showed cardiac infarction in contrast to 43 of 705 Cape Coloured and 2 of 188 Bantu.

Sacks⁵⁰ studied material from the same source during the years 1953-1958. He graded the degree of coronary and aortic atherosclerosis in 1250 unselected necropsies in adults. A marked racial difference was found. Severe aortic and coronary atherosclerosis did on occasion occur in the Bantu, but this was far less common than in the White. Severe luminal narrowing of the coronary arteries was particularly rare in the Bantu. The aorta and coronary arteries often showed complete freedom from atherosclerosis in age groups in which it was rarely absent in Whites. The Cape Coloured seemed to show a lower frequency of severe luminal narrowing than did the Whites. The difference was far less pronounced between Cape Coloured and Whites than between Whites and Bantu. Two further examples of cardiac infarction in the Bantu were found and in neither of these could atheroma be implicated.

On the Witwatersrand, Becker^{60,61} commented on the rarity of ischaemic heart disease in the Bantu. In 1487 necropsies on predominantly Bantu people over the age of 30 only one death could be attributed to coronary thrombosis. Higginson and Pepler⁶² found only 8 subjects in a series of 523 necropsies, in whom death could be attributed to coronary vascular disease. They refer to a larger series of 1328 consecutive necropsies (including their 523 cases) in which there were only 7 cases of coronary thrombosis or myocardial infarction and one of ischaemic heart disease. Severe aortic and coronary atherosclerosis was less common in the Bantu than in comparable Danish and American groups.⁶³ In Pretoria, Meyer *et al.*⁶⁴ using the modified Schlesinger injection technique in 98 specimens, came to similar conclusions: coronary atherosclerosis and its complications have a low prevalence in the Bantu which is striking when compared with White controls. This could not be attributed to a particularly favourable natural coronary arterial circulation,⁶⁵ although they did observe

a significantly better coronary anastomotic blood supply in Bantu hearts from a very early age, they attributed this to anaemia. The aorta in the Bantu is also less susceptible to atheroma⁶⁶ but the cerebral vessels are as commonly affected as in the Whites.

In Pietermaritzburg, Natal, Laurie *et al.*⁴² reported an incidence of 1.4% in Bantu—5 cases of 'frank infarction'. Severe atherosclerosis, particularly of the aorta was occasionally encountered. Aortic atheroma does not imply coronary atheroma and wrong inferences can be drawn if aortic atherosclerosis is used as an index. Wainwright,^{67,68} 60 miles away in Durban, failed to substantiate the claim that coronary atherosclerosis was common in the Bantu. A careful study of the aorta and its branches by the Holman technique⁶⁹ in a large series of cases⁷⁰ clearly showed a lower prevalence of atheroma in the aorta and coronary vessels in the Bantu. The necropsy prevalence of myocardial infarction (old and recent) in the Bantu, White and Indian was 0.9, 13.6 and 9.2% respectively. The same differences were not noted with cerebral haemorrhage and infarction. Kallichurum,⁷¹ working in the same department, confirmed the low prevalence of ischaemic heart disease in the Bantu. In 694 necropsies, 2.2% showed evidence of ischaemic heart disease, the same figure obtained by Higginson *et al.*⁶³ in 537 patients in Johannesburg. At the same time, 26% of the 173 Indian patients suffered from this condition.

The rarity of myocardial infarction in Bantu elsewhere in Africa has been well documented. Davies³⁴ had never seen a case of cardiac infarction in an East African which had been confirmed at autopsy. Edington's experience³⁶ in the Gold Coast African has been the same.

The racial prevalence of heart disease from several necropsy series in Southern Africa and Uganda is shown in Table VII.

There appears to be some discrepancy, however, between the high prevalence of ischaemic heart disease in Indians and the severity of atheroma which has been noted at necropsy. Wainwright³² has shown that atheroma in the Indian is, in fact, less than in the White of New Orleans or Oslo. A standard technique of collection and grading of atheroma was used, aortas and coronary arteries from various centres in the world being collected and compared in New Orleans, as part of an international atherosclerosis survey. This discrepancy between the severity of atheroma and the prevalence of ischaemic heart disease once again emphasizes the point that cardiac infarction, coronary occlusion and atheroma are not necessarily always related. They are clearly not quantitatively related.⁷²⁻⁷⁷ There are other factors in the causation of cardiac infarction to be considered and some of these remain to be discovered and explored.

Conclusive proof has thus been given of racial differ-

TABLE VII. RACIAL PREVALENCE OF ISCHAEMIC HEART DISEASE (NECROPSY SERIES)*

Author	Area	No. of subjects	IHD %	Race
Becker ⁶⁰	Transvaal	332	1.5	Bantu
Higginson <i>et al.</i> ⁶³	Transvaal	537	2.2	Bantu
Davies ³⁴	Uganda	229	4.3	Bantu
Kallichurum ⁷¹	Natal	694	2.2	Bantu
Kallichurum ⁷¹	Natal	173	26	Indians

*From Kallichurum

ences in the prevalence of ischaemic heart disease but whether there has been a rise in incidence of ischaemic heart disease during the last few decades remains to be considered. Accurate statistics dealing with data of this type are notoriously difficult to come by and impressions may be misleading. Brock⁷⁵ has shown that there has been a striking improvement in the general health in the Cape Coloured over a 25-year period with a gradual 'ironing out' of the differences between the White and the Coloured groups. This has been associated with a fall in infectious diseases and a rise in ischaemic heart disease. In the Cardiac Clinic at Groote Schuur Hospital, we have the impression that coronary artery disease is now seen more frequently in the Bantu than it was in the past. With the introduction of coronary arteriography, coronary arterial obstruction has been demonstrated in several Bantu males with angina pectoris. The rising incidence of cardiac infarction (rigid criteria) in Whites and in Cape Coloureds is shown in Fig. 6 and Table VIII. These represent new patients seen each year. The Bantu figures are too small to have any statistical significance: more than twice as many White patients, and more than four times as many Cape Coloured patients were seen in 1969 compared with 1952-1956. Whether this denotes a genuine increase in incidence of the disease is difficult to say. The population at risk and attendance at hospital have also increased.

The outpatient attendance has been exaggerated because these figures do not reflect new patients and should be reduced by an estimated two-thirds, whereas the cardiac infarctions represent new patients. The figures tend to show a rising incidence of the disease, but the premise has

not been proved. The finding of ischaemic heart disease in young people has been particularly striking: during the last 19 months of the survey, for example 84 patients (33 White and 51 Coloured) of 40 years of age or less with electrocardiographic evidence of transmural infarction were seen—the youngest was 23 years old!

Numerous criticisms have been levelled at conclusions drawn from national statistics based on death certification. Allowing for the validity of these objections, the evidence obtained from this source falls into line. In Fig. 7 deaths from arteriosclerotic and degenerative heart disease between 1962-1966 is shown. The data have been obtained from the relevant Statistical Year Books (1964-1968).⁷⁶ There has been a steady and progressive increase in deaths from these causes in males and females, Coloureds and Whites. The percentage of deaths due to arteriosclerosis and degenerative heart disease over deaths from all causes has likewise risen by approximately a third.

In Johannesburg, Seftel *et al.*⁷⁶ feel that ischaemic heart disease is increasing in the Bantu, though the evidence is largely circumstantial. They compare their findings in 24 Bantu patients during the 4-year period 1956-1968 (0.6% of the admissions to Coronation Hospital) with their previous experience of 30 patients in 11 years—1951-1961—in an institution 9 times as large (Baragwanath Hospital). The apparent increase has been attributed to westernization or 'urbanization of the Bantu'. These conclusions must be taken with some reserve, because the two institutions compared may well serve different populations of Bantu and cater for significantly different needs.

The extent of the problem of ischaemic heart disease has recently been reviewed by Master and Geller.⁷⁶ They estimate that 5% of all people in the United States over the age of 35 suffer from silent coronary artery disease. In 1966, approximately 2 000 000 cardiac infarctions developed with an additional 600 000 silent infarctions. They believe at least 4 000 000 United States citizens suffer from silent coronary disease. Keys⁷⁷ reports on a coronary heart disease survey in seven countries (Yugoslavia, Finland, Greece, Italy, Japan, the Netherlands and the United States), comprising 12 770 men 40-59 years of age. A striking difference in prevalence of ischaemic heart disease was found and this was confirmed by an equally striking difference in incidence during the 5-year period under study. Finland and the United States headed the list, Greece and Japan being at the bottom. On comparison with South African data one would surmise

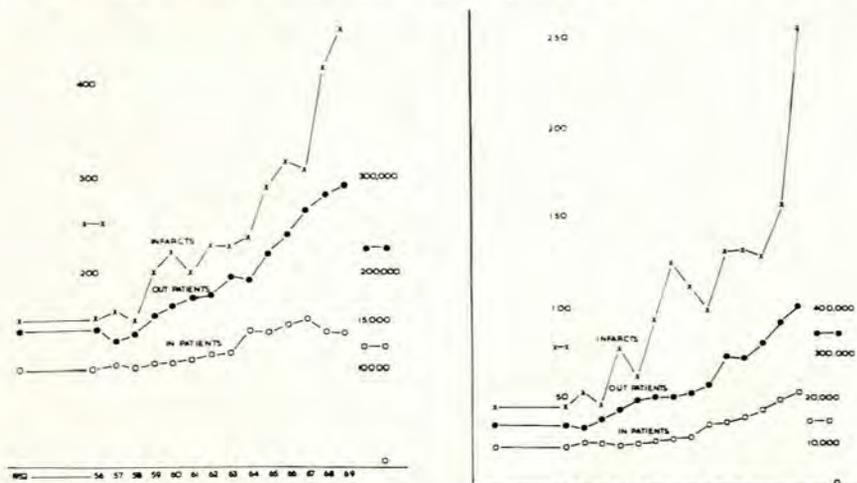


Fig. 6. Incidence of 'certain infarction' using rigid criteria in Whites (left) and in Coloureds (right) for the years 1952-1969. The figures for 1967 and 1968 include new patients attending the hospital only, and exclude old patients who have developed infarction over the years. They therefore understate the actual incidence by approximately 10%.

TABLE VIII. RISING INCIDENCE OF CARDIAC INFARCTION

	1952-56	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967*	1968*	1969
Whites	760	161	152	209	223	205	229	227	237	290	316	307	417	460
Coloureds	228	53	46	78	62	93	125	112	99	131	132	129	158	259
Bantu	3	0	2	1	0	1	2	6	0	3	1	2	1	4

*Approximately 10% underestimated.

that the Whites and Indians here, particularly in the younger age groups, would overtake Finland and the United States, the Bantu would fall below Greece and Japan, and the Coloureds would come close to Italy's figures.

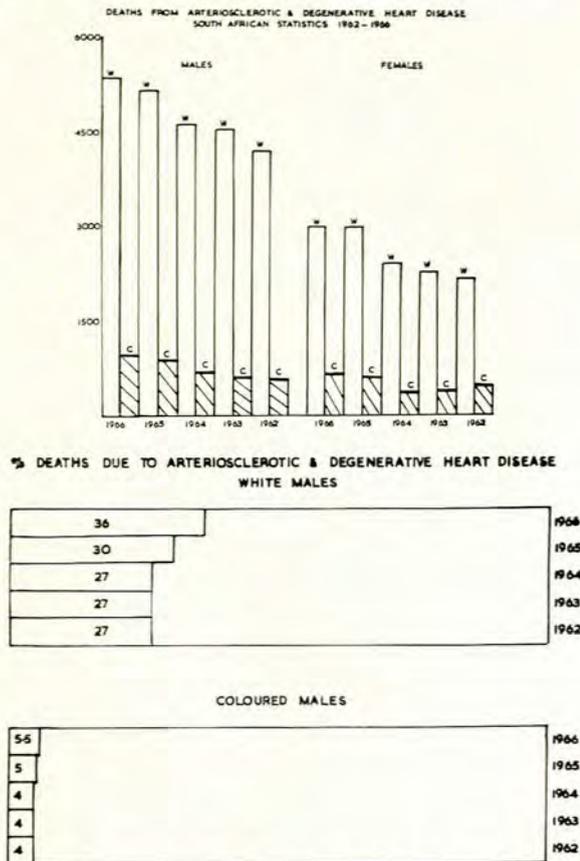


Fig. 7. Above: The increasing number of patients dying from 'arteriosclerotic and degenerative heart disease' is shown, male and female, White and Coloured. Below: Deaths from this condition expressed as a percentage of deaths from all causes. An apparent increase in prevalence of the disease has developed.

CARDIOVASCULAR DISEASE OTHER THAN ISCHAEMIC HEART DISEASE

Hypertension has always been regarded as an aggravating or potentiating factor in the development and progression of ischaemic heart disease.^{55,52-54} Epidemiological studies, however, have shown that hypertension is only important in the racial setting where ischaemic heart disease is prevalent.⁵¹ For example, in the United States and Finland where both diseases are common, hypertension may well be an important factor. In Japan, hypertension is common but ischaemic heart disease is not. Stamler⁵⁵ has pointed out that Negroes have a significantly higher prevalence rate for hypertension than Whites and might be expected to have an increased risk of coronary disease under American conditions. This is apparently not the case.^{55,56}

Data obtained from our institution can be examined with this in view. The electrocardiographic material was analysed according to methods previously described.⁸⁷⁻⁸⁹ All patients were included in whom one or more casual

blood-pressure readings showed a diastolic pressure of at least 100 mmHg irrespective of the systolic pressure (all pressures being expressed to the nearest 5mm) (group 1). In a minority of patients the diastolic pressure was 90-95 mmHg with a systolic pressure of 170 mmHg or more. In the second group all patients who had electrocardiograms recorded 'solely' for hypertensive heart disease were studied (group 2). For practical purposes this meant excluding patients with coronary artery disease from group 1, because the electrocardiographic patterns and blood pressures may be so altered by this disease. Analyses were made of electrocardiographic changes and the height of the diastolic pressure.

The racial prevalence in groups 1 and 2 as well as the sex and age of these patients is shown in Table IX. Hypertension is somewhat commoner in the White female than

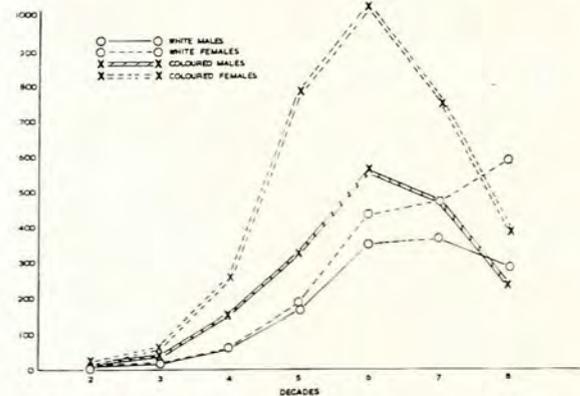


Fig. 8. The prevalence (in decades) of hypertension according to sex and age in 8 314 White males, 9 158 White females, 6 792 Cape Coloured males and 11 635 Cape Coloured females on whom ECGs were recorded. Hypertension was more common in the White female than the White male after the fifth decade. In the Cape Coloured female the prevalence rate was far higher than that of the Cape Coloured male and of the rest of the population. This became manifest from the fourth to the sixth decades with peak incidence at least a decade earlier than other groups.

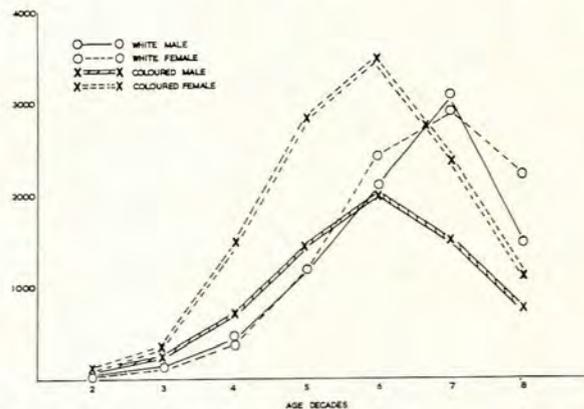


Fig. 9. The prevalence (in decades) of severe electrocardiographic changes according to sex and age in the 1 429 White males, 1 838 White females, 1 780 Cape Coloured males and 3 267 Cape Coloured females. Severe changes were far more commonly encountered in the Cape Coloured females than all other groups and occurred at least a decade earlier.

TABLE IX. SEX AND AGE OF PATIENTS WITH ELEVATED BLOOD PRESSURE AND HYPERTENSION IN THE THREE RACIAL GROUPS

	Age groups (years)	Whites		Cape Coloureds		Bantu	
		M	F	M	F	M	F
Elevated BP	10 - 19	49	40	75	89	11	14
Hypertension		44	36	68	82	6	14
Elevated BP	20 - 29	143	109	239	345	62	80
Hypertension		133	99	213	320	51	73
Elevated BP	30 - 39	434	370	712	1 448	162	192
Hypertension		330	312	577	1 198	145	174
Elevated BP	40 - 49	1 124	1 137	1 445	2 828	357	299
Hypertension		691	896	1 073	2 429	303	273
Elevated BP	50 - 59	2 067	2 395	2 009	3 453	311	263
Hypertension		1 193	1 695	1 441	2 781	286	242
Elevated BP	60 - 69	3 017	2 892	1 500	2 370	172	130
Hypertension		1 296	2 015	1 083	1 914	156	117
Elevated BP	70 +	1 480	2 215	812	1 102	86	55
Hypertension		993	1 617	541	884	74	48
Total — Elevated BP		8 314	9 158	6 792	11 635	1 161	1 033
Total — Hypertension		4 680	6 670	4 996	9 608	1 021	941

the male after the age of 50. The Cape Coloured female far outstrips all others in prevalence and prematurity. The peak prevalence occurs at least a decade earlier in the Cape Coloured female than in the rest of the population (Fig. 8). In Fig. 9 the severity of hypertension (using only the data from those patients with marked electrocardiographic changes, White and Coloured) is shown. Cape Coloured females have far and away the greatest prevalence of severe electrocardiographic changes. By the same

token, the prevalence of diastolic pressures 130 mmHg or more is far greater in the Coloured female. For example, between 30 and 39 years of age there were 242 Coloured females, 102 Coloured males, 45 White females, and 46 White males; between ages 40-49 the figures were 513, 222, 120, and 112 respectively; between ages 50-59 they were 565, 259, 210, and 170 respectively. Severe hypertension is thus not only encountered most commonly in the Coloured female but occurs at an earlier age. Notwithstanding this finding, the prevalence of ischaemic heart disease is lowest in the Cape Coloured female (Table IV). In the Cape Coloured female in Cape Town hypertension does not thus appear to be a particularly potent factor in causing coronary atherosclerosis or ischaemic heart disease. This is all the more interesting when it is appreciated that two other well described risk factors, obesity and diabetes, also appear to be very common in this group (personal observation).

The racial prevalence of heart disease in general¹⁰ at Groote Schuur Hospital is shown in Fig. 9. Data from centres elsewhere is shown in Table X and compared with our own findings. The mystery of these profound racial differences in heart disease remain to be solved. Differences in the prevalence of syphilis, pericarditis and rheumatic fever are relatively easy to explain, but what of the differences in prevalence of ischaemic heart disease and cardiomyopathy? Epidemiological studies have exposed certain facts, but an adequate explanation is not yet forthcoming.

I wish to thank the staff of Groote Schuur Hospital for their co-operation throughout this study and Dr J. G. Burger, the Medical Superintendent, for permission to publish. Special thanks to Mrs C. M. Hall and Mrs G. M. Ball for their

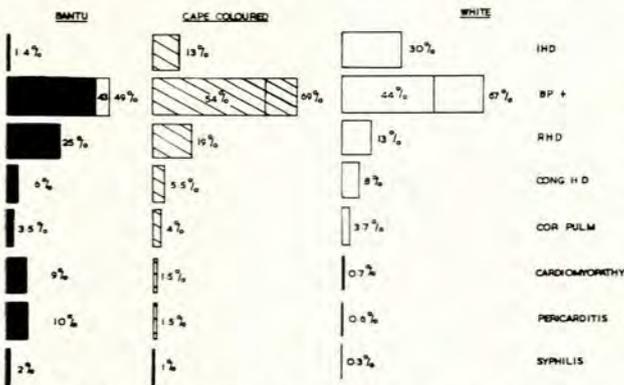


Fig. 10. The racial prevalence of all forms of heart disease in the 57 189 patients with heart disease in this study. The most striking finding is the marked discrepancy in prevalence of ischaemic heart disease and cardiomyopathy between White and Bantu. The aetiology of both conditions is obscure and the reason for the discrepancy is unknown. The marked difference in socio-economic conditions probably accounts for the difference in such conditions as rheumatic heart disease, pericarditis and syphilis.

TABLE X. RACIAL PREVALENCE OF HEART DISEASE (CLINICAL SERIES)

Author	Area	Date	Total No. of cases	IDH %	BP + %	Rheumatic %	Cardio-myopathy %	Peri-carditis %	Syphili-tic %	Cor Pulm. %	Congen-i-tal %	Race
Wood ²¹	London	1956	—	30.0	30.0	20.0	0.3	1.0	1.0	5.0	1.5	Whites
Schrire	Cape Town	1970	25 896	30.0	44.0	13.0	0.7	0.6	0.3	3.7	8.0	Whites
Schwartz <i>et al.</i> ²⁷	Transvaal	1958	275	0.4	19.6	23.6	37.5	4.0	1.1	10.9	1.1	Bantu
Cosnett ²⁸	Natal	1962	1 000	0.6	20.2	20.5	13.8	2.5	8.8	16.2	0.6	Bantu
Powell and Wright ²²	Natal	1965	270	0	14.0	17.0	34.0	6.0	10.0	10.0	—	Bantu
Schrire	Cape Town	1970	6 679	1.4	43.0	25.0	9.0	10.0	2.0	3.5	6.0	Bantu
Gelfand ²³	Rhodesia	1957	189	0	14.8	27.0	15.4	6.9	10.5	3.7	8.9	Bantu
Baldachin ²⁵	Rhodesia	1963	564	0	22.2	38.3	7.3	2.8	11.3	5.1	7.1	Bantu
Shaper ²⁴	Uganda	1960	712	1.3	37.4	14.7	13.6	3.5	13.6	0.28	1.3	Bantu
Schrire	Cape Town	1970	26 808	13.0	54.0	19.0	1.5	1.5	1.0	4.0	5.5	Coloureds

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