Poverty and Chronic Diseases in South Africa

Technical Report
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Executive Summary

South Africa, a middle income country, has amongst the most extreme disparities in wealth in the world. Although the extent of poverty depends on the poverty line and methodology employed, analyses by the national statistical office suggests that 52% of households were living in poverty in 1996. While poor maternal and child health, infectious diseases and malnutrition are known to be associated with poverty, there remains a need to investigate the relationship between poverty and chronic diseases and their determinants. This report presents a detailed analysis of mortality data from vital registration in 1996 and chronic disease and risk factor data from the South African Demographic and Health Survey (SADHS) conducted in 1998.

A factor analysis of socio-economic variables in the SADHS data yielded an asset index based on 14 household items and is shown to provide a robust indicator of poverty that correlates well at provincial level with indicators based on other income and expenditure data. Multivariate analyses of the SADHS data were conducted to investigate the association of a range of related chronic conditions, risk factors, lifestyle and health care indicators with this asset index, while assessing the independent effects of education, urban/rural setting and population group while adjusting for age.

Due to the lack of alternatives, the mortality data have been analysed by contrasting the premature mortality experienced in the poorest quintile of the population with that in the richest quintile. The quintiles were identified on the basis of the proportions of households living in poverty in each magisterial district.

The findings of the study reveal complex patterns of mortality, morbidity, risk factors and unhealthy lifestyles – an amalgam of a stratified society undergoing a health transition at a rapid pace. This study demonstrates the value of detailed analysis of large national data sets such as mortality statistics and SADHS for surveillance and research in order to address the complex interactions of lifestyle, risk factors and related chronic diseases in a country with multiple burdens of disease. The key findings, their policy implications and future research needs based on these findings are presented.

Key findings:

- Although the rich areas are further ahead in the epidemiological transition, the poor areas are also in the process of transition and suffer a substantial burden of premature mortality due to chronic disease including stroke, COPD, asthma, epilepsy, oesophageal cancer and cervical cancer. Heart disease also plays a large role but details of the actual cause were missing as the majority were ill-defined cardiovascular disease. Ischaemic heart disease, lung cancer and breast cancer were common in the rich areas.

- Asthma has a relatively high mortality burden among the poor, particularly women. This could be related to the finding that the poor were using appropriate asthma medication less frequently than the wealthier South Africans.

- The prevalence of abnormal peak expiratory flow rate and airway limitation ("asthma") was similar for all levels of wealth. This suggests that being richer does not mean that the required healthy lifestyle that will protect against lung disease is followed. A high level of education appears to be an additional prerequisite to adopt a healthier lifestyle.

- The poor are at greater risk of being exposed to cigarette smoking (albeit light) and are at greater risk of being exposed to smoky fuels predominantly in rural areas.

- Wealthier and more educated non-smoking men are less exposed to environmental tobacco smoke (ETS) than their poor counterparts. For women no such differences were observed. Non-smokers were more frequently exposed to ETS in urban settings than in rural settings.

- Obesity and hypertension emerge as risk factors with increasing wealth and poor people will need to be protected from developing these risk factors as they undergo development and upward social mobility.

- The poorest and the richest prefer less salty food, than those of average wealth. However salty food is preferred by the youngest group and is associated with being African and for men, living in urban areas. This may have consequences for the future development of hypertension in these groups.

- Excessive alcohol use was associated with poverty, which is a concern not only due to its association with hypertension but also for the many physical and psycho-social pathologies associates with excessive alcohol use.

- Access to and quality of health care, measured by the treatment status of hypertension and medication use of patients with airflow limitation ("asthma"), was worse for the poor. This is also reflected in the higher relative mortality burden of asthma and stroke in the poor.

Policy implications:

- The need to improve health care for people with chronic conditions has been identified for all sectors of South African society. However, the poor and the previously disadvantaged have the largest need for these improvements.

- There is an urgent need to ensure that women in poor areas are screened for cervical cancer so that this mortality can be reduced. The need for screening for oesaphageal cancer in poor areas which are at high risk should also be investigated.

- Strategies to prevent future development of chronic diseases are needed as the country undergoes further development. These strategies must include a total population approach to prevent or reduce the burden of unhealthy lifestyles and the emergence of risk factors as well as a high risk approach to diagnose those with risk factors and chronic conditions early and provide cost-effective management.

- This report highlights the need for an integrated nutrition policy that focuses on all forms of malnutrition (over and under-nutrition). It must include policy on the use of salt in the formal and informal food industry.

- The need to develop a comprehensive set of chronic disease health care indicators, based on data that can realistically be collected in South Africa, has been highlighted in this technical report.

Research needs:

- There is a need to improve the burden of disease data-base for the country, particularly for the poor areas. These data should also be used to monitor the impact of interventions already in place, such as the Tobacco Control legislation, and those interventions that still need to be developed and implemented.

- The development and evaluation of a wide range of interventions for many aspects of chronic conditions and their risk factors and the lifestyle modifications are needed, particularly focusing on the needs of the poor. These interventions must be culturally sensitive to the diversity in South Africa.

- The next SADHS needs to address the inadequacies found in the survey tool. For example, the smoking questionnaire previously suggested by WHO did not work well in South African populations. Additions need to be made to the questionnaire, such as questions on physical exercise, to make the survey more comprehensive.

- Epidemiological research to further investigate the determinance of oesophageal cancer is needed as a first step towards reducing this burden.

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CHAPTER 1

Overview on Poverty in South Africa

Krisela Steyn & Michelle Schneider

1 DEVELOPMENT AND HEALTH

Health and development are two closely related phenomena. For hundreds of years it has been recognised that people with the lowest socio-economic levels in the community have higher deaths and illness rates (Kaplan, *et al.,* 1987). This correlation between poverty and ill health has been observed throughout the world, regardless of whether the major causes of death were from infectious or non-infectious diseases and regardless of how socio-economic position was measured (ibid).

In recent decades, the health of people globally has improved more than in the whole span of human history. The rise in per capita income the past century has been closely linked to increases in life expectancy, with the steepest increases occurring at the lowest income levels (WHO Ad Hoc Committee, 1996). (Per capita income and life expectancy are proxy measures of development and health respectively.) The successes in the health sphere have come about in part because of growing incomes and increasing education around the globe and in part because of governments' efforts to expand health services, which have been further enriched by technological progress (World Bank, 1993).

However, development strategies may have adverse effects on the health status of certain population groups (Cooper, *et al.,* 1990). Industrialisation and urbanisation can cause ill health if communities are not protected against the negative impact of these processes.

2 CHANGING VIEWS ON POVERTY, DEVELOPMENT AND HEALTH

Barker (1996) has traced a brief history of changing theories of economic growth versus equity for development. In the 1960s, development was seen as virtually synonymous with economic growth, and growth-promoting policies were the order of the day. While it was accepted that economic growth would not initially reduce poverty, it was assumed that the income of the poorest would rise over time. This process of alleviating poverty was termed the ‘trickle-down effect’. It was accepted that inequality may increase further before moving towards a higher degree of equality. By the 1970s it was clear that little, if any, such trickling was happening and

in mid-1970 a basic needs approach was adopted by the international agencies with a focus on production at all levels of society. Health and education of the poor were promoted, with some shift in investments.

However, once again in the 1980s, development policies were aimed at high growth rates, with growth taking preference over equity. The global recession in the early 1980s resulted in an intolerable debt burden among the poor nations. By the mid-1980s it became apparent that the adjustment policies that were part of the servicing of the developing nation's debt, were causing severe hardship. By the 1990s there were renewed calls for equity to be re-established as a development goal. In terms of health, the *Health for All* programme of the World Health Organisation (WHO) envisaged an equity-oriented health strategy by the year 2000 through primary health care (Alma Ata, 1978).

The World Bank has rapidly emerged as a dominant force in the health policy arena, advocating investment in the health of the poor as a means of development (Zwi & Mills, 1995). In recent years the World Bank has espoused growth with equity (Barker & Green, 1996). Equity has now become a vital constituent of economic development.

3 EQUITY

There is ample evidence from the established market economies that a more egalitarian policy is associated with better health standards (Wilkinson, 1996). Wilkinson said that, "Among the developed countries, it is not the richest societies that have the best health, but those that have the smallest income differences" (Wilkinson, 1996). Furthermore, Caldwell (1993) demonstrated that a relatively egalitarian political culture is a precondition for superior health achievement by low-income countries.

In most parts of the world, equity is accepted as an important social and economic goal for the health care system. The concept of equity means different things to different people. For example, equity can refer to resource allocation and distribution. Equity in health can be defined as equal expenditure per capita, equal expenditure for equal need, equal access for equal need, or equal utilisation for equal need (Mooney & Drummond, 1982). One can also examine equity in terms of outcome, such as health status (Legge, 1993).

Price, (1998) defines equality as being "concerned primarily with treating people equally with respect to some characteristic in which they are alike" and equity is "concerned more with finding some principle of fairness that could be applied to all people consistently" (Price, 1998).

Equality in health care could be defined as the equal provision of health care regardless of need and equity, as the provision of health care with respect to need (Lowenson, *et al.*, 1991). "Equity refers to fairness and justice. It calls for the recognition of differential need, such as those of disadvantaged population groups in addition to equality of rights" (Bryant, *et al.*, 1997).

Economic efficiency does not include any principle of equity in health resource allocation. An economically effecient allocation of resources means that no one in the community can be made better off without making someone else worse off. In order to achieve social justice in the sense of seeking health for all, it will be necessary to divert considerable resources to the most disadvantaged in society

In addition, it will be vital that equity be achieved in the other sectors that impact on health, such as housing, income, education, and the supply of water and sanitation.

4 THE WORLD HEALTH ORGANISATION'S APPROACH TO POVERTY

In 1999 Gro Brundtland, Director General of the WHO, stated "It has long been recognised that poverty is a major risk factor for death, disease and disability. Illness and disabilities among the poor lead to a vicious circle of marginalisation, to falling into or remaining in poverty. But the other side of the coin – that improved health status can prevent poverty and offer a route out of poverty has been given much less attention. The evidence shows that better health translates into greater, and more equitably distributed, wealth by building physical and social capital and increasing productivity." (Brundtland, 1999).

The focus on health and relief of poverty, as a development issue, has been central to the planning of the WHO's activities since it was brought to the attention of member states at the 51st World Health Assembly meeting in 1998. Dr Brundtland emphasised that better health provides a route that can lead people out of poverty – and that an investment in health is an investment in economic development. However, she also highlighted that better information about the poor and the factors that influence their health is needed if the WHO and various countries are to act effectively in poverty relief (Brundtland, 1999). Consequently, much of the WHO activities have focused on understanding the determinants of poverty and ill-health and

the development of tools to assess these factors. The various initiatives in these areas have taken place in close collaboration with other organisations such as the World Bank and other development agencies. In turn, this led to the call for innovative ideas to measure aspects of health and health care, which have not been addressed in the past. This included identifying the most cost-effective approaches to promote health, taking into account the changing patterns of diseases, particularly in poorer countries, as well as assessments of the effectiveness of health delivery services.

One such initiative of the WHO is the development of a composite index measuring the performance of health systems in 191 countries (WHO, 2000). South Africa is ranked number 182. Noteworthy, is that the bottom ten rankings are all in sub-Saharan Africa, where HIV/AIDS is more prevalent. The World Health Report 2000 suggests that important advances can be made in health outcomes by modifying the way currently available health interventions are organised and delivered. This particular initiative has lead to debate raised in the *British Medical Journal.* Braveman. *et al.*, (2001) stated that although the world report is of value for recommending that national health systems be assessed by the average health status of the population of a country, it should also assess the extent to which health varies within the population should also be assessed. These authors expressed concern that the approach adopted in the report may undermine efforts to achieve greater equity in health within nations. They are concerned that the report did not address social inequalities in health defined by social characteristics such as poverty, education, occupation, population groups, gender, rural or urban residence and social conditions related to where people live or work. Such debates highlight the difficulty of developing measurement tools that could be used to address both efficiency and equity. The Disability-Adjusted Life Year, (DALY), the measure of health gap used in the Global Burden of Disease (GBD) study (Murray & Lopez, 1996) and similar measures that target the use of resources to maximise the benefits gained, can be used to identify those who can most benefit, over and above those who are in greater need (Barker, 1996).

5 DEMOGRAPHIC, EPIDEMIOLOGICAL AND HEALTH TRANSITION

Epidemiological patterns are complex and are characterised by constant transformation. A comprehensive model of health change is most useful. In the health transition model, (Omran, 1971), factors such as income, education and employment status and occupation, universally shape the age and sex patterns of populations through their impact on fertility and mortality.

In populations undergoing demographic transition there is generally a decline in mortality, followed by a decrease in fertility, resulting from improved socio-economic conditions. The

changing age structure of the population and the corresponding cause of death patterns during the demographic transition, are largely a function of the fertility decline. As fertility declines and the population ages, there is a relative preponderance of adults, i.e. persons born under conditions of high fertility and hence relatively more people exposed to cardiovascular problems and cancers. In addition, with industrialisation and urbanisation a decline occurs mainly in the mortality due to infectious diseases among the younger age groups. There is a consequent shift in the mortality profile towards chronic diseases, comprising the epidemiological 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. Omran (ibid) initiated the theory of epidemiological transition. He posited a set sequence of events starting with a preponderance of infectious diseases, followed by an era when chronic diseases predominated. Communities adopting unhealthy lifestyles, which include, smoking tobacco products, being physically inactive and consuming a typical westernised diet over time leads to the emergence of the chronic diseases. This results in high levels of obesity, hypertension, diabetes and hyperlipidaemia in communities. Frequently these new conditions are poorly diagnosed and inadequately treated (Omran, 1971).

The epidemiological transition together with the demographic transition has become known as the health transition (Mosley, *et al*., 1993). The health transition model includes determinants of health status: rising income, the expansion of education, urbanisation, industrialisation and the application of medical technology and improved public health, including better access to healthcare as part of the health services of the country. The health transition refers to the combined changes in fertility, mortality, cause of death composition, disability and the health system's response to these trends (Frenk, *et al*., 1989).

It was anticipated that this increase in chronic diseases would occur in poor countries undergoing industrialisation, development and adoption of typical westernised lifestyles. Initially the chronic diseases emerged in the wealthier sector of society, however, in the last quarter of the 20th century these conditions occurred more frequently in the poor, than in the wealthy, typically westernised, industrialised countries. In wealthier countries, chronic diseases are ameliorated through healthier eating and smoking patterns that arise from education (Colhoun, *et al*., 2001; Diez-Roux, *et al*., 1995; Sloggett, *et al*., 1994).

On the basis of observations from some large middle-income populations (Frenk, *et al*., 1989) proposed modifications to Omran's theory with the protracted-polarised model of epidemiological transition. This model is characterized by the coexistence of infectious and chronic diseases in the same population persisting for a long time. In the protracted model more affluent sections of the population would have completed the transition, while economically disadvantaged groups continue to suffer from pre-transitional pathologies. A feature of the protracted-polarised model is the juxtaposition of a developed and an underdeveloped sector of the population. The model has its roots in inequality and the emerging health patterns further aggravate this. The model is useful for the analysis of health status in developing countries but the historical context, such as colonialism, needs to be taken into consideration as well. The health transition occurred in industrialised countries after there had been substantial economic improvement. In Africa there has been urbanisation without industrialisation, which is not incorporated in the model (Behrens, 1994). According to Frenk *et al*. (1989), "Perhaps the major challenge is to make the health-care transition respond to the epidemiological transition in a way that reduces the inequities brought about by the protracted-polarised model".

6 POVERTY AND INEQUALITY IN SOUTH AFRICA

The World Bank classifies South Africa as a Middle-Income country (World Bank, 1993). Despite the reasonable average income, there are high levels of poverty. Depending on the poverty line and the methodology used there are various estimates of the extent of poverty. StatsSA estimate that 52% of households were living in poverty in 1996 (StatsSA, 2000a).

The Gini-coefficient is a measure of income inequality. It ranges from 0-1, with 0 representing absolute equality and 1 representing absolute inequality. The Gini-coefficient for South Africa is currently 0.58, and is the second highest in the world.

While economic growth contributes to poverty reduction, it may not necessarily reduce inequality. Achieving a reduction in poverty and increasing equality with social and distributive justice, pose a fundamental challenge to South Africa, without which, international experience suggests the human development, economic and employment goals of the government will be hindered (May, *et al.*, 1998).

The South African government is committed to poverty reduction and a more egalitarian distribution of income and wealth. Since 1994 the government has been committed to prioritise the health needs of vulnerable groups, such as the poor and in particular, women and children.

7 HEALTH AND DEVELOPMENT IN SOUTH AFRICA

It is essential that health be incorporated in a country's developmental policies. Developmental policies can be detrimental to the health of sectors of the population (Cooper, *et al*., 1990). An important example that occurred in South Africa is the land distribution and population resettlement policies that formed part of Apartheid's separate development programme and resulted in differences in health between race groups and geographical areas. More attention needs to be given to the health implications of developmental policies so as to enhance health and reduce inequalities. The Reconstruction and Development Programme (RDP), emphasising social justice, was initially promoted as the development initiative of the post-apartheid government (African National Congress, 1994). While RDP principles have been entrenched in the form of policy documents and legislation, in 1996, the government presented its new Growth and Redistribution Programme (GEAR). This signalled a significant shift in the African National Congress' (ANC) policies towards development, with economic growth being the primary thrust. Social development, which includes health, clearly takes a secondary position within GEAR. Although redistribution still features prominently in the GEAR strategy, it seems likely that the macro-economic adjustments aiming to reduce the budget deficit and curb state expenditure may seriously affect many of the RDP initiatives. There is general agreement that GEAR will impose additional hardships on the poor rather than alleviating the inequities inherited from apartheid (Van Rensburg, 1997). The government has, in addition, formulated an Integrated Sustainable Rural Development Programme in recognition of the particular need for rural development.

The National Progressive Primary Health Care Network (NPPHCN) states that, "the premise that economic growth is an obligatory precursor to development is false;" and instead, asserts that "when equitable development is pursued with vigour, economic growth will occur as a consequence" (NPPHCN, 1996).

The mortality profile in South Africa partly reflects the protracted-polarised model of diseases with poverty-related diseases, as well as chronic diseases related to an industrialised lifestyle (Bradshaw, *et al*., 1995). Based on the 1996 South African death registration, infectious diseases together with maternal and malnutrition related conditions account for 30.6% of deaths and chronic diseases account for 31.9%. These figures need to be interpreted with caution as there are a large group (15%) of ill-defined causes of death. These mis-classified causes of death could contribute to the proportion of deaths due to chronic or infectious diseases. In addition, the mortality and morbidity pattern reflects the burden of trauma and violence. The latter relates to the social transition under way during the demise of apartheid. The South

African mortality profile is undergoing unprecedented change. By 2001 the HIV/AIDS epidemic in the country will have taken on the pandemic proportions that have long been predicted (Dorrington, *et al*., 2001). Thus, in reality, South Africa has a quadruple burden of diseases.

8 CHRONIC DISEASE CARE IN POOR COMMUNITIES

A consequence of the protracted-polarised model in developing countries with limited resources is the enormous burden placed on the health services to cater for multiple burdens of diseases. In this situation it is clear that the chronic diseases are less likely to be adequately provided for when competing with the more acute and urgent conditions such as patients with trauma or those severely ill with active infections. Chronic diseases lack urgency at every level of resource allocation and consequently, unless a health service has a scientifically based process of priority setting to ensure appropriate resource allocation, chronic diseases seldom receive the resource allocations required for prevention and cost-effective care.

Furthermore, health services in poorer countries are largely based on a model for treating acute illness. Such a model, particularly in public sector clinics catering for the poor, rarely provides for the appropriate health promotion initiatives or educational needs of patients with chronic disease. For example, the logistics of dispensing long-term medication for chronic diseases is seldom organised so that patients can obtain repeat prescriptions in an efficient way.

The reality of the rapid demographic and social changes that underlie much of the health transition is generally not amenable to interventions by the health sector. However, many of the determinants of chronic diseases among the poor are preventable and can be ameliorated. These are highlighted by Yach (2001) and include the following:

1 Changes in the consumption patterns of products associated with unhealthy lifestyles, which increase the risk of chronic diseases, these include tobacco use, alcohol abuse, an increase in the consumption of food high in fat and low in fibre and associated with reduced physical activity. Many of these unhealthy products are unscrupulously promoted by the relevant industries, particularly in poorer countries.
2 Rapid urbanisation, changes in work opportunities and social disintegration associated with the loss of traditional lifestyles.

3 Publicly funded primary health care services have traditionally focused on the treatment of acute conditions and health care for mothers and children with little attention on the prevention and care of chronic diseases.
4 High levels of infectious diseases, under-nutrition, complications of pregnancy and trauma competing for resources allocated to chronic disease.

Yach (ibid) suggests the following approaches to reduce the impact of chronic diseases amongst the poor:

1 Making chronic diseases and disabilities more visible through better information.
2 Health services should continue to give priority to reducing the burden of diseases associated with deprivation.
3 Act on the determinants of chronic diseases through global and national multi-sectoral policies and interventions that reach the poor.
4 Transform health services to respond to chronic care needs of the poor and reinforce the importance of primary health care and the prevention of risk factors for chronic diseases.
5 Expand the partnerships with organisations such as NGOs that contribute to the prevention and care of chronic diseases.

9 ADDITIONAL FACTORS INFLUENCING CHRONIC DISEASES IN THE POOR IN SOUTH AFRICA

In addition to the factors suggested by Yach (2001) as contributing to inadequate chronic disease prevention and control in the poor, some other factors play a role in South Africa. These are related to the historical situation in the country along with the developmental activities that have been introduced since 1994.

9.1 The structure of the health system

Prior to 1994 the public health care system was hospital based and provided excellent tertiary care linked to academic health centres. Primary health care services were not universally available, particularly not to the poor. Since 1994, the primary focus of the ANC government's health plan has been the development of primary health care with universal access. This has resulted in a substantial shift of patients away from large hospitals to primary health care centres in the community. Despite the large numbers of primary health care centres that have been built since 1994, particularly in rural areas of South Africa, there are staff shortages and inadequate facilities for outpatient care in the face of the enormous additional patient load. The Department of Health initiatives to improve primary health care provision includes the

expansion of partnerships of the primary health care team with patients and communities. Attempts to improve professional behaviour through the implementation of social teaching models is also part of current initiatives. However, there have been financial restrictions and limited resources available. This has resulted in poorly organised primary health care clinics (PHCC), with limited numbers of trained staff and inadequate facilities, equipment and medication. Chronic disease prevention and care have proved to be inadequate under such conditions (Goodman, 1997; Levitt, 1999; Steyn, 2001).

9.2 Development of therapeutic guidelines

The National Department of Health's Directorate for Chronic Diseases, Disabilities and Geriatrics has undertaken an extensive programme to develop therapeutic guidelines based on expert opinions, for the common chronic diseases (SEMDSA, 1997; SA Hypertension Soc Executive Committee, 2001). These have been widely distributed to the primary health care clinics. However, there are certain limitations in this approach as was observed by Daniels *et al*. (2000). Some of the guideline recommendations were unrealistic with respect to the resources available in PHCC. Furthermore, some medications that were recommended were not on the Essential Drug Lists or were not in the dispensaries due to budget limitations. These problems will have a greater effect on poor patients with chronic diseases who attend these PHCC rather than the private sector.

9.3 Tobacco control in South Africa

One aspect of the chronic disease prevention that has been particularly successful in South Africa has been the introduction of strong tobacco control legislation. Tobacco control initiatives have increased dramatically in South Africa, especially since 1994 when the new post-apartheid government came into power. In 1993, the first Tobacco Products Control Act was passed, and in 1999 President Mandela signed the Tobacco Products Control Amendment Act. This provides the country with one of the most comprehensive tobacco control legislation packages in the world. The act protects children and adolescents from multimillion-Rand marketing campaigns by banning advertising and promotions. It also ensures the rights of non-smokers to a clean environment, unpolluted by tobacco smoke. These actions seem to have had a marked impact on tobacco consumption in South Africa as tobacco consumption declined continuously between 1991 and 1997. The Tobacco Board reported that annual tobacco consumption dropped by 21.6% from 43.6 to 34.2 million kg of tobacco leaf during this period (RSA Tobacco Board, 1992; RSA Tobacco Board, 1998).

9.4 The AIDS epidemic and chronic disease care in South Africa

The most striking feature of the AIDS pandemic in South Africa is the tremendous increase in the mortality of young adults (Dorrington, *et al.*, 2001). As a consequence, the older and poorer people not only have to care for their adult children who suffer from AIDS, but also for their grandchildren who are orphaned when their parents die. Although not yet formally evaluated, the impact this has on the quality of chronic diseases care for the elderly must be extensive. They are emotionally drained as a result of the changing family structure and through the premature loss of their children, who traditionally would have cared for them in their old age (Adjetaye-Sorsey, 2000). The impact that the AIDS epidemic has on chronic diseases and chronic diseases care in older persons must surely aggravate the position of the poor.

9.5 Role of old age pension in the poor in South Africa

South Africa and Namibia are the only African countries to have a universal, non-contributory old-age pension system. The monetary value of the South African social pension is relatively low, but generous by standards in other developing countries (Ferreira, 1998). Males and females may become eligible for a pension according to a means test, from the age of 65 and 60 years, respectively. The rate of up-take among African and coloured South Africans is about 90%, while it is lower in the more affluent Indian (60%) and the wealthier white communities (20%) (Ferreira, 1998).

There is limited welfare assistance for other South Africans and there is no support for the unemployed from government. The dependency ratio on old age pensions in South Africa is very high (NP 1:7). With 40% of households headed by older person, because of the impact of HIV/ADIS, this has even worsened. As a consequence the old-age pension is pivotal in the lives of the majority of older South Africans and frequently a lifeline for entire families (Van Vuuren & Groenewald, 2000). The extended demand on the old age pension has been shown to be associated with physical and economic abuse of older people in order to get to their pension money. Consequently the funds of the elderly funds for food, water, electricity and visits to clinics and hospitals are limited and will impact on their chronic diseases care and clearly the poorer they are, the larger the impact.

9.6 The role of the informal sector and poverty in South Africa

In South Africa's townships where large proportions of poor people live, the informal sector makes an enormous contribution to the local economy. Although the size of the latter is extremely difficult to measure or evaluate, it was estimated in 1995 that 1.74 million people were working in the informal sector (Mohr, 2000). Since 1995, large numbers of workers have lost their jobs in the formal sector and the informal sector has consequently grown. It has been

suggested that workers in the informal sector must have grown to at least 2 million in 2001 (Personal communication, Dr Corne Van Walbeeck, School of Economics, University of Cape Town, South Africa). The influence benefits of this for the poor must be significant but extremely difficult to capture when attempting to assess the socio-economic status (SES) of people living in the townships.

10 THE MEASUREMENT OF POVERTY AND SOCIO-ECONOMIC STATUS IN SOUTH AFRICA

Considering some of the factors mentioned above, it is clear that the measurement of socio-economic status and poverty can be challenging in South Africa. Many of the usual determinants cannot be ascertained with any degree of accuracy or are not comparable for all sectors of society. In large, multi-generational families, particularly in the townships, the total income is never calculated and the contribution of goods and infrastructure that is acquired without the exchange of money also cannot be determined.

Population group of the person has in the past broadly reflected socio-economic status as influenced by apartheid. In effect the population classification could be used as a proxy measure for social conditions, with the black African community being the poorest sector in the society and whites the wealthiest. This situation is now changing rapidly, with an emerging middle class and affluent sector emerging in the black community, assisted by the implementation of the Employment Equity Act of South Africa that enforces affirmative action. Similarly, there is increasing poverty among previously advantaged white South Africans.

The level of education achieved by people is also not a fail-safe indicator of socio-economic status in South Africa. In the black community older people tended to have low levels of education whatever their level of affluence. The ubiquitous ‘Bantu Education’ system of the previous government resulted in a lower level of education for African youth. As a result the number of years of education for African youth is not commensurate with the number of years of education received by white scholars.

11 CONCLUSION

The results of the Global Burden of Disease (GBD) study are based on global population averages. As averages tend to conceal important differences, it is important that one obtains estimates of burden for sub-groups within populations. Gwatkin and Heuveline (1997) re-analysed the Murray-Lopez data for the one billion poorest 20% of the world’s population and

for comparative purposes, the worlds richest 20%. Based on global population averages chronic diseases account for 55.7% of the burden and communicable diseases account for 32.8% of the burden. The relative importance of non-communicable and communicable diseases in the poor is almost exactly the reverse of that appearing in the overall global figures, i.e. 33.6% and 56.1% respectively. Non-communicable diseases account for an overwhelming 84.8% in the rich category.

Notwithstanding the above analysis, Unwin (2001) has said that chronic diseases are major health problems, even in the world's poorest countries where infectious diseases continue to take a huge toll. He argues that in developing countries the rise of chronic diseases are inextricably linked to economic and cultural globalisation, exemplified by the activities of multinational tobacco companies and through processes like urbanisation which predominantly affect the poor. This needs to be taken into account when monitoring the health transition in South Africa.

The burden of disease is concentrated in the poorest countries. However, in developing countries, it becomes difficult to predict whether the rich or the poor are most at risk for chronic disease (Mbanya, 2001). It is important to investigate and assess this for South Africa.

12 THE PURPOSE OF THIS REPORT

Globally the influence of poverty, inequality and health has become an area of interest that is well described in an excellent book, edited by Leon & Walt (2001). In South Africa in the past, no information was available on the association between poverty and the patterns of mortality or morbidity caused by chronic diseases, or their risk factors. This technical report explores the relationship between poverty and the extent of chronic diseases in South Africa using the improving mortality data and the newly available morbidity and chronic disease risk factor data from the South African Adult Demographic and Health Survey conducted in 1998 (Department of Health, MRC & MacroInt, 1999).

In Chapter 2 the measurement of poverty is discussed in detail and an asset index is developed for the adult SADHS data set. This is created by considering the availability of durable goods in a household, along with the type of the housing and access to basic facilities such as water and sanitation. The robustness of this index is explored as well as its correlation with other poverty indicators.

The reported mortality data based on the 1996 death certificates have been analysed according to the socio-economic status of the area in which the death occurred as there are no individual based socio-economic indicators linked to the data. The mortality profile of the poor areas is contrasted with the profile of the rich areas and discussed in Chapter 3.

Chapter 4 summarises the multivariate analysis of the socio-demographic indicators against a range of chronic diseases and their risk factors as outcome measures that were measured in the adult health section of the SADHS. This chapter also includes an analysis of some health service indicators. The indicators of poverty and SES that were evaluated include the level of education, the population group, self-identified by each participant in the SADHS survey and the 'asset index' discussed in Chapter 2. The participant's age and place of residence, whether urban or rural, were also considered in this analysis.

Chapter 5 provides an overview and identifies some policy implications that emerge from the analysis presented in this technical report.

CHAPTER 2
The Measurement of Poverty

Frikkie Booysen

1 INTRODUCTION

There are different approaches to the measurement of poverty, depending on the objective of the analysis, and the nature of the data and the methodology employed in measuring poverty. In essence, one can distinguish between the conventional approach to the measurement of poverty, which is based on income and/or expenditure data, and a number of alternative approaches, such as those that employ socio-economic indicators and participatory poverty assessments. Of these alternative approaches, the asset index approach applied to data from international Demographic and Health Surveys (DHS) has gained increasing popularity in recent years, particularly in analyses of the relationship between poverty, health and population issues. The objective of this chapter is to describe the mainstream and asset index approaches to the measurement of poverty and to compare the results of their application to South Africa.

2 NATIONAL, REGIONAL AND INTERNATIONAL TRENDS IN POVERTY

Available estimates of the prevalence of poverty in South Africa range from 11.05 to 56.9%, depending on the poverty line, the method employed in measuring poverty and whether poverty is measured at the household or at the individual level. In terms of the internationally comparable poverty line of PPP$1 per capita per day, the level of poverty in South Africa compares as follows to regional and global trends in poverty. Globally, the proportion of people living in poverty has declined from 29% in 1987 to 26% in 1998. Yet, the total number of poor remained almost unchanged at 1.2 billion. The reduction in global poverty is attributed to progress in East Asia, with the situation in Africa not changing significantly. In 1987, 47% of the African population lived in poverty, a figure that by 1998 stood at 46%. By 1998 an additional 74 million people in Africa had joined the ranks of the poor. Sub-Saharan Africa, moreover, is the region in the world with the highest prevalence of poverty (World Bank, 2000b). In 1993, the World Bank reported that the prevalence of poverty in South Africa stood at 23.7% relative to the international poverty line of PPP$1 per capita per day, considerably higher than the figure of 11.05% reported for 1995 using the same poverty line. This may suggest that levels of poverty have deteriorated considerably over a relatively short

period of time. However, these two poverty estimates were derived from different data sets (the 1993 Saldru and 1995 IES data sets respectively) and therefore are not directly comparable. Of the African countries for which similar estimates are reported, only Côte d'Ivoire outperformed South Africa, the prevalence of poverty for 1988 being estimated at 17.7%. The eleven remaining African nations performed considerably worse than South Africa, with the headcount poverty index ranging from 31.1% (Nigeria, 1991-92) to 84.6% (Zambia, 1993) (World Bank, 2001).

3 MAINSTREAM APPROACHES TO THE MEASUREMENT OF POVERTY

3.1 Methodology

In order to measure poverty, it needs to be adequately defined. Lipton & Ravallion (1995) describe 'poverty' as where 'one or more persons fall short of a level of economic welfare deemed to constitute a reasonable minimum, either in some absolute sense or by the standards of a specific society'. This latter conceptualisation corresponds closely to Townsend's (1971) view of poverty as relative deprivation resulting from a maldistribution of resources.

There are two main approaches to the measurement of poverty. In the case of the *utility approach* to measurement, poverty is interpreted in terms of the command over commodities that resources afford people via income and consumption (Lipton & Ravallion, 1995). The concern, therefore, is with what Woolard & Leibbrandt (1999) call 'poverty proper' (i.e. resource adequacy); not with the physiological, sociological or political dimensions of poverty. The *capability approach* to measurement focuses on the extent to which the consumption of certain goods and services affords people certain capabilities, e.g. health, literacy and sanitation (Sen, 1984). Capabilities are measured with the aid of indicators such as life expectancy, literacy and calorie intake.

Lipton (1997) endorses a separate analysis of utility and capability-based measures of poverty. There is a clear distinction between measuring resource adequacy and functioning capability. People commanding an adequate level of resources to afford them to be fed adequately or to be educated, are not necessarily fed adequately or educated (Drèze & Sen, 1989; Sen, 1992; Sen, 1993). Consequently, capability measures and other social indicators greatly complement conventional measures of poverty and inequality (Greeley, 1994; Ravallion, 1994b). These indicators are indispensable in describing living conditions within households, something which aggregate measures of poverty cannot do if not decomposed into poverty profiles (Ravallion, 1994b).

Participatory poverty assessments (PPAs) also complement conventional poverty measures. PPAs are crucial in what Burkey (1996) calls the first step in poverty alleviation, i.e. analyzing the 'causes of poverty affecting a particular people in their own particular situation' in a participatory manner. This allows policy makers a 'better understanding of both the dynamics of poverty and the coping strategies adopted by the poor' (Brocklesby & Holland, 1998). These assessments are useful in verifying the conclusions drawn from the type of poverty comparisons described in this chapter. Woolard & Leibbrandt (1999), amongst other things, relate the higher prevalence of poverty amongst female-headed households in South Africa to the large amount of time these women spend in unpaid labor according to a PPA, thus leaving them with less time to spend earning income.

The utility approach, however, remains the conventional approach to the measurement of poverty and is discussed in more detail below, particularly insofar as the poverty estimates for South Africa published by Statistics South Africa (2000) are based on this approach. Before describing the common measures of poverty employed in this mainstream approach, it is necessary to distinguish between the identification and aggregation aspects of measurement (Sen, 1976 & 1981; Hagenaars, 1991). Identification is aimed at determining who the poor are and how poor they are, whereas aggregation is concerned with determining how much poverty there is (Ravallion, 1994b). Woolard & Leibbrandt (1999) present an alternative typology of measurement. They distinguish between the ranking of households, poverty line selection and the profiling of poverty. The former two aspects are elements of the identification process. The construction of poverty profiles can best be described as a method of comparison that follows on aggregation.

Generally, a single monetary indicator, such as income or consumption, is employed in assessing the extent of poverty (Ravallion, 1996). Income is argued to reflect consumption opportunities and is therefore a popular measure of poverty (Hagenaars, 1991). Expenditure represents an alternative resource base for measuring poverty and inequality (Lipton, 1997). There are various reasons why income represents an inadequate measure of poverty. Although household income is generally assumed to be spent so as to benefit the whole family, this may not necessarily be the case (Woolley & Marshall, 1994). Furthermore, levels of income and consumption often differ as a result of saving/dissaving, i.e. so-called consumption smoothing. Consumption, moreover, represents a better proxy of current living standards and long-term average well-being than income for various reasons. Consumption bridges the observed disparity between income and expenditure levels. Expenditure also reveals information about both past and future incomes, because it includes consumption financed from saving or dissaving (Lipton & Ravallion, 1995). Expenditure, however,

underplays inequalities between rich and poor, because the rich do not spend all their income and do save some of their income unlike the poor who tend to live from hand to mouth.

Households with the same level of income or consumption do not necessarily enjoy the same level of well-being. The larger the household, the lower the level of well-being at similar levels of household income or expenditure. Measures of equivalent income or expenditure are employed to allow for these differences in well-being related to household characteristics (Lipton & Ravallion, 1995; Burkhauser, *et al*., 1997). 'Equivalent income or expenditure' represents minimum total income or expenditure adjusted for differences in household size and composition using a suitable equivalence scale (Ravallion, 1994b; Woolley & Marshall, 1994). Equivalence scales are factors employed to adjust income, consumption and/or specific poverty line estimates for differences in household size and composition to obtain better comparable poverty estimates (Ravallion, 1992). An equivalence scale represents the number of adult males that a household of specific size and composition is equivalent to in terms of consumption needs. Adult females and children are normally assigned an adult male equivalence of less than one (Ravallion, 1994b). Various methods are employed in estimating adult equivalent income or expenditure. So, for example, estimates of household income and expenditure can be adjusted for differences in household size by dividing total monthly income and expenditure by n^{α}, where n presents the number of household members and α an adjustment for household economies of scale (Filmer and Pritchett, 1998). According to Lanjouw & Ravallion (1995) and Drèze & Srinivasan (1997), a α coefficient of 0.6 represents an adequately robust and reliable adjustment for household economies of scale.

To estimate poverty one requires a poverty line, i.e. a level of expenditure or income below which people are considered poor. Poverty lines provide a yardstick with which to compare the circumstances of individual households or persons. Aggregate measures of poverty cannot be estimated without a poverty line. Four types of methods are employed in estimating poverty lines. The cost-of-basic-needs (CBN) approach is the most common approach to poverty line estimation (Lipton & Ravallion, 1995). It involves the estimation of the cost of that bundle of goods required for meeting subsistence needs. The second group of methods focuses on determining the amount of resources required to meet certain minimum nutritional requirements. These methods determine a food poverty line based on the cost of that food bundle required to match the daily calorie intake requirements determined by the World Health Organization (WHO) (Ravallion & Bidani, 1994). An example of these techniques is the food-energy-intake (FEI) method, which requires observations of actual food consumption patterns (Thorbecke, 1998). Thirdly, there are those methods that employ data on the distribution of resources to identify people as poor (Ravallion, 1992). Identification

takes place relative to current levels of income and/or consumption. The following are three examples of such methods. The food-ratio (FR) method employs an Engel curve function to determine an adequate food expenditure-income ratio. People whose food expenditure-income ratio falls below this level are considered poor. The percentile-of-income-distribution (PID) method defines as the borderline a certain percentile of the income distribution. The average income of people falling within this percentile is then used as the poverty line. The fraction-of-median-income (FMI) method employs the relation between actual and median income to determine people's poverty status. Once a person's or a household's income amounts to less than a certain percentage of the median income, they are considered poor (Hagenaars & Van Praag, 1982). Lastly, in the case of the estimation of a 'subjective' poverty line, people evaluate their own economic status by answering questions as to what level of income or consumption they consider adequate or desirable (Danziger, *et al.*, 1984). The poverty line is then set with reference to actual and required levels of income or expenditure.

Arbitrariness is practically unavoidable in setting poverty lines, primarily because of the multitude of methods that are employed for this purpose (Kgarimetsa, 1992; Alcock, 1993; Johnson, 1996). The standard practice has become one of testing the robustness of poverty lines by simultaneously employing more than one such estimate in poverty analysis. Results are compared across estimates based on different methodologies and/or alternative assumptions made using similar methods (Lipton & Ravallion, 1995; Lipton, 1997). Poverty line estimates for 1993 that have been employed in poverty analysis for South Africa range from R105.00 to R251.10 per adult equivalent per month. The former estimate is the international poverty line of US$1 per capita per day commonly used by the World Bank, while the latter estimate is the household subsistence level (HSL) set by the Institute for Development Planning Research (Klasen, 1997; Woolard & Leibbrandt, 1999).

Armed with the required adjusted estimates of income or consumption and the poverty line estimate, one can aggregate this information into descriptive measures of poverty (Grootaert, 1983). The following three summary indicators of poverty are commonly used in poverty analysis.

- The *headcount poverty index* (H) is a measure of the prevalence of poverty, i.e. the percentage of the population with a level of income or consumption below the poverty line (z). H = q/n, where q represents the number of poor persons falling below the poverty line z and n the total population (Ravallion, 1992/94a/94b; Lipton & Ravallion, 1995).

- The *poverty gap index* (PG) is a measure of the intensity or depth of poverty that allows for how far the poor fall below the poverty line. The index is calculated as each individual's shortfall below the poverty line (z) summed over the total population. It considers the non-poor to have a zero poverty gap. $PG = 1/n \Sigma [(z-y_1)/z] = H (1-\mu/z)$, where H represents the headcount poverty index, μ mean expenditure or income, and z the poverty line. PG can be interpreted as a measure of the potential saving to the poverty alleviation budget from targeting exactly the right amount of transfers to the poor. PG reflects the ratio between the cost of filling up each poverty gap to the poverty line (i.e. the sum of all poverty gaps) and transferring to everyone the value of the poverty line (i.e. zxn) (Ravallion, 1992/94a/94b; Ravallion & Bidani, 1994; Lipton; 1997).

- The *squared poverty gap index* (SPG) represents a measure of the severity of poverty that allows for the extent of inequality amongst the poor. The SPG attaches more weight to those gains furthest from the poverty line. The index is calculated as the mean of the squared proportional poverty gaps over the entire population with the non-poor again counted as having a zero poverty gap. $SPG = 1/n \Sigma[(z-y_1)/z]^2 = PG^2/H + (H-PG)^2 / H*CV_p^2$, where H and PG respectively represent the headcount and poverty gap indexes, while CV_p^2 is the squared coefficient of variation of income or consumption amongst the poor (Ravallion, 1994a/94b; Ravallion & Bidani, 1994; Lipton & Ravallion, 1995; Lipton, 1997).

The headcount, poverty gap and squared poverty gap indexes are special cases of the Foster-Greer-Thorbecke (FGT) class of poverty measures. $P_\alpha = 1/n\Sigma[z-y_i/z]^\alpha$, where z represents the poverty line and y_i the actual income or consumption level of each person or household. The three FGT measures each focus on a different conventional poverty measure. P_0, P_1 and P_2 respectively are derivatives of the headcount (H), poverty gap (PG) and squared poverty gap (SPG) indexes (Greer & Thorbecke, 1986). These measures become more sensitive to the well-being of the poorest person as the value of α increases (Woolard & Leibbrandt, 1999).

3.2 Application to South Africa

The 1996 poverty estimates published in the report by Statistics South Africa entitled *Measuring Poverty* are calculated with the aid of this mainstream approach to the measurement of poverty. Estimates of the headcount poverty index were derived from income and expenditure data available from the 1995 Income and Expenditure Survey (IES), October Household Survey (OHS), and the 1996 population census. The poverty lines employed respectively to assess poverty at the household and at the individual level are a

monthly household income of R800, which is employed in calculating the equitable shares grant to provinces and local councils, and a per capita income of R250. Comparisons, though, of some of these estimates exhibit substantial discrepancies. So, for example, the national level of poverty is more than 80% higher in the census than in the IES data. Yet, the poverty estimates that were derived from the expenditure and income data from the IES correspond closely. This means that the substantial discrepancy between the IES and census estimates cannot be put down to the fact that the estimates from the census data are based on income data and that for the IES on expenditure data. The income data for the census is derived from one question about individual income and one on remittances. The IES include detailed questions on individual earnings from both formal and informal sources, as well as returns on household assets and receipts of gifts and dowry. Thus, the census data probably understates household income. Analysis of the goodness-of-fit between the IES expenditure and census income showed that this is indeed the case, particularly for rural areas. Consequently, the analysis focused on the IES expenditure data in constructing poverty maps for South Africa.

Data from the 1995 Income and Expenditure Survey (IES) and October Household Survey (OHS), which visited the same households, were combined to construct a poverty map of South Africa based on data from the 1996 population census. The annual OHS survey collects data on certain key indicators of living patterns, notably employment, migration, housing, access to services, education and vital statistics. The IES provides data on household income and expenditure. Expenditure data from the 1995 IES was regressed on the socio-economic variables available from the 1995 OHS for each of the nine provinces to determine an association model between per capita household expenditure and household characteristics common to the census and the household survey data. Included in the model are the age distribution of males and females, the population group distribution of the population, whether the household lives in a formal dwelling and whether they own the dwelling, the number of rooms per person, the availability of sanitation, refuse removal and a telephone, the use of electricity for lighting, and the number of individuals within the household who completed primary education and who are skilled or professional workers. The explanatory power of the nine models ranges from 0.6 (Northern Province) to 0.79 (Free State), which are considered relatively good, given that the analysis is based on household level data. As explained elsewhere, the focus is on expenditure rather than income insofar as it is assumed that expenditure is recorded more accurately during household surveys than income and that expenditure is a better indicator of household level in the long run. Expenditure estimates were then imputed from the census data based on the results of this regression analysis, after which poverty estimates were calculated for each of the units of analysis, namely province, district council, and magisterial district. The analysis makes use

of the headcount poverty index, i.e. the poverty measure described above as being least pro-poor. The poverty estimate represents the average of the probability that individual households with certain observable characteristics within the particular geographical region are poor, with the average weighted by household size and sampling weights whenever available.

The resulting estimates of expenditure and poverty correspond more closely to the IES estimates than the poverty estimates based on the income data from the census. The simple and rank order correlation coefficients for the association between the provincial estimates of average expenditure are respectively 0.97 and 0.93, while the corresponding coefficients for the provincial poverty estimates are 0.98 and 0.90. The extent of this correlation drops as the analysis moves down to the level of EA types, district councils and magisterial districts. This is understandable insofar as the IES sample, which includes a total of 28 585 households, becomes very limited beyond this level. Furthermore, there is no systematic pattern in the differences between the imputed expenditures and the IES data, which indicates that the estimates of imputed expenditure are relatively reliable measures of differences in standards of living.

Three important assumptions underlie the methodology employed by Statistics South Africa in calculating these poverty estimates. Firstly, the residuals from the regressions employed in calculating imputed expenditure are assumed to be normally distributed, an assumption backed by a preliminary analysis of the distribution of these residuals. In the second instance, residuals were assumed to be homoskedastic. Preliminary analysis, though, seems to indicate that the residuals are, in fact, heteroscedastic, which will require further analysis to adjust the estimates of imputed expenditure accordingly. Finally, the authors assume that the disturbance term in the equation employed in estimating imputed expenditure is not correlated across households within a cluster, town or magisterial district, an assumption that preliminary analysis also appears to contradict, thus requiring further work to fine-tune these poverty estimates for South Africa. Although the authors highlight the fact that further analysis will indeed explore the following issues, it needs to be pointed out that the analysis does not investigate the depth and severity of poverty, because it focuses only on the headcount index of poverty, which measures only the prevalence of poverty. The analysis also does not compare the robustness of the results to different assumptions about poverty lines, although the poverty line that it does employ has immediate policy relevance, nor does the analysis adjust imputed expenditure for differences in household economies of scale (StatsSA, 2000a). In the final pages of this chapter, these and other poverty estimates for

South Africa based on the conventional approach to measurement are compared to poverty estimates derived from the 1998 DHS data for South Africa.

4 MEASURING POVERTY WITH THE AID OF DHS SURVEY DATA

4.1 Methodology

More than seventy nationally representative Demographic and Health Surveys (DHS) have been conducted in more than fifty countries since 1984 (Sahn & Stifel, 2000). The DHS traditionally does not include questions on income and expenditure. As a result, it is not possible to apply the conventional approach to the measurement of poverty. Consequently, a number of alternative indexes of socio-economic status or standard of living have been derived from the socio-economic variables included in the DHS questionnaires. This alternative approach to the measurement of poverty has also been applied to other socio-demographic data sets.

Factor and principal component analysis are frequently employed in the measurement of differences in socio-economic status from socio-demographic data. The purposes of these analytical techniques are to determine the number of latent variables underlying the data, to condense the data and to define the content and meaning of the factors or latent variables accounting for the variation in the data (Child, 1970; Afifi & Clark, 1984; De Vellis, 1991). Thus, it is assumed that the long-run wealth of households causes the most common variation in asset variables (Filmer & Pritchett, 1998). A distinction can be drawn between studies that employ these analytical techniques only in the process of identifying the variables to be included in such standard of living indexes and studies that also employ the results in calculating the indexes (Child, 1970; Afifi & Clark, 1984; De Vellis, 1991). So, for example, factor analysis also features in the poverty report released by Statistics South Africa (2000). Factor analysis was employed in identifying the components included in the two development indexes of household infrastructure and circumstance derived from the 1996 census data. Other methods of weighting and indexing were applied to the data to calculate the index values. In this case, use was made of the method of assigning particular scores to certain ranges of indicator values and then adding up these scores across the indicators to calculate the composite index value. Each range of indicator scores was divided into equal thirds, with scores of one, two or three assigned to each range of scores (StatsSA, 2000a). The emphasis here though is on those methods that employ factor and principal component analysis in its entirety in measuring poverty, of which the asset index approach employed by the World Bank has become a prime example.

The World Bank has published a number of country reports describing the health, nutrition and population status and service utilization among individuals of different socio-economic classes using DHS data. Filmer & Pritchett's (1998) asset index approach to the measurement of poverty is used to quantify differences in socio-economic status. The index is based on data from the household questionnaires administered during the DHS. The variables used for this purpose include all those items in the DHS household questionnaire for the particular country that measures household ownership of consumer goods and access to services and resources such as electricity, water and sanitation. It is important that variable selection has a conceptual framework so that variables included in the factor analysis are ones that are important in improving health status. The long-term determinants of health prospects include education, water and sanitation, unemployment, living and working conditions, nutrition, social security, lifestyle, and social and community networks (DFID, 1999). In this sense, the use of DHS household data in analyzing poverty can at least be justified in some theoretical sense. Following, is an overview of the methodology employed by the World Bank in measuring differences in socio-economic status.

The methodology adopted by the World Bank first codes the household variables into dichotomous variables, distinguishing between households that own the particular asset or for which a particular statement about access to services is true and ones that do not own the asset or for which the statement is not true. Hence, all variables take on a value of zero or one. The only variable that is included in the principal component analysis as a continuous variable is the number of household members sharing a room for sleeping purposes. Scoring factors for each of these variables are estimated with the aid of iterated principal factor analysis. During iterated factor analysis a more reliable result is determined by repeated approximations (Child, 1970). In the World Bank application, only the scores of the first principal component or factor are used to derive the asset index. Filmer & Pritchett (1998), though, emphasizes the fact that the second principal component or factor may also be useful, particularly where the first component explains a relatively low percentage of variance. The second component or factor may, for example, be important in distinguishing 'rich' rural households from 'rich' urban households. The score on each variable is standardized in relation to the unweighted mean and standard deviation of the particular variable. The resulting scores are then weighted with the scoring coefficient for that variable. The value of the household asset index is calculated by summing the score on each variable across all the variables included in the principal component analysis. In mathematical terms, the asset index for asset variables 1 to n can be represented as:

$$A_j = f_1 \times (a_{j1} - a_1) / (s_1) + \ldots f_n \times (a_{jn} - a_n) / (S_n) \qquad (1)$$

where A_j represents the asset index, f the scoring factors or coefficients for each asset, a the household's score on the particular asset, and a and s the mean and standard deviation of each asset variable (Filmer & Pritchett, 1998).

The World Bank assumes complete economies of scale, i.e. that the addition of one person to a particular household does not change the weight of the variable for other individuals in that household. Differences in health, nutrition and population status across different socio-economic classes are then analyzed by comparing various 'status' and 'service' indicators across individuals with different asset scores. Individuals are assigned the score on the asset index for the particular household to which they belong. During these and other analyses applied to the asset index, the data is weighted with the standard DHS weight multiplied by the number of *de jure* members in each household. For the purpose of these comparisons, scores on the asset index are divided into five population quintiles (i.e. five groups with an equal number of households in each group), with comparisons being made across the five quintiles. There are two ways of making this type of comparison. The approach employed by the World Bank is to compare the values of particular heath-related indicators between the quintiles, e.g. body-mass index (BMI) values. Another possibility is to compare the number of individuals in each quintile that are at risk in terms of certain indicators, e.g. percentage of people with BMI below a specific standard (Filmer & Pritchett, 1998; World Bank, 2000a).

Different weighting systems can be applied to the results of factor or principal component analysis when calculating the index value. One option is to simply add up the scores on those variables that load heavily on a given factor without weighting the index components in any way. Such approach assumes that the variables included in the index are equally important in explaining differences in socio-economic status. On the other hand, individual scores on variables can be multiplied by the scoring coefficients obtained from the factor analysis, thus introducing weights into the index. In most cases the scoring coefficient is multiplied by the standardized value of the variable, calculated by subtracting the mean of the variable from the score and then dividing it by the standard deviation of that variable. A regression procedure that combines the correlation between variables and their factor loadings is used to determine these scoring coefficients. Two different approaches to weighting can be followed. One option is to include all the variables in the factor in the calculation, like in the case of the World Bank methodology. The alternative option is to include only those variables that load excessively during the factor analysis and exclude ones with scoring coefficients close to zero. In the latter case, the scoring coefficients of the selected variables are often rounded up to further simplify the calculation of the index value. A common guideline used for this purpose is to select only those items that have factor loadings larger than $|0.50|$. The latter

criterion can be lowered as the size of the data set increases (Child, 1970; Afifi & Clark, 1984; Filmer & Pritchett, 1998). Filmer & Pritchett (1998) also list two alternative options of weighting employed in the construction of asset indexes. The one option is to weight the scores on different asset variables with the price of the particular assets. However, such calculations require price data to be collected for the relevant assets, which is not done in DHS surveys. The other option is that of entering the asset variables individually into the regression equation as proxies of socio-economic status in order to 'control' for the effect of wealth on other outcomes.

The World Bank methodology has much in common with what Ngwane, *et al*. (2001) describe as the totally fuzzy and relative approach to poverty analysis. In this method, poverty is estimated based on the membership of households or individuals to certain specified groups or categories. The poor are the proportion of households or individuals that belong to each of these categories, or in other words, for which each of the specified characteristics hold. In essence, a headcount ratio is determined for each of these categories since these characteristics normally assume only the values of zero or one. The poverty index derived with the aid of this approach is called the Index of Global Poverty (IGP) and can also be described as a headcount index calculated across a specified number of household characteristics (Ngwane, *et al*., 2001).

The methodology adopted by the World Bank in its analysis of poverty and health has certain distinct limitations. *Firstly*, the analysis is only descriptive and cannot be employed in an analysis of the causal relationship between health and poverty. *Secondly*, it is difficult to in terms of policy proposals determine whether policies should focus on all the components included in the index or only on those variables that are weighted heavily in the principal component analysis. *Thirdly*, such analysis only provides an economic perspective on poverty and inequality and does not include parameters of social exclusion such as gender and ethnicity as determinants of socio-economic status. In the *fourth* instance, the effect of different assumptions about economies of scale on the results of the analysis is not explored (World Bank, 2000a).

A *last* common criticism, which is not as relevant here since the focus is on South Africa only, is that choices pertaining to the selection of variables are not standardized across the different countries, which precludes direct comparisons between countries. A common criticism of the use of DHS and other demographic data sets in measuring standards of living is that the variables used for this purpose are often selected on an *ad hoc*, study-specific basis. To date no common methodology has emerged from these measurement efforts

(Montgomery, *et al*., 2000: 156; World Bank, 2000a). The variables employed in the factor analysis for individual countries differ considerably, depending on the nature of the variables included in the household questionnaire of the particular survey. Although it is possible to distinguish core variables included in most DHS surveys, standardization even then remains problematic. Questions are not coded similarly, because the coding allows for country-specific responses to questions. A look at the asset indexes employed in the World Bank HNP reports of six southern African countries that belong to SADC illustrates this point. The number of items included in the indexes varies between twenty-six (Tanzania) and thirty-five (Namibia), with the number of questions from which the items were derived ranging from eleven (Tanzania) to fourteen (Namibia and Malawi). The six countries share only six common and similarly defined DHS variables in their asset indexes, namely access to electricity, ownership of a radio, bicycle, motorcycle and car, and the number of household members sharing a room. Three other commonly shared variables differ considerably between the countries in terms of their categorization. The source of drinking water, type of sanitation and type of floor material in the six countries respectively allow for between six and nine, between five and seven and between five and eight categorizations. Five of the indexes include ownership of a television and refrigerator, the exception being Malawi. Five countries share the variable indicating whether the household work on their own or their family's agricultural land, while three include the presence of a domestic worker not related to the household head as an index variable. Only one index, that for Mozambique, includes access to a telephone (Gwatkin, *et al*., 2000). Hence, cross-country comparisons are limited by differences in the definition of the socio-economic groups across which comparisons are made (Kakwani, *et al*., 1997).

In light of these limitations, further analysis is required to fully explore the scope for DHS-based cross-country comparisons of poverty. Sahn & Stifel (2000), in their poverty analysis based on DHS data for a number of African countries, attempted this. They applied factor analysis to a pooled sample of DHS country data rather than individual country data, after which they calculated an asset index for the households in each country with the aid of a standardized methodology. They also went a step further than the World Bank in their application of the asset index approach. They calculated a headcount poverty index from the asset index value by determining the percentage of households whose score on the asset index falls below a certain value (Sahn & Stifel, 2000). Towards the end of this chapter estimates of the headcount poverty index for South Africa calculated with the aid of the World Bank's asset index approach are compared to estimates obtained with the aid of more conventional approaches to the measurement of poverty. The ultimate objective with these comparisons is

to determine to what extent different approaches to measurement yield relative comparable results.

Montgomery *et al*. (2000) have also investigated whether socio-economic proxies derived from socio-demographic data are indeed good proxies of differences in standards of living. They compare expenditure with three standard of living indexes (SLIs). The first index (SLI-1) is calculated by simply adding up the number of household assets or items present in the household. The second index (SLI-2) is derived from SLI-1 by assigning a dummy variable to certain values of SLI-1, with the lowest range of values treated as the omitted category. Such specification, the authors claim, is useful in allowing the index to exert a nonlinear influence. SLI-3 treats each variable as a distinct indicator, assigning a dummy variable to each individual variable before summing these to calculate the index value. The results indicate that SLIs are weak predictors of per capita expenditure, with their R^2 values being extremely low. However, the indexes were found to perform well in regression models explaining certain health-related behaviour and, in this sense, do appear to be good proxies of differences in standards of living. The authors ascribe this to the fact that the indexes at least broadly track the considerable variation in expenditure and that the relatively large sample sizes employed in such analysis enhances the statistical power of the models (Montgomery, *et al*., 2000). Hence, there is good reason for pursuing this avenue for measurement with data for South Africa.

4.2 Application to South Africa

In order to be able to compare the results published in the World Bank HNP country reports with results for South Africa, the World Bank methodology described above is employed here in calculating an asset index for South Africa. The variables in the South African Demographic and Health Survey (SADHS) household questionnaire that represent proxies of socio-economic status, i.e. asset ownership and access to services, are used for this purpose. A total of nine questions comply with these criteria, namely those on main source of drinking water, type of toilet facility, fuel used for cooking/heating, number of rooms used for sleeping, main material of floor and walls, affordability, and household and individual ownership of specific assets. After each of these variables where necessary was recoded in the manner specified by the World Bank methodology, a total of fifty-five variables was entered into an iterated principal factor analysis. The results of the analysis are presented in Table 2.1, which lists the scoring coefficient, the mean and the standard deviation for each of the variables as well as a description of each of the variables. The table also reports the mean and standard deviation for the asset index. The mean and standard deviation for the index should theoretically be zero and one respectively, but the reported values differ from these

values. The reason for this is that the mean and standard deviation for the individual variables are calculated across the entire sample of household for which the particular variable is available. Asset index values are only calculated for households for which information on all the variables are available, which means that the mean and standard deviation for the asset index are calculated across a smaller number of households.

Table 2.1: Scoring factors and summary statistics for an asset index for South Africa

Variable	Scoring coefficient	Mean	Standard deviation	Mean		
				Poorest 40 %	Middle 40 %	Richest 20 %
Has electricity	0.082	0.617	0.485	0.18	0.90	1.00
Own radio	0.027	0.793	0.405	0.66	0.85	0.97
Own television	0.070	0.545	0.497	0.18	0.73	0.98
Own refrigerator	0.113	0.468	0.499	0.06	0.66	1.00
Own bicycle	0.015	0.166	0.372	0.08	0.13	0.38
Own motorcycle	0.014	0.178	0.132	0.00	0.01	0.06
Own car	0.067	0.228	0.419	0.03	0.15	0.80
Own telephone	0.096	0.256	0.436	0.01	0.19	0.91
Own personal computer	0.027	0.051	0.221	0.00	0.01	0.27
Own washing machine	0.075	0.188	0.391	0.00	0.08	0.82
Own donkey/horse	-0.008	0.034	0.182	0.05	0.01	0.01
Own sheep/cattle	-0.009	0.126	0.331	0.20	0.05	0.02
Uses electricity for cooking/heating	0.143	0.480	0.499	0.04	0.73	0.99
Uses gas for cooking/heating	0.021	0.080	0.272	0.04	0.09	0.10
Uses paraffin for cooking/heating	-0.021	0.374	0.483	0.55	0.32	0.02
Uses wood for cooking/heating	-0.042	0.300	0.458	0.58	0.09	0.01
Uses coal for cooking/heating	0.015	0.084	0.278	0.08	0.13	0.02
Uses animal dung for cooking/heating	-0.014	0.014	0.117	0.02	0.00	0.00
Uses other fuel for cooking/heating	0.006	0.003	0.056	0.00	0.01	0.01
Number of members per sleeping room	-0.013	2.176	1.396	2.47	2.15	1.65
If piped drinking water in dwelling	2.875	0.354	0.478	0.03	0.41	0.96
If piped drinking water on site	2.501	0.243	0.429	0.16	0.41	0.02
If piped drinking water in public tap	2.285	0.193	0.395	0.40	0.11	0.00
If drinking water from water carrier/tanker	0.571	0.009	0.098	0.02	0.00	0.00
If drinking water from borehole/well	0.931	0.026	0.161	0.06	0.02	0.01
If drinking water from dam/river/stream/spring	2.002	0.145	0.352	0.29	0.02	0.00
If drinking water from rain-water tank	0.579	0.010	0.100	0.01	0.01	0.00
If drink bottled water	0.142	0.000	0.024	0.00	0.00	0.00
Other source of drinking water	0.648	0.012	0.112	0.02	0.01	0.01
If has own flush toilet	2.894	0.415	0.492	0.03	0.57	0.99
If uses shared flush toilet	1.051	0.035	0.185	0.03	0.07	0.00

If uses bucket latrine	1.494	0.076	0.265	0.08	0.07	0.00
If uses pit latrine	2.615	0.327	0.469	0.55	0.27	0.00
If has no toilet facility	1.917	0.138	0.345	0.29	0.02	0.00
If uses other toilet facility	0.366	0.004	0.063	0.01	0.00	0.00
If main floor material is earth	-0.530	0.204	0.403	0.40	0.02	0.00
If main floor material is wood	-0.137	0.013	0.116	0.01	0.01	0.02
If main floor material is cement	-0.539	0.307	0.461	0.42	0.41	0.03
If main floor material is vinyl	-0.470	0.191	0.393	0.11	0.30	0.11
If main floor material is carpet	-0.438	0.192	0.394	0.05	0.17	0.55
If main floor material is tiles	-0.275	0.064	0.246	0.00	0.06	0.20
If main floor material is parquet	-0.156	0.018	0.135	0.00	0.02	0.06
If other floor material	-0.067	0.003	0.057	0.00	0.00	0.01
If has plastic or cardboard walls	0.080	0.026	0.161	0.04	0.04	0.00
If has mud walls	0.165	0.178	0.383	0.37	0.01	0.00
If has mud and cement walls	0.148	0.091	0.288	0.16	0.07	0.01
If has corrugated iron walls	0.142	0.080	0.272	0.13	0.09	0.00
If has prefab walls	0.031	0.003	0.057	0.00	0.00	0.00
If has bare brick walls	0.184	0.127	0.333	0.13	0.15	0.04
If has plastered walls	0.346	0.465	0.498	0.15	0.61	0.94
If other wall material	0.051	0.010	0.100	0.01	0.01	0.00
If often goes hungry	0.146	0.127	0.333	0.19	0.09	0.01
If sometimes goes hungry	0.205	0.329	0.469	0.50	0.31	0.03
If seldom goes hungry	0.100	0.046	0.210	0.04	0.06	0.02
If never goes hungry	0.308	0.487	0.499	0.25	0.53	0.95
Asset index		**-0.058**	**1.071**	**-1.03**	**0.30**	**1.40**

Note: Except for number of members per sleeping room, each variable takes the value 1 if true, 0 otherwise.

As in the case of the World Bank HNP reports, the resulting index was divided into five population quintiles for the purpose of analyzing relationships between poverty, health and population issues. Quintiles are useful measures for doing the type of cross-sectional analysis performed here but are not particularly useful when analyzing trends in poverty over time. The cut-off points for the five quintiles are reported in Table 2.2.

Table 2.2: Cut-off points on Asset index for quintiles

	Minimum	**Maximum**
Quintile 1	-12.170820	-0.9577793
Quintile 2	-0.9577793	-0.4439259
Quintile 3	-0.4439259	0.2963971
Quintile 4	0.2963971	1.0594950
Quintile 5	1.0594950	2.3155980

An exploration of the results of a multi-factor analysis, including three factors rather than a single factor and based on rotated rather than unrotated factor analysis revealed the following. Rotated factor analysis improves the interpretation of the results of factor analysis by reducing ambiguities that may characterize preliminary results, in the process presenting more

distinct loadings across different factors (Childs, 1970). The three factors have eigen values in excess of one and respectively explain approximately 70, 20 and 10% of the variance in the underlying construct. Looking at the index items in the three factors that achieved loadings higher than |0.50|, the three factors appear to represent distinct indexes for measuring urban and rural standards of living, rather than grouping together items representing different characteristics of poverty in general, e.g. housing characteristics versus asset ownership. Factor one represents households with access to piped water in their dwelling, that have their own flash toilet, that own a telephone, washing machine and refrigerator, that use electricity as fuel source, own a car, live in a dwelling with plastered walls, own a television and electricity and never go hungry, which represent common characteristics of non-poor, urban households. Factor two loaded high on dwellings with walls of mud and a floor of earth, water being supplied from a dam, river or stream, no access to sanitation and the main source of fuel being wood, which represents common characteristics of the rural poor. Factor three loaded high on access to a pit latrine, which characterize poor households living in urban and rural areas. When the criterion for high loading is lowered to |0.30|, the following items can be added to the three factors. Factor one now also includes households living in dwellings with carpeted floors and that own a personal computer and bicycle. The single addition to factors two and three are respectively ownership of sheep or cattle and dwellings with a cement floor.

Table 2.3: Differences in the classification of households based on three asset indexes derived from the results of rotated, multi-factor analysis

Place of residence		Metropolitan areas	Small cities	Towns	Country side	Total
Asset index derived from factor 1	Bottom 40%	13.4	11.7	7.0	67.9	100.0
	Middle 40%	30.9	21.4	9.7	38.0	100.0
	Top 20%	57.4	24.4	8.4	9.8	100.0
Asset index derived from factor 2	Bottom 40%	37.1	25.2	12.1	25.5	100.0
	Middle 40%	34.4	18.2	8.3	39.1	100.0
	Top 20%	2.2	3.4	1.1	93.3	100.0
Asset index derived from factor 3	Bottom 40%	38.3	24.7	13.7	23.3	100.0
	Middle 40%	28.7	16.2	5.7	49.5	100.0
	Top 20%	5.9	5.7	1.5	86.9	100.0

The poverty indexes derived from the three factors using the same methodology employed in constructing the asset index presented in Table 2.1 were divided into quintiles and cross-tabulated with place of residence, distinguishing between the bottom 40%, middle 40% and top 10%. Higher scores on the index derived from factor one characterise urban households,

whereas higher scores on factors two and three respectively represent rural households. The results are presented in Table 2.3. The majority of households scoring high on the index derived from factor one reside in metropolitan areas, while households that scored low on this index primarily reside in the country. In the case of the index derived from the second factor, the majority of households that scored high on this index reside in the country. The asset index derived from the third factor presents a similar picture to that derived from the second factor, although a smaller percentage of high scoring households reside in the country and slightly more in metropolitan areas, small cities and towns. This suggests that this index also describes the socio-economic characteristics of peri-urban households. Given that the objective here is to measure poverty in general, rather than measure urban as opposed to rural poverty, the asset index represented in Table 2.1 is employed in the remainder of the analysis.

Asset indexes derived from DHS data can be subjected to a number of tests (Filmer & Pritchett, 1998). *Firstly*, a good index needs to be internally coherent, which means that it needs to consistently produce sharp distinctions across socio-economic groups on almost all assets. Indexes should not only load excessively on variables that are only dependent on the local availability of infrastructure (e.g. piped water), but should also load high on variables that reflect more household-specific characteristics (e.g. asset ownership). Although the latter characteristics are also dependent on the availability of services, electricity in particular, these variables also reflect differences between households in terms of them being able to afford to and deciding to purchase these specific assets. If this is not the case, it may mean that the index reflects differences in the delivery of public services rather than in the standard of living of households or individuals. In the *second* instance, a good index needs to be robust, i.e. produce similar classifications of households or individuals across constructions of asset indexes based on different subsets of variables. *Lastly*, rankings on the asset index can be compared to rankings on other measures of poverty so as to determine whether these indexes are indeed good proxies of socio-economic status. Rank order correlation is normally employed for the purpose of these comparisons. Comparisons of this nature can be applied to different regions or population subgroups within the particular country.

In order to test for *internal coherence*, the mean of each of the variables included in the index can be compared across households that fall into the poorest 40%, middle 40% and richest 20% of the population. These figures are reported in the three right-hand columns in Table 2.1. Because each variable is dichotomous, the mean represents the percentage of the population in that group for which the particular statement is true. The differences between the three groups are distinct for almost all variables. The exceptions are variables that represent ‘other’, less distinct classifications of household characteristics or variables for

which the statement is true for a very small number of households, meaning that differences between the groups are not as pronounced. The ten variables with the highest loadings include variables that solely reflect the local availability of infrastructure, i.e. living in a dwelling with a flush toilet, piped water and plastered walls. These variables also include variables that report on more household-specific characteristics, i.e. using electricity for cooking and owning a refrigerator, telephone, television, washing machine and car. Hence, the asset index presents differences in the overall standard of living of South African households rather than only differences in public service delivery.

Table 2.4: Differences in the classification of households on the original index and three asset indexes constructed from different sets of variables

Full asset index	**Index with 12 asset ownership variables**		
	Bottom 40%	Middle 40%	Richest 20%
Bottom 40%	89.7	10.2	0.1
Middle 40%	17.1	77.8	5.0
Richest 20%	0.1	12.8	87.1
	Index with 5 variables on housing infrastructure		
	Bottom 40%	Middle 40%	Richest 20%
Bottom 40%	83.3	16.7	0.0
Middle 40%	15.6	72.0	12.3
Richest 20%	0.0	22.6	77.4
	Index with 14 variables with factors loadings > |0.50|		
	Bottom 40%	Middle 40%	Richest 20%
Bottom 40%	89.0	11.0	0.0
Middle 40%	10.4	84.9	4.7
Richest 20%	0.0	15.3	84.7

The *robustness* of the index can be determined by comparing the differences between the ranking of the poorest 40% of households on the original asset index and their ranking on three alternative indexes constructed from different subsets of variables. These results are reported in Table 2.4. The first alternative asset index is constructed only from the twelve indicators of asset ownership included in the household questionnaire. The second index includes only those variables that reflect differences in infrastructure and housing, i.e. number of members per sleeping room, main source of drinking water, type of toilet facility, and main material of floor and walls. The third index includes only those variables in the original index that had factor loadings in excess of |0.50|, which is a common technique applied in index construction based on factor analysis. Except for the first index, no household that was classified in the poorest group on the original asset index was classified as 'rich' on the alternative indexes. In fact, a relatively high proportion of households were classified into the poorest 40% of households on each of the indexes. The classification of households across the middle 40% and richest 20% of households is equally robust for the first and third of the alternative asset indexes, with the extent of overlap in the classification of households

exceeding 80% in almost all cases. The second index, though, produced slightly less consistent classifications. This again highlights the fact that an asset index including only household variables that pertain to the local availability of infrastructure will present a different picture of differences in socio-economic status than do indexes that combine this information with data on household-specific socio-economic characteristics.

Table 2.5: Rank order correlation between four asset indexes constructed from different sets of variables

	Full asset index	**Index with 12 asset ownership variables**	**Index with 5 variables on housing infrastructure**	**Index with 14 variables with factors loadings > |0.50|**
Full asset index	1.000			
Index with 12 asset ownership variables	0.919	1.000		
Index with 5 variables on housing infrastructure	0.928	0.764	1.000	
Index with 14 variables with factors loadings > |0.50|	0.944	0.838	0.935	1.000

Note: All Spearman's correlation coefficients are significant at the 0.01 level.

Another way in which to evaluate the robustness of the original asset index is to compare the extent of rank order correlation between the four alternative indexes. These results are reported in Table 2.5. As in the case of the evidence presented in Table 2.4, there is a great overlap between the ranking of households on the original full asset index and their ranking on the alternative asset indexes constructed only from selected variables. More than 90% of households are ranked similarly on the three alternative indexes than on the original full asset index.

Table 2.6: Comparison of the prevalence of poverty in South Africa and its nine provinces

Data source	1995 IES			1996 Census		1995 IES and 1996 Census	1998 SADHS
Indicator of socio-economic status	income	expenditure	range of household variables[1]	income	income	imputed expenditure	asset index
Poverty line	PPP$1 per day per person[2]	R800 per month per household	totally fuzzy and relative approach	R800 per month per household	R950 per month per household	R800 per month per household	40th percentile of asset index
Western Cape	2.50 (2)	12.45 (2)	12.03 (2)	26.74 (1)	29.1 (1)	12.05 (1)	7.5 (1)
Eastern Cape	23.84 (9)	44.51 (8)	33.52 (9)	68.30 (8)	74.3 (8)	47.29 (8)	66.5 (9)
Northern Cape	10.20 (4)	38.02 (7)	18.77 (3)	50.33 (3)	57.5 (4)	35.04 (5)	19.9 (3)
Free State	15.40 (7)	51.04 (9)	21.32 (5)	58.81 (6)	54.1 (3)	48.14 (9)	28.4 (4)
Kwazulu-Natal	9.66 (3)	24.27 (3)	22.67 (6)	55.37 (4)	63.0 (6)	25.67 (4)	46.8 (7)
North West	13.32 (5)	37.18 (6)	20.20 (4)	56.06 (5)	60.9 (5)	37.32 (6)	38.2 (5)
Gauteng	1.49 (1)	10.57 (1)	9.51 (1)	33.90 (2)	32.3 (2)	13.20 (2)	13.1 (2)
Mpumalanga	14.94 (6)	25.58 (4)	23.96 (7)	60.19 (7)	63.9 (7)	24.46 (3)	44.1 (6)
Northern Province	19.61 (8)	36.42 (5)	27.26 (8)	71.76 (9)	77.9 (9)	37.44 (7)	62.6 (8)
South Africa	**11.05 (A)**	**28.40 (B)**	**20.14 (C)**	**52.20 (D)**	**56.90 (E)**	**28.50 (F)**	**40.0 (G)**

Sources: Whiteford & Van Seventer (1999: 32), Statistics South Africa (2000: 11-12), Ngwane, *et al*. (2001: 82-84).

The asset index derived from the SADHS data was employed to calculate estimates of the headcount poverty index for South Africa and its nine provinces. The asset index value at the 40th population percentile is employed as the poverty line. Filmer & Pritchett (1998) and Sahn & Stifel (2000) followed a similar approach in their poverty analysis based on asset indexes derived from SADHS data. In order to determine the comparative reliability of the asset index, poverty estimates derived from the index can be compared with poverty estimates derived from other data sets and/or with the aid of other approaches to measurement. These national and provincial estimates of the headcount poverty index are reported in Table 2.6. Since the asset index and poverty estimates derived from the SADHS data are calculated at the household level, the comparisons presented here focus only on estimates of poverty derived from household level data. Consequently, poverty estimates that are derived from individual level data, such as those reported by Woolard & Leibbrandt (1999) were excluded

[1]The TFR approach applied to the 1995 IES data focus on nine household characteristics, grouped into three categories of poverty symptoms, i.e. socio-economic symptoms, housing and services, and household income. The specific variables employed in this analysis are employment status, education, lack of formal dwelling, lack of sanitation facility, lack of refuse disposal facility, lack of safe water for drinking purposes, lack of telephone, lack of electricity for cooking, and household income (Ngwena, *et al*., 2001: 82-83).

[2]Purchasing Power Parity (PPP$) represents the amount of 'goods and services (that) can be purchased with the recorded income per capita of different countries (in this case the US) depending on the relative prices of similar products (and services)' in different countries (Todaro, 1994: 698). PPPs are the 'currency converters' or 'price deflators' employed in converting broad aggregates such as GDP to a comparative basis across countries (Hill, 1984: 128, 132).

from the comparison. The majority of these estimates are calculated with the aid of the conventional approach to the measurement of poverty, with headcount indexes having been calculated with the aid of income and expenditure data. Two sets of estimates are based on an alternative approach to measurement. Ngwane, *et al*. (2001) applied the so-called totally fuzzy or relative approach to the 1995 IES data, while Statistics South Africa (2000) imputed expenditure estimates from socio-demographic census data. For each set of poverty estimates, the data source, indicator of socio-economic status, and poverty line are noted in the table. The ranking of the provinces on each of the set of poverty estimates are indicated in brackets. It is important to note that by doing such comparisons, one is not implying that one is 'creating an asset index intended to serve as a proxy for expenditures' or for incomes (Filmer & Pritchett, 1998). The objective rather is to compare different proxies of an unobserved construct called wealth or socio-economic status.

The poverty estimates presented in Table 2.6 are not directly comparably, given that different poverty lines and data sets are employed in estimating the headcount poverty index. The test for comparative reliability lies in the extent of rank order correlation between the different sets of poverty estimates. Table 2.7 reports on the rank order correlation between the seven sets of provincial poverty estimates reported in Table 2.6. The estimates are ordered in the same way as in Table 2.4, using the letters assigned to each set of estimates in the bottom row of the table. According to the evidence presented in Table 2.7, the poverty estimates based on the asset index (G) are most closely associated with the poverty estimates derived from the income data from the 1996 census (E) and from the TFR approach applied to the 1995 IES data (C) (r=0.950). The lowest degree of association is between the poverty estimates derived from the 1995 expenditure data (B) and the 1996 income data (E) (r=0.317). This particular point was already alluded to in the discussion of the methodology employed by Statistics South Africa (2000) in estimating poverty estimates from imputed expenditure.

Table 2.7: Rank order correlation between provincial poverty estimates derived from an asset index and other indicators of socio-economic status (n=9)

	A	B	C	D	E	F	G
A	1.000						
B	0.767*	1.000					
C	0.867**	0.467	1.000				
D	0.933**	0.550	0.917**	1.000			
E	0.750*	0.317	0.917**	0.883**	1.000		
F	0.833**	0.900**	0.600	0.717*	0.483	1.000	
G	0.767*	0.383	0.950**	0.867**	0.950**	0.583	1.000

Note: Spearman's correlation coefficients with two asterisks are significant at the 0.01 level using a two-tailed test. Coefficients with one asterisk are significant only at the 0.05 level, while those without an asterisk are not statistically significant.

Of particular interest here though is the correlation between the poverty estimates derived from the asset index and those reported elsewhere. The poverty rankings derived from the asset index correlate fairly well with the four income-based sets of poverty estimates. The asset index estimates fail to correlate meaningfully with the poverty estimates derived from IES expenditure data (B) and imputed expenditure (F). The same applies to the asset-based index derived from the 1995 IES data set by Ngwane, *et al*. (2001). The fact that the asset index estimates fail to correlate meaningfully with both of these sets of poverty estimates makes sense insofar as the latter estimates were, in fact, imputed from the 1995 IES data. Although expenditure, as argued elsewhere, remains a better measure of poverty than income, these results suggest that asset ownership is a better proxy of income than of expenditure. This makes theoretical sense insofar as people will most probably only be able to afford to purchase and hold onto durable assets once they have a job and sustained income and do not have to live from hand to mouth. A possible methodological explanation for the failure of the asset index estimates to correlate with those derived from imputed expenditure may be the fact that the variables included in the estimation of the asset index differ considerably from those variables employed in imputing household expenditure. The model, in addition to the type of variables employed in estimating the asset index, also included information on age, race, education and employment, which are not accounted for in the estimation of the asset index. However, the TFR approach included variables similar to those employed in the imputation, yet yielded poverty estimates that compare poorly with estimates based on imputed expenditure. This suggests that methodological differences remain important in explaining differences in reported poverty estimates and that no one methodology necessarily represents an ideal approach to measuring poverty.

The asset index for South Africa presented here performs relatively well on the three tests for a good index. The results show that it is possible to employ the SADHS data for South Africa to measure differences in socio-economic status with the aid of an asset index that represents an internal coherent, robust and comparable measure of poverty. In Filmer & Pritchett's (1998) words, therefore, the impact of wealth on population and health issues can be estimated without income or expenditure data – without apologies or tears – using household asset variables.

5 CONCLUSION

Different methodologies of measurement are distinct and direct comparisons between poverty estimates obtained with the aid of different methodologies that are not always feasible or sensible. The choice of a particular method should always be adequately justified with

reference to the objectives of the analysis and the nature of the available data. The results presented in these pages suggest that it is possible, in the absence of income and expenditure data, to employ the available data from the SADHS to measure differences in the socio-economic status of South African households. The asset index represents an internal coherent, robust and comparable indicator of poverty in South Africa. The analysis, moreover, of the relationship between poverty, health and population issues in South Africa, for which the SADHS data set presents a wealth of data that are generally not available from other household surveys or population censuses, will be impossible without such an asset index.

CHAPTER 3

Mortality profile of the rich and the poor

Debbie Bradshaw & Ria Laubscher

1 INTRODUCTION

The cause of death profile provides essential information concerning the health of the population. In developed countries, such information comes from death registrations, a component of routine vital registration. In the past, South African death statistics were problematic with extensive under-registration of deaths of blacks in rural areas and mis-classification of causes with a high proportion classified as ill-defined causes (Botha & Bradshaw, 1985; Bradshaw, *et al*, 1995). Extensive efforts by the post-Apartheid Government have resulted in great improvements as can be seen from the latest cause of death statistics for the year 1996 (StatsSA, 2000b). Comparing the total number of deaths registered with the number expected according to the South African Actuarial Society's demographic model (ASSA2000) suggests that about 80% of the deaths were registered in 1996 (Bradshaw, *et al.*, 2001), a substantial improvement over the levels of about 50% observed in 1990 (Dorrington, *et al.*, 1998). Another indicator of the improvement in death registration in South Africa is that 96% of the registered deaths were certified by a medical practitioner in 1996.

Analysis of the overall cause of death profile suggests that South Africa is undergoing a protracted bipolar transition with the coexistence of both diseases of poverty and the emerging chronic diseases (Bradshaw, *et al.*, 2001). The data show that there is an added burden of injuries, particularly severe for men. Deaths due to external causes, generally did not have the manner of death specified and were consequently classified as having an external cause with undetermined cause and undetermined intent. This information gap has in part been amended with the introduction of the new death certificate in 1998, but the statistics remain to be collated.

It would be important to be able to investigate the cause of death profile according to levels of poverty so as to understand how the transition unfolds among the poor and the rich. Unfortunately the death data do not have any socio-economic variables and population group, which has previously been used as a proxy for socio-economic status, was dropped in 1991. The introduction of a new death certificate in 1998 has included a range of socio-demographic variables as well as population group but the statistics are not yet processed. The only option

for an investigation into poverty and chronic diseases is to conduct an ecological study and analyse the cause of death profile according to the socio-economic level of the geographic areas in which the deceased lived.

Due to the rapidly changing cause of death profile resulting from the AIDS epidemic, the lack of timely cause of death statistics is extremely problematic. Analysis of the trend in the age and sex pattern of total deaths for more recent years reveals that there is a significant increase in young adult mortality likely to be caused by AIDS (Dorrington, *et al*., 2001). According to the ASSA2000 model, AIDS only started to become a significant cause of death in subsequent years. Thus the 1996 cause of death information goes some way to identify the health problems of the rich and the poor but these statistics need to be interpreted in the context of the rapid changes arising from AIDS as well as the pervasive under-registration and mis-classification.

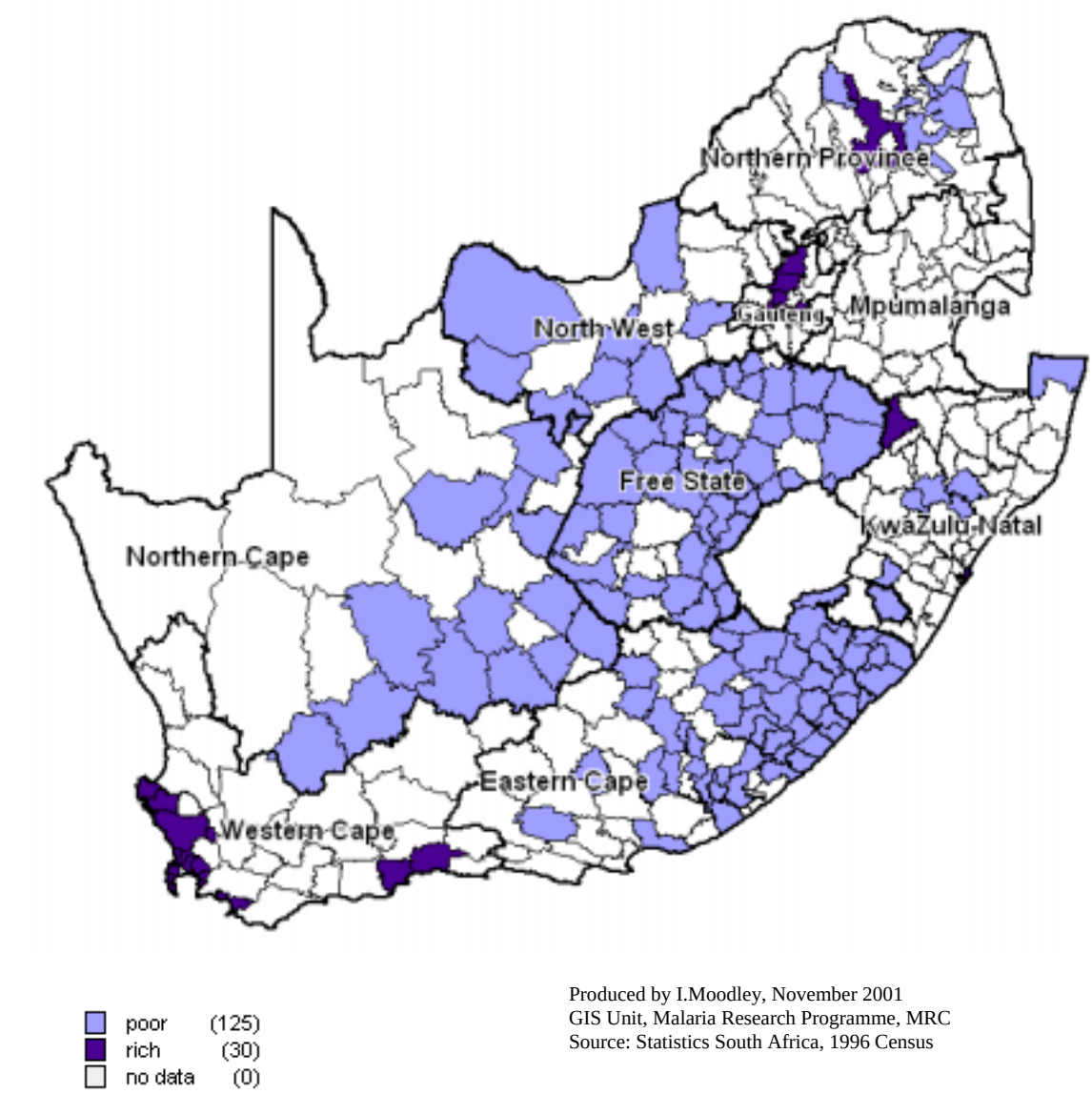
2 DATA AND ANALYSIS

There were 327 253 deaths reported in South Africa for 1996. The place of residence of the deceased has been coded by StatsSA according to towns and non-urban areas within magisterial districts (StatsSA, 1994). Rich and the poor areas are identified on the basis of the level of poverty in the magisterial districts where the deceased lived. The level of poverty, assessed by StatsSA, is based on a headcount poverty index derived from data from the 1995 Income and Expenditure Survey (IES), October Household Survey (OHS), and the 1996 population census (StatsSA, 2000a). A monthly household income of R800 was used by StatsSA as a poverty line to identify the household living in poverty (see chapter 2 for more detail). We ranked magisterial districts according to headcount poverty index and calculated the cumulative population based on the 1996 census. This was used to identify districts to give approximate quintiles of the population according to income.

The allocation of the deaths according to income quintiles was further complicated by the fact that a few boundaries of magisterial districts have been modified since the code list of 1994 was developed. Thus the boundaries of a few magisterial districts from the death data were not the same as the boundaries for the income data. This made it necessary to allocate the deaths into the new magisterial districts on the basis of the town or non-urban area code. A mapping exercise, although preferable, was not possible as the death data do not have geographic details beyond the level of town or non-urban area. Since the approach to stratify the population into income levels is very crude, it was therefore decided to only consider the extreme categories – the magisterial districts comprising the poorest quintile and the

magisterial districts comprising the richest quintile of the population. The boundaries of the rich areas were not affected by the changes in boundaries while a few of the poor districts were. The magisterial districts falling in the poorest quintile and in the richest quintile are shown in Fig. 3.1. It can be seen that the rich areas include the metropolitan areas of the country while the poor areas span deep.

Figure 3.1: The geographical distribution of the rich and poor magisterial district, 1996 census



Population pyramids for the rich and the poor districts, relative to the whole country, are presented, based on the 1996 census.

The age distribution of the deaths for the rich and the poor are shown in stacked histograms reflecting the reported cause of death in broad categories. The underlying cause of death for 1996 were coded by Statistics South Africa using both ICD-9 (WHO, 1978) and ICD-10

(WHO, 1989) as a bridging dataset. The deaths were aggregated into 4 broad disease categories using the emerging South African Burden of Disease list (Bradshaw, *et al.*, 2001 and ICD-9): Type 1 for infectious diseases, maternal and peri-natal conditions and malnutrition; Type 2 for non-communicable diseases (NCD); Type 3 for injuries including intentional and unintentional; and Ill-defined for the unspecified natural causes of death.

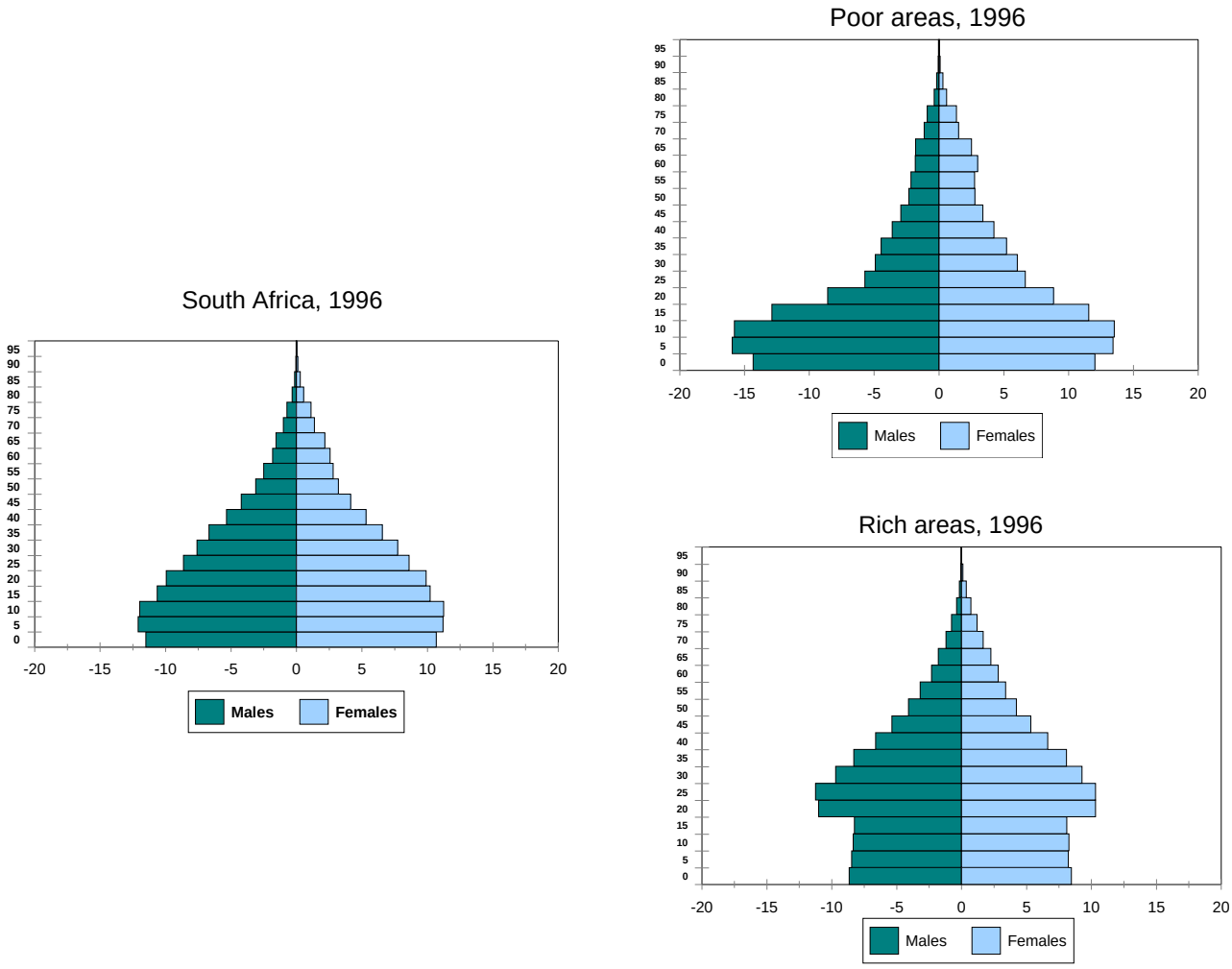
The years of life lost (YLLs) are calculated using the standard life expectancy for each age, age weights and discounting of 3% as used in the Global Burden of Disease Study (Murray & Lopez, 1996). The overall distribution of causes of premature mortality for males and females are reported in pie charts that include groupings of causes that account for about 5% or more of the deaths. The residual categories that account for less than 5% each are grouped according to broad burden of disease type. The top twenty causes of premature mortality for males and females are shown graphically and the details of the causes of premature mortality are displayed in a table. The cause of premature mortality is analysed for the rich and poor areas relative to the whole country for males and females separately. The YLLs are used to reflect the burden of premature mortality and take age into account. It would be ideal to be able to calculate age-adjusted death rates for the poor and the rich but this is not possible as it is known that a large part of the under-registration of deaths occurs in rural areas (Dorrington, *et al*, 1998).

3 POPULATION STRUCTURE

In 1996, the census estimated a total population of 40.5 million. The districts falling in the rich quintile had 14% of the households living in poverty or less and accounted for 7.5 million people. The districts falling in the poor areas had 44% of the households living in poverty or more and accounted for 8.2 million people. Several districts with the threshold proportion of poor households had to be included into the lowest quintile making it account for more than 20% of the population.

The age and sex distribution of the population living in the rich and poor areas of South Africa are very different. Fig. 3.2 shows that in the rich districts, mostly metropolitan, there is an under-representation of children under 20 years and an excess of young adults of working age. The distribution in the poor areas is typical of the rural areas and has a higher proportion of older women and a higher proportion of young boys.

Figure 3.2: The population structure of the rich and poor and total population 1996 census



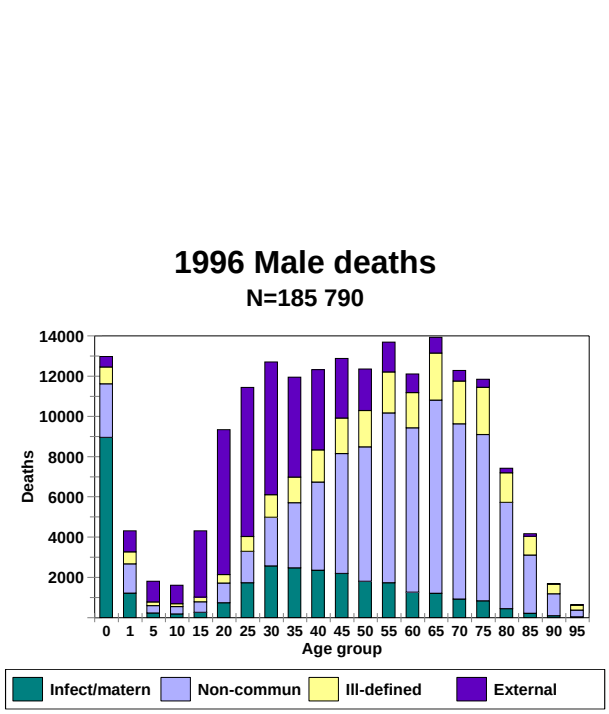
4 AGE DISTRIBUTION OF DEATHS

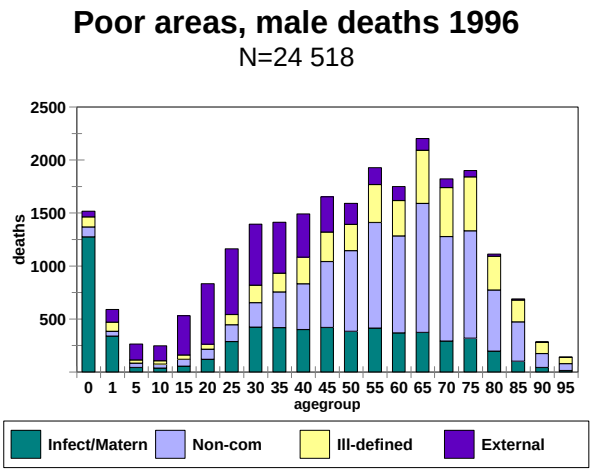
The age distribution of the reported deaths in 1996 are shown in Figs. 3.3 and 3.4 for males and females respectively. These reflect a combination of the age pattern of the population in those areas as well as the death rates. The low number of deaths in poor areas as a result of under-registration must be noted, making it impossible to assess from this data whether the death rates in the poorest areas are higher or lower than in the richest areas. However, by assuming that there is no bias in the deaths which are registered, it is possible to compare the profile of the causes between the poor and the rich areas.

From Fig. 3.3 it can be seen that there are large numbers of injury-related deaths among young men, a pattern which is more marked in the richest areas than the poorest areas. There is also a large number of deaths due to non-communicable diseases over the age of 40 years,

particularly in the richest areas. The poorest areas have higher numbers of type 1 diseases (infectious, maternal, perinatal and malnutrition) and ill-defined natural causes of death.

Figure 3.3: The age distribution of male deaths according broad disease categories





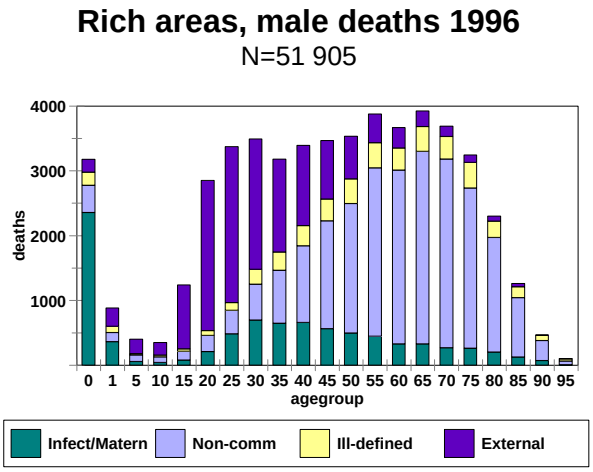
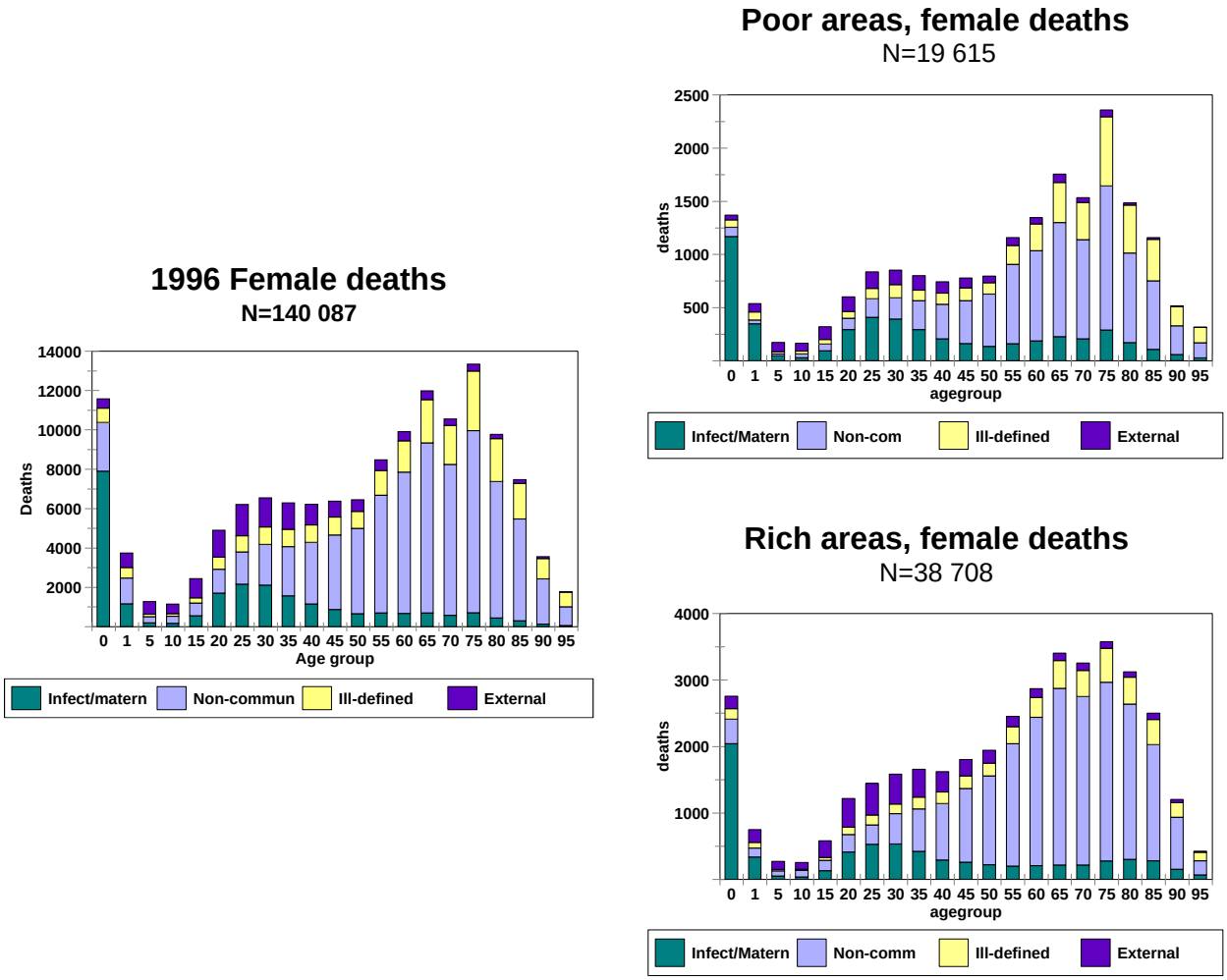


Figure 3.4: The age distribution of female deaths according to broad disease categories



5 YEARS OF LIFE LOST

The pattern of the causes of years of life lost for men shows the triple burden of disease (Fig. 3.5) - the very high burden due to injuries and similar proportions of type 1 and type 2. The poor have a lower proportion of injuries – but the proportion of type 2 (chronic diseases) is almost equal to the proportion of type 1 (infectious, maternal, perinatal and malnutrition). From Fig. 3.6, it can be seen that stroke, COPD, diabetes mellitus and nephritis and nephrosis feature in both the rich and the poor while the poor have more asthma, epilepsy and oesphageal cancer, and the rich have more ischaemic heart disease and lung cancer.

Figure 3.5: The distribution of years of male life lost

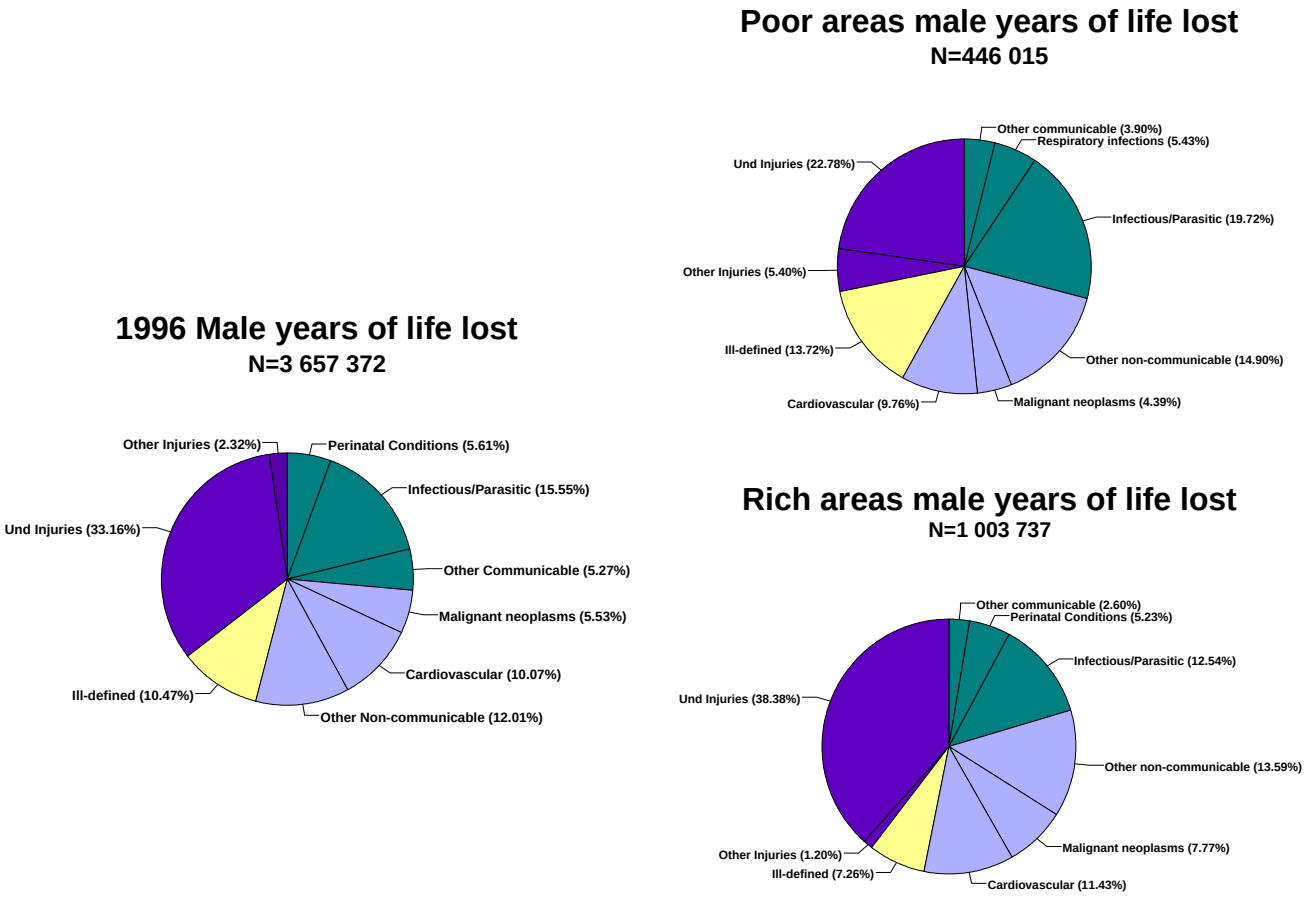
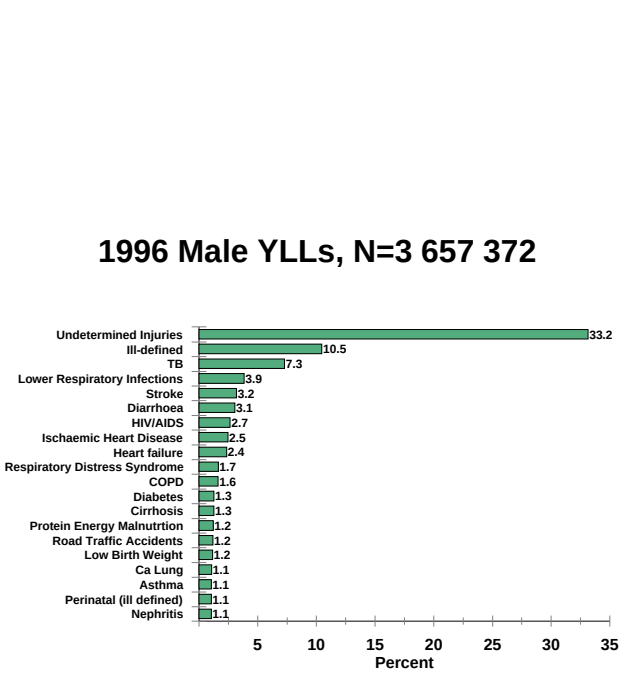
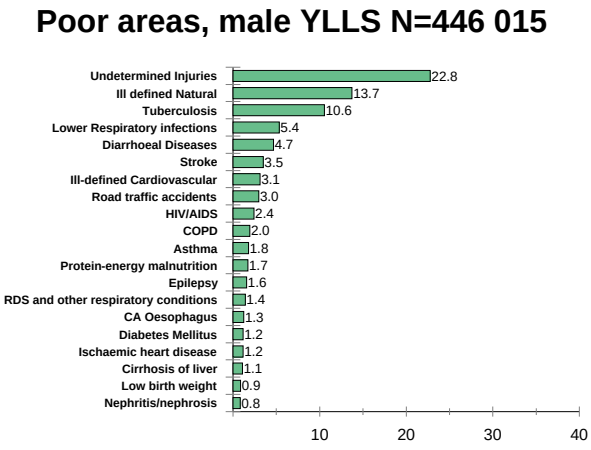


Figure 3.6: The top 20 causes of male years of life lost





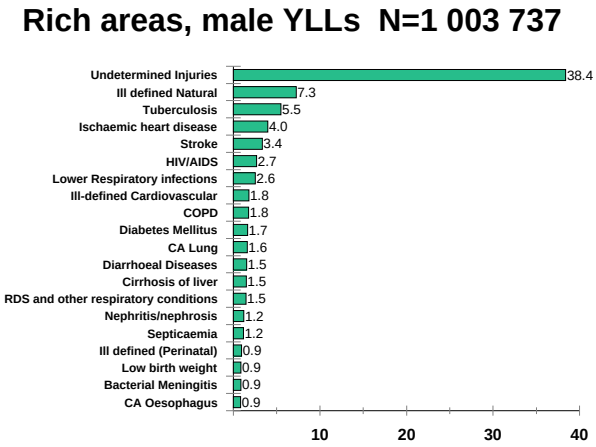
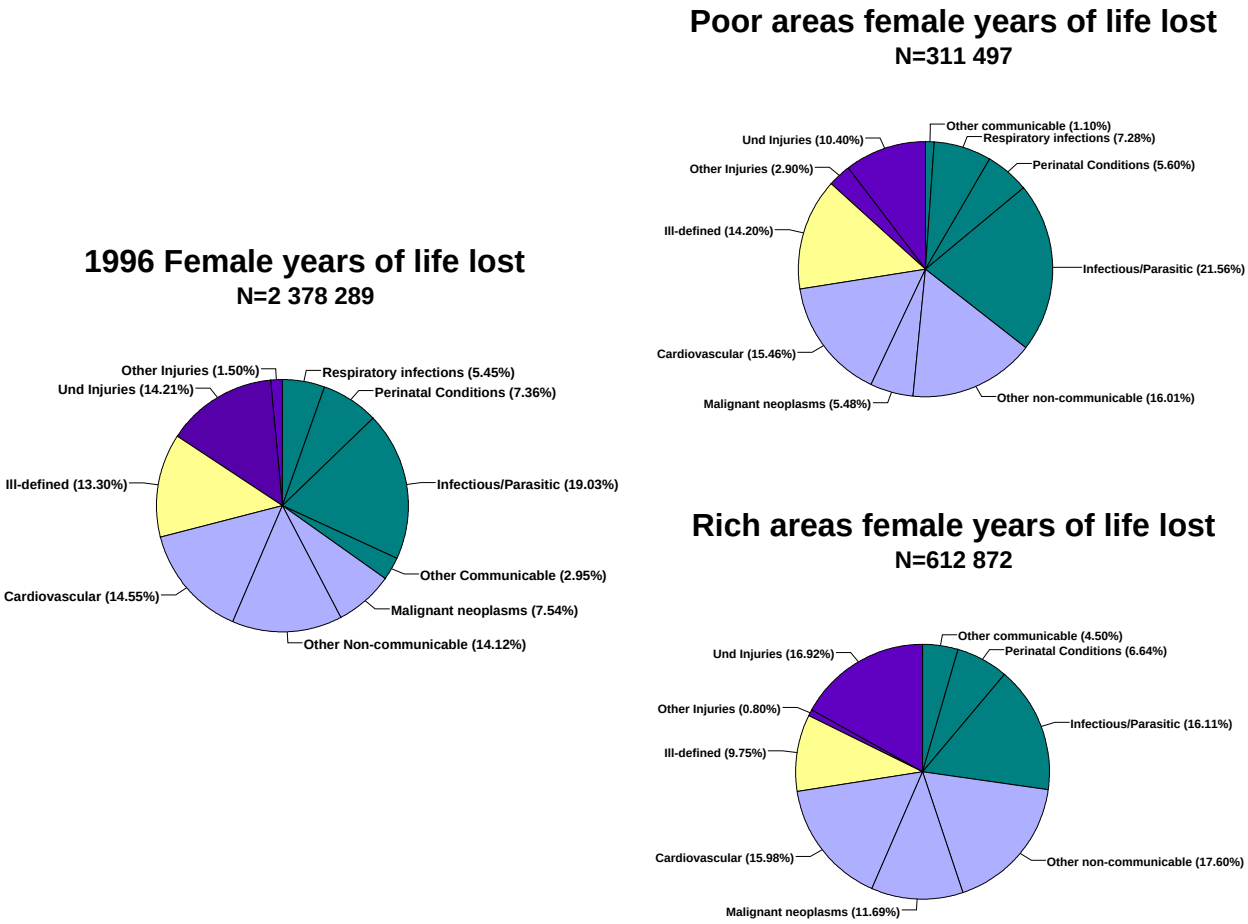
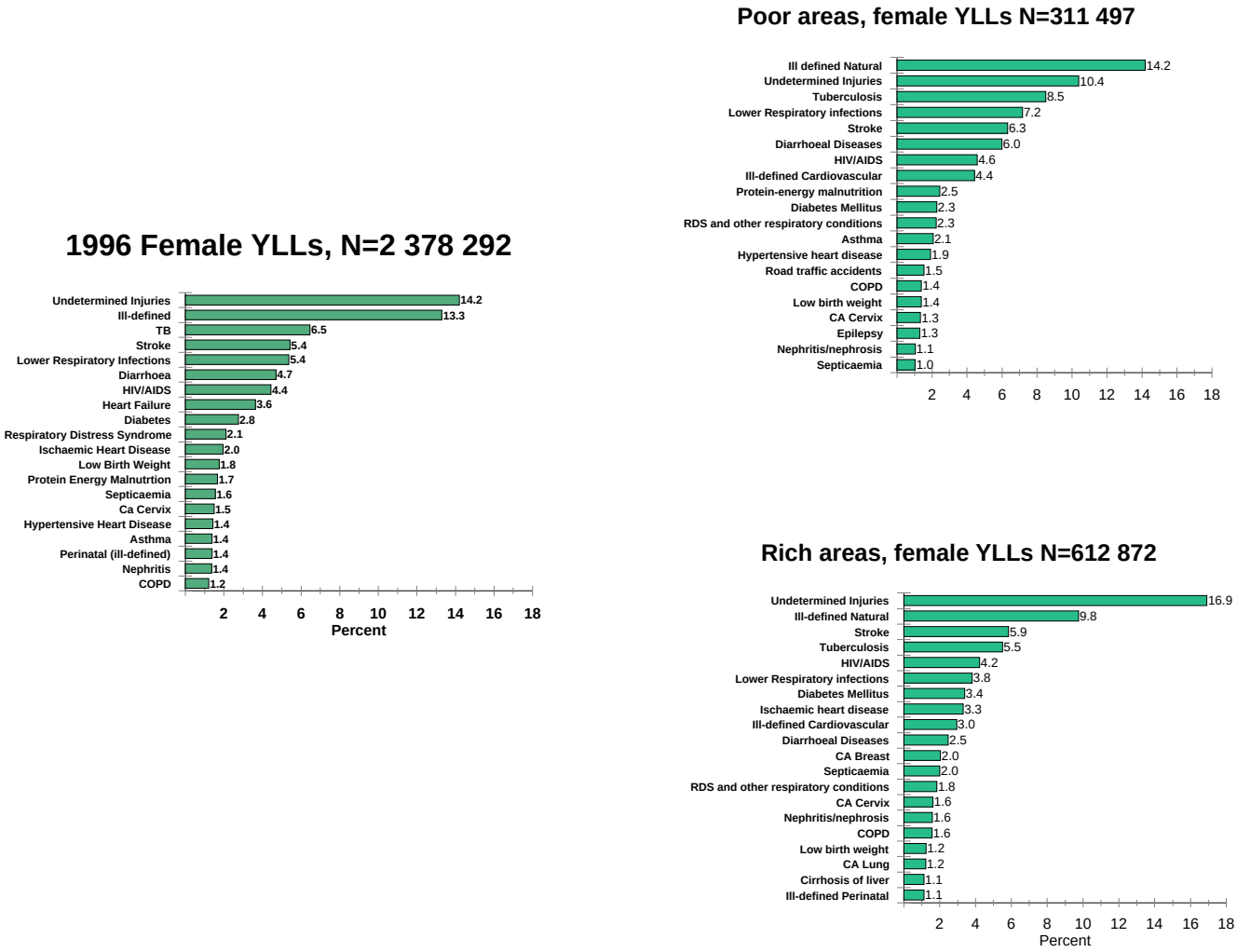


Figure 3.7: The distribution of years of female life lost



In the case of females, it can be seen from Fig. 3.7 that injuries play a smaller role in premature mortality than for males. Type 2 diseases (chronic diseases) account for a larger proportion of the premature mortality for the rich than for the poor and the whole country and from Fig. 3.8, it can be seen that the causes differ. While stroke, ill-defined cardiovascular, diabetes mellitus and nephritis and nephrosis feature in the top causes for both, the poor have asthma, hypertensive heart disease, cancer of the cervix and epilepsy while the rich have ischaemic heart disease, breast, cervix and lung cancers and cirrhosis of the liver in the top 20 causes of loss of life.

Figure 3.8: The top 20 causes of female years of life lost



6 NON-COMMUNICABLE CAUSES OF YEARS OF LIFE LOST

It has been seen that there are differences between the poor and the rich in the causes of years of life lost due to non-communicable diseases. The relative contribution of cardiovascular diseases, cancer, respiratory diseases and other chronic disease as a proportion of the total chronic diseases loss of life is shown for males and females in Table 3.1. It can be seen that cardiovascular disease are the major cause for both males and females in both poor and the rich, accounting for 40% and 36% respectively. In the case of the poorest areas, this is followed by respiratory diseases for males and cancers for females. In the richest areas, cancers are the second biggest group of diseases for both males and females.

Table 3.1. The distribution of causes of years of life lost due to non-communicable diseases

	South Africa			Poor			Rich		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**
Total cardiovascular YLLs	**714209**	**368201**	**346008**	**90213**	**42085**	**48128**	**212781**	**114826**	**97955**
% of total non-comm	**38.2%**	**36.5%**	**40.2%**	**40.0%**	**35.2%**	**45.5%**	**35.8%**	**35.5%**	**36.1%**
Percentage distribution									
Stroke	34.5%	31.9%	37.3%	39.2%	37.1%	41.0%	32.8%	29.5%	36.6%
Ill-defined cardiovascular	24.2%	23.4%	25.0%	30.8%	33.2%	28.7%	17.0%	15.7%	18.5%
Ischaemic heart disease	19.2%	24.6%	13.5%	9.3%	12.4%	6.5%	28.4%	34.9%	20.8%
Hypertensive heart disease	8.2%	6.7%	9.9%	10.7%	8.6%	12.5%	5.4%	4.4%	6.7%
Inflammatory heart disease	4.6%	5.1%	4.2%	3.8%	4.6%	3.1%	5.4%	6.1%	4.6%
Pulmonary embolism	3.0%	2.6%	3.5%	1.9%	0.5%	3.2%	3.3%	2.6%	4.3%
Rheumatic heart disease	2.1%	1.4%	2.8%	1.8%	1.2%	2.3%	2.6%	1.7%	3.7%
Non-rheumatic valvular disease	1.5%	1.5%	1.6%	1.3%	1.2%	1.4%	1.7%	1.6%	1.9%
Peripheral vascular disorders	1.1%	1.1%	1.0%	0.3%	0.0%	0.5%	1.5%	1.6%	1.4%
Other cardiovascular	0.8%	0.8%	0.7%	0.7%	0.8%	0.6%	0.7%	0.7%	0.8%
Aortic aneurism	0.7%	0.9%	0.5%	0.3%	0.3%	0.2%	1.1%	1.4%	0.8%
Total cardiovascular	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total cancer YLLs	**381455**	**202237**	**179218**	**36643**	**19579**	**17064**	**149646**	**78019**	**71627**
% of total non-comm	**20.4%**	**20.0%**	**20.8%**	**16.3%**	**16.4%**	**16.1%**	**25.1%**	**24.1%**	**26.4%**
Percentage distriubution									
Trachea/bronchi/lung	14.6%	19.8%	8.7%	11.3%	17.4%	4.3%	16.0%	21.1%	10.5%
Oesophagus	12.7%	16.3%	8.6%	23.4%	28.6%	17.5%	8.5%	11.1%	5.8%
Cervix	9.4%	0.0%	19.9%	11.5%	0.0%	24.6%	6.6%	0.0%	13.9%
Ill-defined cancers	7.8%	8.0%	7.6%	9.0%	9.2%	8.7%	8.1%	8.2%	8.1%
Breast	7.1%	0.2%	14.9%	5.0%	0.3%	10.7%	8.5%	0.2%	17.5%
Liver	6.5%	8.6%	4.2%	8.6%	10.8%	6.0%	4.6%	6.2%	2.9%
Stomach	4.9%	6.0%	3.7%	4.6%	4.7%	4.5%	4.6%	5.9%	3.3%
Colo-rectal	4.5%	4.4%	4.5%	2.9%	2.2%	3.6%	5.3%	5.4%	5.2%
Leukaemia	4.3%	4.7%	3.9%	2.0%	2.3%	1.7%	6.2%	7.2%	5.2%
Other malignant neoplasms	4.0%	3.6%	4.5%	2.6%	2.0%	3.4%	4.2%	3.8%	4.6%
Prostrate	4.0%	5.3%	2.5%	3.4%	5.3%	1.2%	4.0%	5.0%	2.8%
Mouth and Oropharynx	3.3%	4.8%	1.7%	3.1%	4.1%	2.0%	3.2%	4.3%	1.9%
Pancreas	3.3%	3.4%	3.2%	2.1%	2.0%	2.1%	4.0%	3.7%	4.3%
Lymphoma	3.0%	3.7%	2.3%	1.5%	1.6%	1.4%	4.3%	5.5%	3.1%
Bone and connective tissue	2.1%	2.2%	2.1%	1.6%	1.8%	1.5%	2.6%	2.4%	2.8%
Larynx	1.7%	2.7%	0.5%	1.9%	3.2%	0.4%	1.3%	2.2%	0.3%
Brain	1.5%	1.6%	1.4%	0.6%	0.9%	0.3%	1.9%	1.9%	2.0%
Corpus uteri	1.2%	0.0%	2.5%	1.5%	0.0%	3.2%	1.1%	0.0%	2.3%
Bladder	1.1%	1.4%	0.8%	1.0%	0.8%	1.2%	1.2%	1.6%	0.8%
Kidney	1.1%	1.2%	0.9%	0.7%	0.8%	0.7%	1.4%	1.4%	1.4%
Melanoma and other skin cancer	1.0%	1.2%	0.8%	0.6%	0.5%	0.7%	1.2%	1.6%	0.9%
Other skin cancer	0.8%	1.0%	0.7%	0.9%	1.3%	0.4%	0.9%	1.1%	0.5%
Total cancer	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total respiratory YLLs	**211123**	**129745**	**81379**	**34527**	**21000**	**13527**	**53612**	**33052**	**20560**
% of total non-comm	**11.3%**	**12.8%**	**9.5%**	**15.3%**	**17.6%**	**12.8%**	**9.0%**	**10.2%**	**7.6%**
Percentage distribution									
COPD	42.1%	46.0%	35.9%	37.9%	41.5%	32.3%	51.2%	53.8%	46.9%
Asthma	34.3%	30.1%	40.9%	42.1%	38.4%	47.8%	23.7%	20.0%	29.7%
Other respiratory	14.8%	15.0%	14.5%	13.0%	12.8%	13.4%	16.8%	17.6%	15.3%
Aspiration pneumonia/ lung abscess	4.5%	4.9%	3.9%	3.3%	3.7%	2.6%	4.9%	5.0%	4.7%
Ill-defined respiratory	4.3%	3.9%	4.8%	3.7%	3.5%	3.9%	3.5%	3.5%	3.4%
Total respiratory	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Total other non-comm YLLs	**564120**	**309682**	**254439**	**63917**	**36970**	**26947**	**179028**	**97709**	**81318**
% of total non-comm	**30.2%**	**30.7%**	**29.6%**	**28.4%**	**30.9%**	**25.5%**	**30.1%**	**30.2%**	**30.0%**
Percentage distibution									
Digestive	26.0%	31.5%	19.4%	26.4%	31.3%	19.5%	21.5%	29.8%	21.2%
Diabetes Mellitus	19.9%	15.1%	25.7%	19.4%	14.3%	26.4%	20.3%	17.0%	25.7%
Neuro-pyschiatric	18.0%	22.6%	12.5%	28.2%	30.7%	24.7%	21.9%	19.0%	13.6%
Genito-urinary	15.8%	13.6%	18.5%	12.4%	11.6%	13.4%	13.0%	13.3%	13.2%
Congenital	9.8%	9.8%	9.8%	7.0%	6.1%	8.3%	13.0%	12.9%	14.7%
Endocrine and metabolic disorders	4.4%	4.2%	4.7%	4.1%	3.9%	4.4%	5.7%	4.6%	6.3%
Oral conditions	2.3%	0.0%	5.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Benign neoplasms	1.6%	1.6%	1.7%	1.0%	1.0%	1.0%	1.2%	2.2%	1.9%
Cot death	1.2%	1.1%	1.4%	1.1%	0.6%	1.7%	12.1%	0.8%	1.2%
Musculo-skeletal	0.7%	0.3%	1.2%	0.4%	0.4%	0.5%	1.1%	0.4%	2.1%
Skin disease	0.1%	0.1%	0.2%	0.1%	0.1%	0.2%	0.2%	0.1%	0.2%
Total other non-comm	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

6.1 Cardiovascular diseases

The patterns of cardiovascular disease are different for the poor and rich and show clear evidence of the transition within cardiovascular diseases described from predominantly cerebrovascular heart diseases to Ischaemic heart disease. From Table 3.1 it can be seen that for poor men, stroke accounts for the greatest loss while for rich men it is ischaemic heart disease. In the case of females, stroke is the most common cause of years of life lost for both poor and rich while hypertensive heart diseases accounts for a sizable proportion of the years of life lost among the poor (13%) and ischaemic heart disease accounts for a sizable proportion of the loss among the rich (21%). Surprisingly, rheumatic heart disease and inflammatory heart disease account for a greater loss in the rich than in the poor and may be a reflection of access to medical care and higher level of diagnoses. Ill-defined cardiovascular accounts for a higher proportion of the poor than of the rich for both males and females.

6.2 Cancers

The pattern of causes of cancer also differ for males and females in poor and rich areas. Oesophageal cancer is by far the most common cause of premature mortality for males in poor areas followed by lung cancer and liver cancer. For males in rich areas, lung cancer is the most common followed by oesophageal cancer and leukaemia. Cervical cancer is the most common cause of premature mortality for females in poor areas followed by oesophageal cancer and breast cancer. In rich areas, breast cancer is the most common cause of premature mortality followed by cervical cancer and lung cancer.

6.3 Respiratory diseases

With the exception of asthma in the case of females in the poor areas, chronic obstructive pulmonary disease (COPD) is the most common cause of life lost due to non-communicable respiratory diseases.

6.4 Other non-communicable diseases

From Table 3.1, it can be seen that digestive conditions are the most common cause of years of life lost in males in both poor and rich areas, followed by neuro-psychiatric (largely epilepsy), diabetes mellitus and genito-urinary. For females in poor areas these conditions were the second most common cause of death. No meaningful differences were observed for the proportion of deaths due to diabetes when comparing the poor and the rich areas. In the rich areas, congenital anomalies play a more significant role, accounting 13% of the burden.

7 LIMITATIONS

This descriptive study of the cause of death profile amongst the poor and the rich has many limitations. An estimated 20% of the deaths were not registered in 1996 and this is more prevalent in the poor areas. No adjustments have been made for the mis-classification as reflected by the high proportion of ill-defined causes of deaths (15%). Again this is more prevalent in the poor areas. It is not clear whether these factors result in a bias of the profile of the registered and classified deaths. However, the degree of coherence in the findings suggests that the bias may not be too big and that the profiles are informative.

The impact of HIV/AIDS on mortality was limited in 1996 (Dorrington, *et al*, 2001). Our projections are that the disease will add to the triple burden experienced in South Africa and that by the year 2001, AIDS will account for a third of all the deaths. The rapid transition requires that efforts to improve death statistics, including information to monitor differences in sub-populations and health risks such as tobacco need to be strengthened. In addition, it is essential that a national burden of disease study be conducted to develop consistent and coherent estimates of the level and causes of mortality as well as morbidity.

CONCLUSION

Despite the limitations of this analysis, interesting differences in the profile of the causes of death emerge. Although the rich areas are further ahead in the epidemiological transition, the poor areas do suffer a substantial burden due to non-communicable diseases including stroke, COPD, asthma, epilepsy, oesphageal cancer and cervical cancer. Heart disease was also common but details of the actual cause were largely missing as shown by the high proportion of ill-defined cardiovascular. Ischaemic heart disease, lung cancer and breast cancer were more common in the rich areas.

These data suggest that timely interventions targeting the poor are also required to reduce risk factors and ensure cost-effective management of chronic diseases. In addition, considering the long incubation of chronic diseases, interventions to prevent future increase in mortality are needed as the country undergoes economic development. Prevention strategies should be included in a comprehensive health care approach.

CHAPTER 4

Chronic Diseases, Risk Factors and Lifestyles Based on the South African Adult Demographic and Health Survey

Rosana Norman, Debbie Bradshaw & Krisela Steyn

1 INTRODUCTION

The first South African Demographic and Health Survey (SADHS) of 1998 included a module on adult health that was designed to enable an in-depth analysis of selected chronic diseases (Dept. of Health, 2001). Hypertension and lung diseases were identified as conditions which could be measured in the context of such a large survey conducted by lay interviewers. Morbidity for three chronic lung diseases or respiratory conditions, namely airflow limitation ("asthma"), chronic bronchitis and abnormal peak flow was assessed using a combination of self-reported symptoms and observed morbidity measures. The questionnaire included information regarding risk factors and behaviours that may be related to these conditions.

The asset index approach to the measurement of poverty, outlined in Chapter 2, yielded an asset index which could be used in this chapter to investigate poverty and the relationship with these respiratory conditions, risk factors, lifestyle factors and some health service indicators. Risk factors studied included hypertension and obesity. A wide range of lifestyle factors were investigated: smoking, alcohol dependence, high sodium intake, exposure to environmental tobacco smoke in the home and in the workplace, occupational exposure to polluted air, and domestic exposure to "smoky" fuels. The health service indicators studied included use of "asthma" medication among people with airflow limitation and access to hypertension medication among hypertensive subjects. Further analysis on the treatment status of hypertension included control of hypertension and awareness of hypertension among adults with hypertension.

2 METHODS

2.1 Sample design and study population

The SADHS was a national household survey providing cross-sectional data on a representative sample of the non-institutionalised population. The two-stage sample used the 1996 census demarcation as a sample-frame. The first stage consisted of selecting census enumeration areas (EAs) with the probability proportional to size based on the number of

visiting points in the EA, stratified into urban and non-urban areas of the nine provinces. The second stage involved a systematic sample of 10 visiting points in the selected urban EAs and 20 visiting points in the selected non-urban EAs. For inclusion in the adult health survey, all adults who were usual residents of every second household were selected. The overall response rate for participants in the adult survey was 90%.

Participants were asked to classify themselves into one of the four previously defined official South African population groups. African refers to black people whose place of origin is the African continent; white refers to Caucasian individuals with European ancestry; coloured, a uniquely defined South African group, includes people of mixed Khoi, San, Malay, European and African ancestry; while Asian/Indian defines those descendants from East Asia and the Indian subcontinent.

2.2 Data collection

The Medical Research Council of South Africa co-ordinated the implementation of the survey, with technical assistance from Macro International. The Centre for Health Systems Research Development undertook the fieldwork.

The questionnaires and clinical measurements were completed between January and September 1998. Respondents were asked about recent contact with the health care system, health insurance status, family medical history, personal medical history, medication use, occupational health and lifestyle/habits. Further demographic information, such as age, education level, and ownership of durable goods was recorded.

Interviewers received intensive training over several weeks. Questionnaires were prepared in all the official languages of South Africa. The language of the questionnaire, interviewer and respondent, as well as use of a translator, were recorded.

2.3 Respiratory conditions

Data on the symptomatology of chronic bronchitis and airflow limitation (“asthma”) were recorded using standardised questions. The fieldworkers assessed peak expiratory flow rate on each participant at their home by means of a Tru-Zone peak flow meter of the Trudell Medical International Company. Daily standard cleaning procedures were carried out and a disposable mouthpiece was used. The following symptomatology markers of lung disease were used:

- The chronic bronchitis symptom complex, defined by chronic cough with phlegm every day for at least three months a year, for at least two successive years.[1]
- Airflow limitation ("asthma"), defined by wheezing/tight chest with breathlessness in the past year associated with sleep interruption by wheezing/tight chest or by coughing.[2]
- Abnormal peak flow, identified when the observed value was more than two standard deviations lower than those for a healthy population adjusted for the age, sex, weight and height of the respondent (Dept. of Health, 2001).

Treatment for airflow limitation was recorded, on viewing the prescribed medication containers. The specific medications were classified according to the Anatomical Therapeutic Chemical (ATC) classification codes allowing the estimated use of classes of "asthma" medication (WHO, 1998a). For the analysis on the use of "asthma" medication, participants were termed "asthmatic" if they had symptoms described above and/or they were on the correct treatment for airflow limitation.

2.4 Risk factors

Hypertension

The adult health questionnaire was designed to provide estimates of the prevalence, awareness, treatment status and control of hypertension in the general population and the various demographic sub-populations. Respondents were asked about prior diagnosis of hypertension determined by a doctor or nurse**.**

The appropriate hypertension terminology was used for the different languages. Their treatment was recorded, on viewing their prescribed medication containers. The specific medications were classified according to ATC classification codes allowing the estimated use of classes of antihypertensive medication or specific agents (WHO, 1998).

Blood pressure (BP) measurements were taken after the participant was seated for 5 minutes using an Omron M1 electronic BP manometer. The BP and pulse were taken three times on the left arm, with the palm upward, resting on a table or support at the level of the heart.
In accordance with the JNC VI if the second systolic or diastolic BP differed more than

[1] Questions and responses used for definition: Do you usually cough? (yes). When you cough, do you usually bring up phlegm from your chest? (yes). If yes, have you brought up phlegm every day for at least three months during the last year? (yes). If yes, how many years have you brought up phlegm in this way? (>2).

[2] Questions and responses for definition: During the last year have you had wheezing or tightness of your chest? (yes). If yes, were you also short of breath? (yes). Does your coughing ever interrupt your sleep? OR Does a wheezing or a tight chest ever interrupt your sleep? (yes).

5 mmHg, the first BP reading was excluded. A BP reading was retained in the data set if the systolic BP was 80 mmHg or higher and when it was at least 15 mmHg higher than the diastolic BP level. Thereafter, a mean systolic and diastolic BP was calculated from the remaining BPs. Those patients who reported not having hypertension but suffering from angina and taking either beta-blocking agents or long-acting calcium channel blockers, were excluded from the hypertension diagnosis. Estimates were weighted according to the sample design, taking the non-response rate into account within each stratum.

Uncontrolled hypertension was defined according to current South African guidelines by systolic pressure $\geq$160mmHg and or diastolic pressure $\geq$95 mmHg. Awareness of hypertension referred to patients who reported having been told by a health professional of their high BP. Receiving treatment for hypertension was confirmed by coding the recorded drug as a valid antihypertensive medication according to the ATC classification described above. Controlled hypertension was defined as being on antihypertensive medication and with a BP below 160/95 mmHg. Participants were termed hypertensive if their systolic pressure measurement was $\geq$160mmHg and/or their diastolic pressure measurement was $\geq$95 mmHg and/or they were on the correct treatment for hypertension.

Obesity

Weight was measured to the nearest 0.5 kg using a calibrated bathroom scale manufactured by Soehnle, Germany. Each subject was weighed wearing light clothing without shoes and stockings. Height was measured using a metal measuring tape, secured against a flat wall and a flat headboard placed at right angles to the wall to ensure correct reading. Where a wall was not available, the nearest flat, upright surface was used. Each respondent was requested to stand barefooted, with back and legs straight, and back of the head placed against the wall. The head was positioned in such a way that the angle of the eye and the opening of the external auditory meatus were on a horizontal line. Height was measured to the nearest 0.1 cm. A flexible tape measure was used to take the measurements of body circumferences.

Anthropometric measurements were not taken on 172 respondents and a further 215 respondents did not have all the measurements taken. A regression analysis was used to identify outlying values of height and weight. Respondents with extreme values were excluded.

2.5 Lifestyle factors

Tobacco use

Data on participants' smoking patterns were collected in the adult health questionnaire, based on a standard questionnaire recommended by the WHO to monitor the tobacco epidemic (WHO, 1998b). In addition, participants were asked their opinions on the health effects of tobacco use and their exposure to environmental tobacco smoke.

Regular smokers were those people who reported that they currently smoke daily or occasionally. Adults, who responded ever having smoked daily but did not smoke at all at the time of the interview, were classified as *ex-smokers* (quitters). Adults who smoked every day at the time of the interview were classified as *daily smokers*. The group of daily smokers was subdivided into light (1-14 tobacco equivalents per day) and heavy ($\geq$15 tobacco equivalents per day) daily smokers. One tobacco equivalent was defined as one manufactured cigarette, one hand rolled cigarette, one pipe smoked, one cigar, cheroot or cigarillo (about 1g of tobacco). Adult ever-daily smokers who only smoked occasionally at the time of the interview were included in the daily light smoking category. *Non-smokers* are adults that had never smoked tobacco but may have used smokeless tobacco. Users of smokeless tobacco or snuffers included adults that had never smoked tobacco products but had used snuff or chewed tobacco. Adults who had never smoked, used snuff or chewed tobacco were referred to as never having been exposed to tobacco products.

Exposure to environmental tobacco smoke (ETS) in the home and in the workplace was assessed in adult non-smokers. Adult non-smokers who responded positively to the question: "Do you now live in a house where other people smoke cigarettes regularly?" made up the exposed group while adult non-smokers who responded negatively made up the unexposed group. For occupational exposure to ETS, adult non-smokers who had worked for payment in the 12 months preceding the survey and who had answered "yes" to the question: "Do you now work in a job where other people smoke cigarettes around you?" were referred to as exposed to ETS in the workplace. Employed adult smokers who answered "no" to that question were referred to as unexposed.

Alcohol dependence

Alcohol dependence was assessed in the SAADHS by using a set of questions known as the CAGE Questionnaire (Erwing, 1984). The questions inquire if the participant has ever felt that he/she should cut down on their drinking; have been annoyed by being criticized for drinking; felt guilty about drinking or have ever had a drink first thing in the morning to steady nerves or get rid of a hangover. Participants with affirmative answers to two or more questions were classified as alcohol dependent.

High sodium intake

Adults who responded that they usually add salt or Aromat/Fondor to their serving of food after tasting their food or even before having tasted their food and said they ate salty snacks (chips, niknaks, salted peanuts, salty biscuits, biltong, dried sausage, dried fish) at least three times per week were classified as having high sodium intake.

Occupational exposure to polluted air

Adults who responded ever having worked underground in a mine for more than a year or ever having worked in a job where they were regularly exposed to smoke, dust, fumes or strong smells for more than a year were classified as exposed to occupational polluted air.

Domestic exposure to 'smoky' fuels

Adults who used wood, coal or dung as fuel for cooking and heating were exposed to domestic 'smoky' fuels.

2.6 Asset index

Poverty was measured in terms of the ownership of a number of consumer items (durable goods), dwelling characteristics, such as wall and flooring material, and the source of drinking water and toilet facilities. This information was gathered through the household questionnaire administered during the Demographic and Health Survey. Households were divided into wealth quintiles based on the asset index developed in Chapter 2, based on the 14 items that had a factor loading greater than 0.5.

2.7 Logistic regression analysis

Logistic regression analysis was used to calculate adjusted odds ratios (OR) and 95% confidence intervals (95% CI) for males and females separately, for each of the respiratory conditions, risk factors and lifestyle factors in relation to age [15 - 24 (reference group), 25 - 34, 35 - 44, 45 - 54, 55 - 64, ≥65 years], place of residence [urban (reference group), rural], measures of poverty using the asset index [poorest (reference) group, followed by second poorest, middle, fourth poorest and richest groups], level of education [none (reference group), primary, secondary, tertiary] and population group [African (reference group), coloured, white, Asian]. Taking into account the survey design, the survey set option in the STATA statistical package was used (StataCorp., 1999). Fully adjusted predicted proportions for each condition, risk and lifestyle factor by income level were then calculated for men and women separately.

For the treatment status of hypertension and airflow limitation, men and women were

combined to calculate odds ratios and 95% confidence intervals for being on the correct "asthma" medication if "asthmatic", being on the correct hypertension medication if hypertensive and having controlled hypertension and being aware of being hypertensive if hypertensive by definition adjusting for gender, age, an urban or rural setting, asset index, level of education, population group and membership of a medical aid.

A multinomial logistic regression was used to calculate the relative risk (RR) ratios and 95% confidence intervals for daily light and heavy smoking in relation to several factors. The three smoking categories included in the model were: non-smokers (reference group), daily light smokers and daily heavy smokers. Quitters (544 men and 856 women) were excluded from this analysis.

Relative risk ratios and 95% confidence intervals were calculated, separately for men and women, for age categories [15 - 24 (reference group), 25 - 34, 35 - 44, 45 - 54, 55 - 64, ≥65 years], place of residence [urban (reference group), rural], income level using the asset index [poorest (reference) group, followed by second poorest, middle, fourth poorest and richest groups], level of education [none (reference group), primary, secondary, tertiary] and population group [African (reference group), coloured, white, Asian]. The survey design was taken into account with the survey set option in STATA.

2.8 Graphs

Odds ratios and 95% confidence intervals were plotted against each level of poverty for each respiratory condition, risk factor and lifestyle factor in order to illustrate the relationship with wealth quintiles.

2.9 Ethical considerations

The Ethical Committee of the South African Medical Research Council approved the protocol of the study. Informed consent to participate was obtained.

3 RESULTS

The characteristics of the study sample (unweighted) are summarized in Table 4.1. It can be seen that the sample included more women and more people living in urban areas.

Table 4.1: Characteristics of the study sample: SADHS 1998

Characteristics	*Men*	*Women*
N (%)	5753 (41.6)	8073 (58.4)
Years of education, mean (SD)	7.7 (4.0)	7.2 (4.2)
Age, mean (SD)	37.1 (17.7)	39.6 (18.0)
Urban Residence (%)	58.1	54.6
Abnormal Peak Flow (%)	4.2	4.4
"Asthma" Symptoms (%)	6.6	8.2
Chronic Bronchitis Symptoms (%)	2.5	2.9
Hypertension (%) (BP ≥ 160/95 mmHg + treatment)	12.2	15.9
Obesity (%) BMI ≥ 30	6.3	26.4
Light smoking (%) (1-14 Tobacco equivalents/day)	35.7	9.7
Heavy smoking (%) (≥ 15 Tobacco equivalents/day)	8.3	1.9
Exposed to environmental tobacco smoke in home (%)	25.8[1]	31.9[1]
Exposed to environmental tobacco smoke in workplace (%)	47.5[2]	34.4[2]
Alcohol Dependence (%) (≥ 2 positive CAGE questions)	29.8	10.4
High Sodium Intake (%) ♦	23.0	19.8
Occupational Exposure to polluted air (%) •	28.5	9.7
Domestic Exposure to smoky fuels (%)*	32.6	38.2
Awareness of Hypertension (%)	39.4[3]	64.6[3]
Use of Hypertension medication (%)	35.8[3]	52.0[3]
Controlled Hypertension (%)	24.2[3]	36.6[3]
Use of "Asthma" medication (%)	22.3[4]	19.3[4]

1. Out of a total of non-smokers in the sample (Men N=2678 Women N=6276)

2. Out of a total of employed non-smokers in the sample (Men N=953 Women N=1546)

3. Out of a total of hypertensive adults (Men N=704 Women N=1275)

4. Out of a total of adults with airflow limitation and/or using "asthma" medication (Men N=413 Women N=725)

♦ Self reported addition of salt to food served at the table plus eating at least 3 salty snacks per week.

• Previous occupational exposure of at least 1 year to smoke, dust or fumes, or having worked underground in a mine for at least 1 year.

*Burning wood, coal or dung for cooking or heating.

3.1 Poverty and respiratory conditions

Abnormal peak flow

The prevalence of this condition remains similar across the different asset index quintiles (Table and Fig. 4.2). Similarly, in the fully adjusted model, there were no significant differences among the different population groups or between an urban or rural residence. Abnormal peak flow, however, was strongly associated with illiteracy and fewer years of education in both men and women (Table 4.2). As expected the risk for abnormal peak flow also increased with increasing age.

"Asthma" symptoms

The prevalence of airflow limitation was also similar among the rich and the poor (Table and Fig. 4.3). This respiratory condition was also associated with lower education in both men and women. Population group differences were observed with white men showing a 3.2 (95% CI 1.8–5.8) fold increased risk of developing airflow limitation compared with African men. Asian men and women were also at a significantly increased risk [OR=2.6 (95% CI 1.4-5.0) for men and OR=1.7 (95% CI 1.0-2.7) for women] of developing airflow limitation compared with the African population. The risk for airflow limitation increased with increasing age in women, but in men, the risk seemed to peak at 45-54 years and then decrease slightly. Residence in a rural area did not have a protective effect (Table 4.3).

Chronic bronchitis

Chronic bronchitis was associated with poverty and the risk for this condition decreased significantly with increasing wealth (Table and Fig. 4.4). Education also had a protective effect and chronic bronchitis was lowest in both men and women with a tertiary education. Population group differences were observed for men only with coloured, white and Asian men showing excess risks for chronic bronchitis compared with African men. As with the other respiratory conditions, the risk was higher in the older age groups and no significant differences were observed between urban and rural settings.

Table 4.2: Poverty and Abnormal Peak Flow

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Abnormal Peak Flow=240 Normal=5513			*Women: Abnormal Peak Flow=353 Normal=7720*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.274	0.707 – 2.297	0.420	1.108	0.705 – 1.743	0.656
Middle group	0.833	0.470 – 1.475	0.530	0.845	0.514 – 1.389	0.506
Fourth poorest	1.513	0.807 – 2.840	0.197	1.625	0.877 – 3.011	0.123
Richest group	1.133	0.492 – 2.609	0.768	0.727	0.301 – 1.760	0.479
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.878	0.559 – 1.379	0.572	0.808	0.545 – 1.197	0.288
8 – 12 years	0.401	0.220 – 0.729	0.003	0.634	0.390 – 1.030	0.065
> 12 years	0.248	0.093 – 0.664	0.006	0.321	0.120 – 0.856	0.023
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	1.119	0.589 – 2.127	0.731	0.937	0.534 – 1.645	0.821
35 – 44 years	2.201	1.302 – 3.718	0.003	1.569	0.961 – 2.562	0.072
45 – 54 years	2.662	1.537 – 4.611	0.000	2.271	1.317 – 3.915	0.003
55 – 64 years	3.784	2.100 – 6.817	0.000	2.833	1.730 – 4.638	0.000
≥ 65 years	2.169	1.055 – 4.460	0.035	2.873	1.645 – 5.016	0.000
Population group						
African	1.00	-	-	1.00	-	-
Coloured	0.776	0.467 – 1.291	0.329	1.341	0.844 – 2.130	0.214
White	0.821	0.298 – 2.260	0.702	1.513	0.730 – 3.136	0.266
Asian	1.271	0.469 – 3.446	0.637	0.834	0.329 – 2.114	0.702
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.888	0.535 – 1.473	0.644	0.730	0.432 – 1.234	0.240

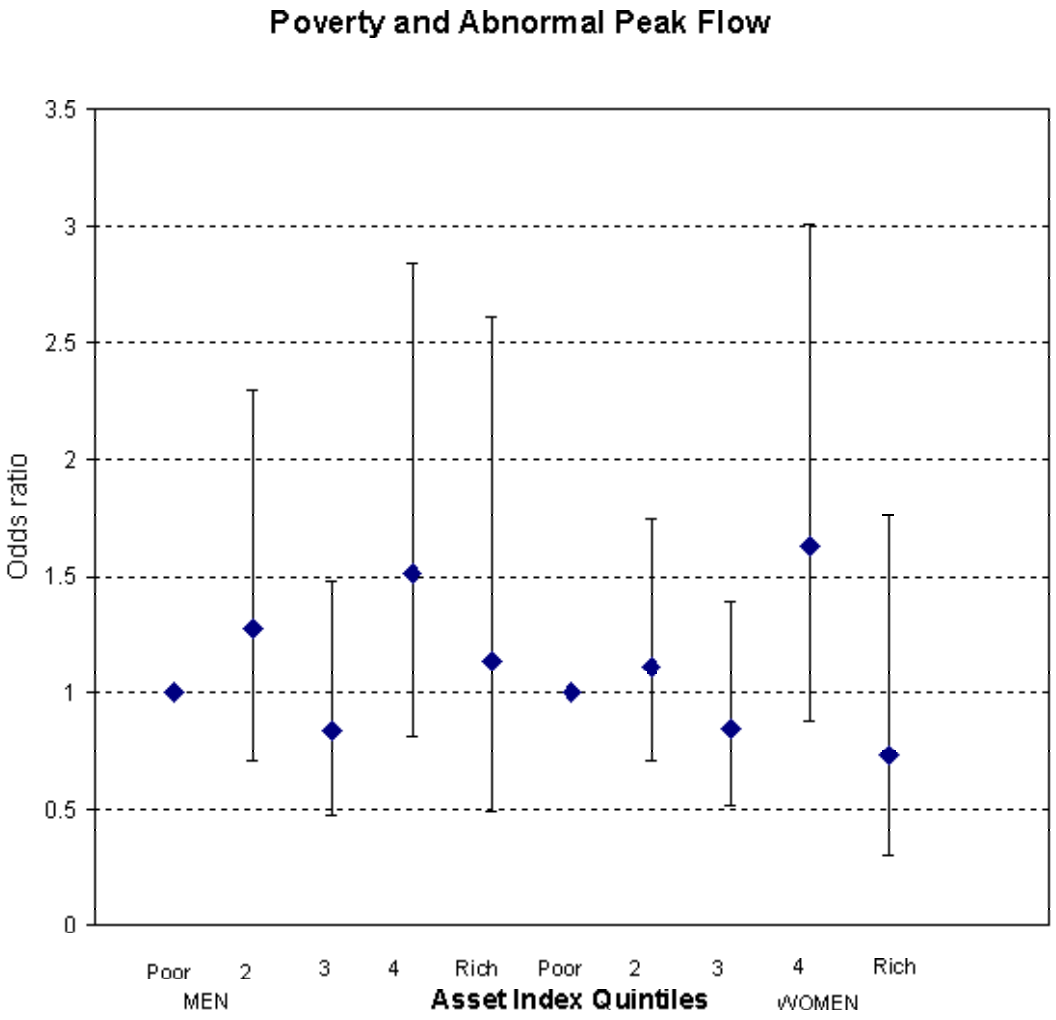

Poverty and Abnormal Peak Flow
Odds ratio
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.2

Table 4.3: Poverty and "Asthma" symptoms

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: "Asthma"=377 Normal=5376			*Women: "Asthma"= 662 Normal= 7411*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.316	0.797 – 2.174	0.283	0.793	0.594 – 1.058	0.115
Middle group	0.757	0.450 – 1.274	0.294	0.630	0.470 – 0.844	0.002
Fourth poorest	1.002	0.550 – 1.826	0.994	0.807	0.562 – 1.157	0.243
Richest group	0.759	0.402 – 1.434	0.395	0.953	0.609 – 1.493	0.834
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.842	0.565 - 1.256	0.400	0.724	0.552 – 0.948	0.019
8 – 12 years	0.384	0.255 - 0.579	0.000	0.433	0.318 – 0.590	0.000
> 12 years	0.110	0.043 - 0.279	0.000	0.285	0.152 – 0.532	0.000
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	1.518	0.922 – 2.499	0.101	1.074	0.748 – 1.542	0.698
35 – 44 years	2.174	1.368 – 3.457	0.001	1.225	0.871 – 1.723	0.243
45 – 54 years	2.934	1.762 – 4.884	0.000	1.437	1.026 – 2.012	0.035
55 – 64 years	2.892	1.700 - 4.921	0.000	1.672	1.146 – 2.438	0.008
≥ 65 years	2.297	1.300 – 4.059	0.004	1.745	1.237 – 2.460	0.002
Population group						
African	1.00	-	-	1.00	-	-
Coloured	1.098	0.719 – 1.676	0.665	0.957	0.691 – 1.324	0.790
White	3.209	1.783 – 5.778	0.000	1.162	0.738 – 1.831	0.516
Asian	2.607	1.367 – 4.970	0.004	1.658	1.031 – 2.667	0.037
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	1.114	0.761 – 1.629	0.579	0.976	0.760 – 1.253	0.848

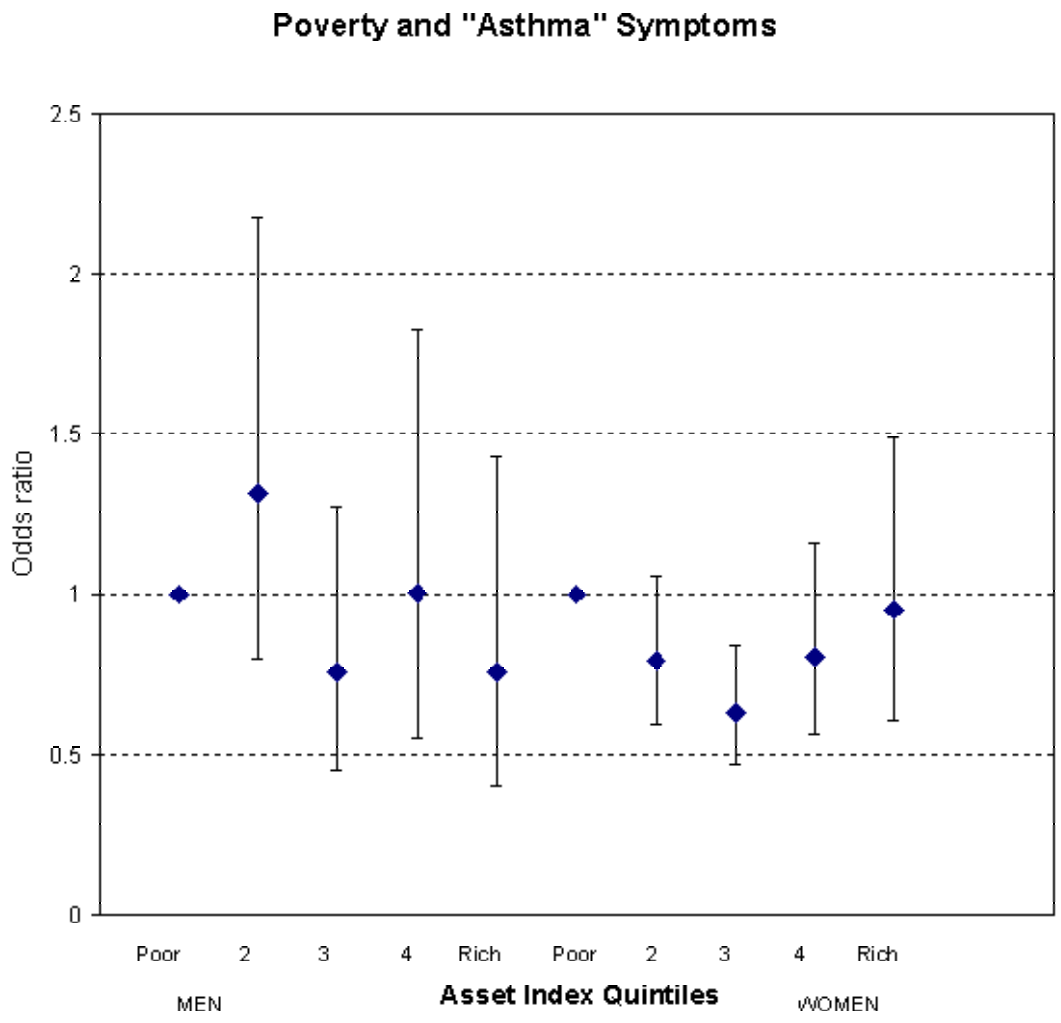

Poverty and "Asthma" Symptoms
2.5
2
1.5
1
0.5
0
Odds ratio
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.3

Table 4.4: Poverty and Chronic Bronchitis

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Chronic Bronchitis=144 Normal=5609			*Women: Chronic Bronchitis=234 Normal=7839*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.555	0.290 – 1.062	0.075	0.528	0.344 – 0.810	0.004
Middle group	0.374	0.185 – 0.754	0.006	0.333	0.210 – 0.529	0.000
Fourth poorest	0.368	0.174 – 0.778	0.009	0.219	0.103 – 0.465	0.000
Richest group	0.327	0.135 – 0.787	0.013	0.228	0.086 – 0.600	0.003
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.803	0.482 – 1.339	0.401	0.857	0.568 – 1.293	0.462
8 – 12 years	0.416	0.220 – 0.786	0.007	0.594	0.353 – 1.001	0.050
> 12 years	0.210	0.058 – 0.759	0.017	0.285	0.072 – 1.130	0.074
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	1.826	0.830 – 4.018	0.135	0.713	0.352 – 1.441	0.345
35 – 44 years	2.119	0.956 – 4.694	0.064	1.129	0.599 – 2.128	0.708
45 – 54 years	3.998	1.827 – 8.748	0.001	1.627	0.870 – 3.044	0.128
55 – 64 years	2.493	1.011 – 6.151	0.047	1.712	0.957 – 3.064	0.070
≥ 65 years	3.000	1.389 – 6.476	0.005	2.157	1.222 – 3.807	0.008
Population group						
African	1.00	-	-	1.00	-	-
Coloured	2.199	1.237 – 3.909	0.007	1.666	0.846 – 3.280	0.140
White	3.098	1.319 – 7.273	0.009	2.426	0.897 – 6.564	0.081
Asian	2.600	0.794 – 8.517	0.114	0.513	0.102 – 2.589	0.419
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.783	0.475 – 1.291	0.338	0.820	0.532 – 1.266	0.371

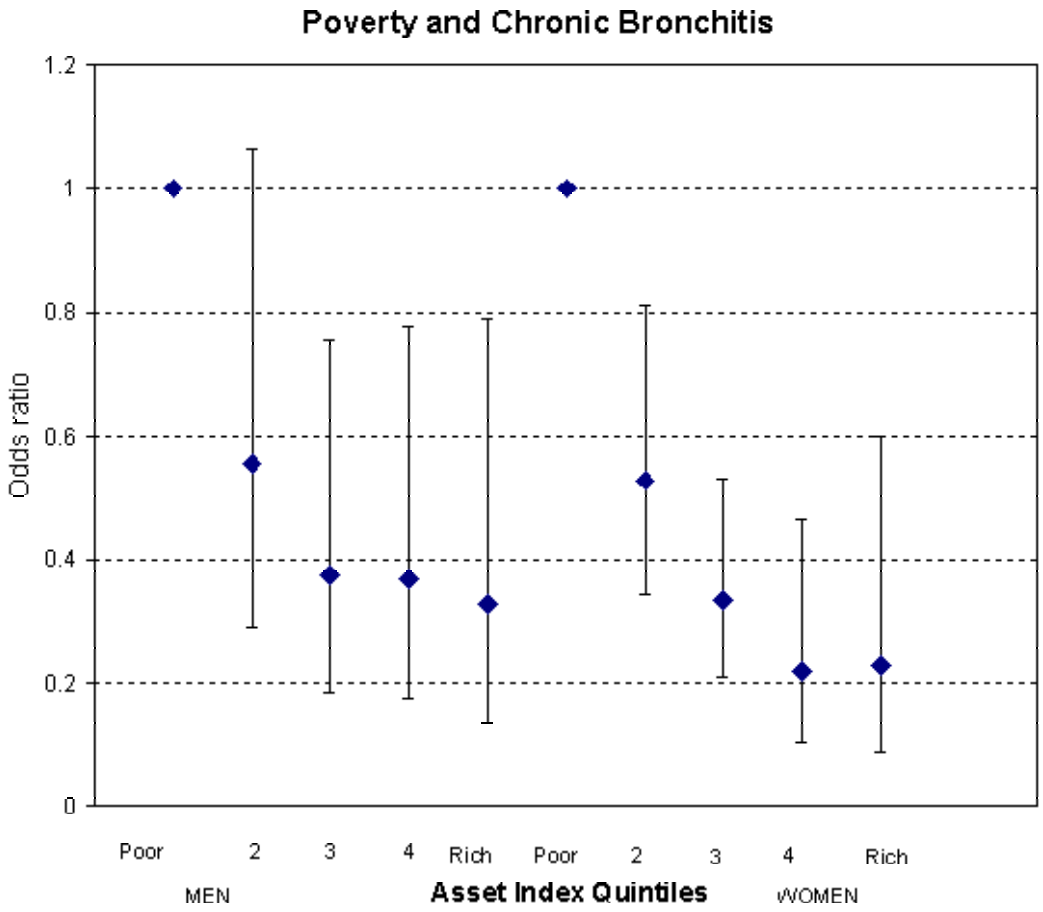

Poverty and Chronic Bronchitis
1.2
1
0.8
0.6
0.4
0.2
0
Odds ratio
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.4

3.2 Poverty and risk factors

Hypertension

Hypertension was highest in the richest group of men and decreased with decreasing wealth (Table and Fig. 4.5). This decrease, however, was not statistically significant in women. Hypertension also seemed to be associated with lower levels of education, although the risk was only significantly reduced in women with a tertiary education. High blood pressure was strongly associated with illiteracy and fewer years of education in both men and women in a study conducted in Cameroon (Mbanya, 2001). Hypertension increased with increasing age with men and women in the oldest age group showing a 32.7 (95% CI 19.9 – 53.9) and 48.3 (95% CI 30.7-75.9) fold increased risk for hypertension, respectively, compared with men and women in the youngest age group. Coloured women were at a significantly increased risk compared with African women but no other population group differences were observed. A rural residence had a protective effect in women only (Table 4.5).

Obesity

Obesity was associated with increasing wealth and was highest in men and women in the richest asset index quintile and lowest in the poorest group (Table and Fig. 4.6). It was interesting to note that the risk for obesity was significantly increased in women with a primary and secondary education compared with women with no education. Similar findings were reported in the Cameroon study where obesity was highest in those with most years of education (Mbanya, 2001). Obesity was strongly associated with age in both men and women. There were marked population group differences in women and obesity was most common in African women. A rural residence seemed to protect women against obesity (Table 4.6).

3.3 Poverty and lifestyle factors

Tobacco use

The risk for light smoking (1-14 tobacco equivalents per day) was highest in the poorest group of men and women, and decreased with increasing wealth. This decrease was significant from the second poorest to the richest asset index quintile in men but in women, the decrease in risk for light smoking was only significant in the richest group. In contrast, heavy smoking ($\geq$15 tobacco equivalents per day) was similar among the different income groups (Tables and Figs.

Table 4.5: Poverty and Hypertension (BP≥ 160/95 mmHg ± anti-hypertensive medication)

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Hypertensives=704 Normatensives=5049			*Women: Hypertensives=1280 Normatensives=6793*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.142	0.777 – 1.679	0.498	0.998	0.738 – 1.350	0.992
Middle group	1.114	0.745 – 1.667	0.599	0.998	0.731 – 1.364	0.992
Fourth poorest	1.774	1.153 – 2.729	0.009	1.330	0.943 – 1.874	0.104
Richest group	2.204	1.352 – 3.593	0.002	1.132	0.747 – 1.717	0.558
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.988	0.703 – 1.388	0.945	1.187	0.943 – 1.496	0.145
8 – 12 years	1.188	0.839 – 1.681	0.332	1.112	0.844 – 1.464	0.451
> 12 years	0.754	0.433 – 1.311	0.316	0.579	0.363 – 0.924	0.022
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	2.789	1.687 – 4.610	0.000	3.408	2.161 – 5.375	0.000
35 – 44 years	7.976	4.943 – 12.871	0.000	8.257	5.313 – 12.830	0.000
45 – 54 years	19.212	12.003 – 30.752	0.000	22.261	14.312 – 34.623	0.000
55 – 64 years	21.097	13.082 – 34.022	0.000	39.624	25.119 – 62.505	0.000
≥ 65 years	32.743	19.906 – 53.856	0.000	48.269	30.717 – 75.849	0.000
Population group						
African	1.00	-	-	1.00	-	-
Coloured	0.872	0.609 – 1.248	0.453	1.403	1.042 – 1.889	0.026
White	1.280	0.837 – 1.959	0.254	1.234	0.865 – 1.760	0.247
Asian	1.021	0.615 – 1.695	0.936	1.084	0.714 – 1.645	0.706
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	1.060	0.823 – 1.367	0.651	0.631	0.499 – 0.798	0.000

Figure 4.5

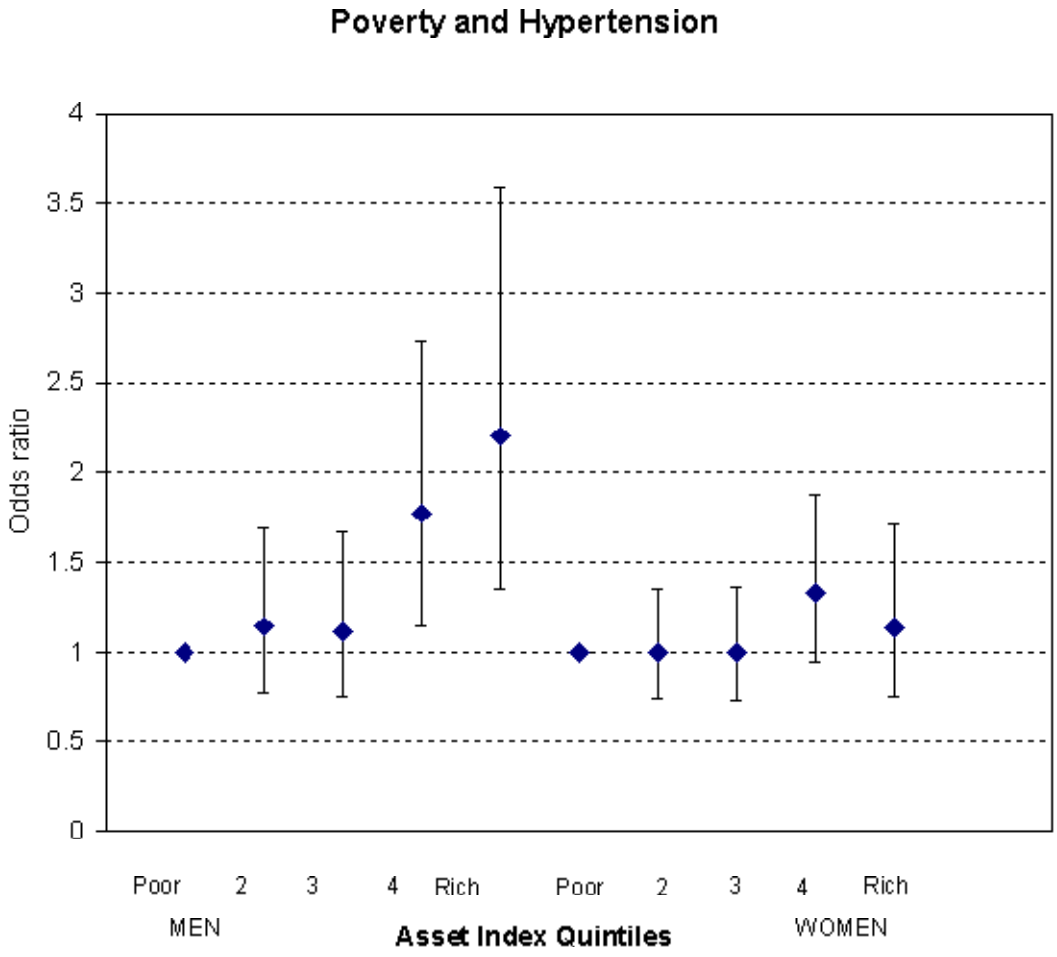

Poverty and Hypertension
Odds ratio
4
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Table 4.6: Poverty and Obesity (Body mass index=Weight in Kg/(Height in m)^2 Obesity: (BMI ≥30)

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Obese=364 Normal=5389			*Women: Obese=2127 Normal=5946*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.644	0.328 – 1.263	0.200	1.205	0.946 – 1.534	0.130
Middle group	1.082	0.589 – 1.988	0.799	1.452	1.140 – 1.849	0.003
Fourth poorest	1.554	0.813 – 2.968	0.182	1.912	1.451 – 2.520	0.000
Richest group	3.210	1.596 – 6.457	0.001	2.106	1.536 – 2.886	0.000
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.765	0.467 – 1.252	0.286	1.301	1.054 – 1.605	0.014
8 – 12 years	1.110	0.666 – 1.848	0.689	1.345	1.061 – 1.705	0.014
> 12 years	1.359	0.704 – 2.624	0.360	0.841	0.586 – 1.207	0.347
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	4.813	2.625 – 8.823	0.000	3.620	2.866 – 4.572	0.000
35 – 44 years	9.650	5.548 – 16.783	0.000	6.626	5.220 – 8.410	0.000
45 – 54 years	11.945	6.969 – 20.476	0.000	8.912	6.835 – 11.620	0.000
55 – 64 years	11.330	6.325 – 20.297	0.000	9.723	7.300 – 12.949	0.000
≥ 65 years	10.259	5.484 – 19.191	0.000	5.514	4.071 – 7.467	0.000
Population group						
African	1.00	-	-	1.00	-	-
Coloured	0.771	0.506 – 1.175	0.225	0.520	0.414 – 0.653	0.000
White	1.253	0.794 – 1.976	0.332	0.381	0.286 – 0.506	0.000
Asian	0.641	0.339 – 1.210	0.170	0.336	0.226 – 0.500	0.000
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	1.041	0.695 – 1.558	0.847	0.765	0.641 – 0.914	0.003

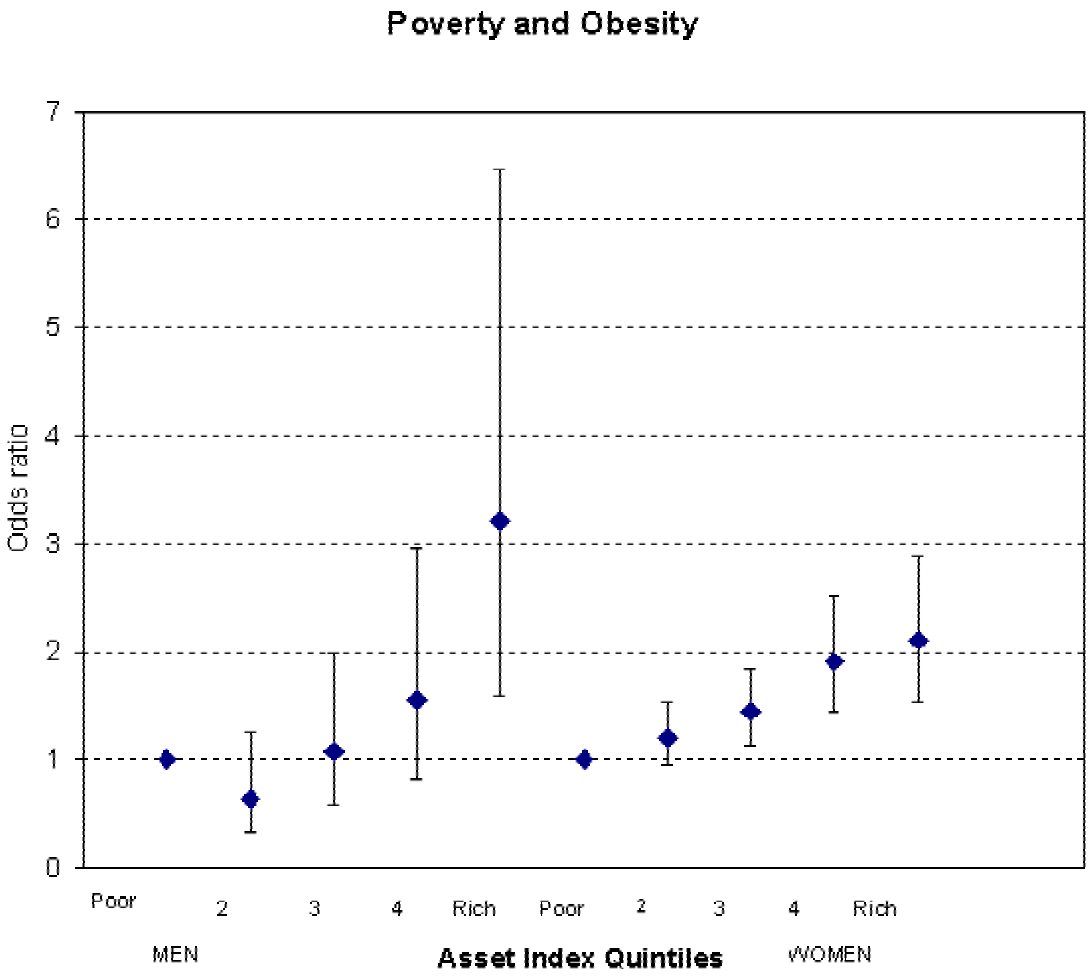

Poverty and Obesity
Odds ratio
0
1
2
3
4
5
6
7
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.6

Table 4.7a: Poverty and Light Smoking (1-14 tobacco equivalents/day)*

Socio-Demographic Characteristics	*Relative Risk Ratio*	*95% Confidence Interval*	*P-value estimate*	*Relative Risk Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Light smokers=2051 Non-smokers=2678			*Women: Light smokers=780 Non-smokers=6276*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.765	0.598 - 0.977	0.032	0.884	0.590 - 1.324	0.550
Middle group	0.569	0.441 - 0.734	0.000	0.989	0.651 - 1.502	0.958
Fourth poorest	0.613	0.458 - 0.819	0.001	0.717	0.438 - 1.173	0.185
Richest group	0.369	0.253 - 0.537	0.000	0.393	0.218 - 0.708	0.002
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.875	0.679 - 1.128	0.302	0.652	0.479 - 0.888	0.007
8 – 12 years	0.729	0.562 - 0.946	0.017	0.257	0.174 - 0.379	0.000
> 12 years	0.351	0.228 - 0.538	0.000	0.162	0.086 - 0.306	0.000
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	3.843	3.110 - 4.749	0.000	1.468	1.011 - 2.133	0.044
35 – 44 years	4.935	3.921 - 6.212	0.000	2.610	1.794 - 3.795	0.000
45 – 54 years	2.912	2.193 - 3.866	0.000	2.538	1.706 - 3.777	0.000
55 – 64 years	3.164	2.359 - 4.244	0.000	1.224	0.767 - 1.951	0.396
≥ 65 years	2.756	2.039 - 3.725	0.000	0.961	0.594 - 1.556	0.872
Population group						
African	1.00	-	-	1.00	-	-
Coloured	2.277	1.747 - 2.967	0.000	18.344	13.341 - 25.225	0.000
White	0.836	0.483 - 1.448	0.523	12.955	7.546 - 22.241	0.000
Asian	2.191	1.375 - 3.489	0.001	3.203	1.680 - 6.107	0.000
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.719	0.594 - 0.870	0.001	0.526	0.360 - 0.770	0.001

*One tobacco equivalent was defined as one manufactured cigarette, one hand rolled cigarette, one pipe smoked, one cigar, cheroot or cigarillo (about 1g of tobacco).

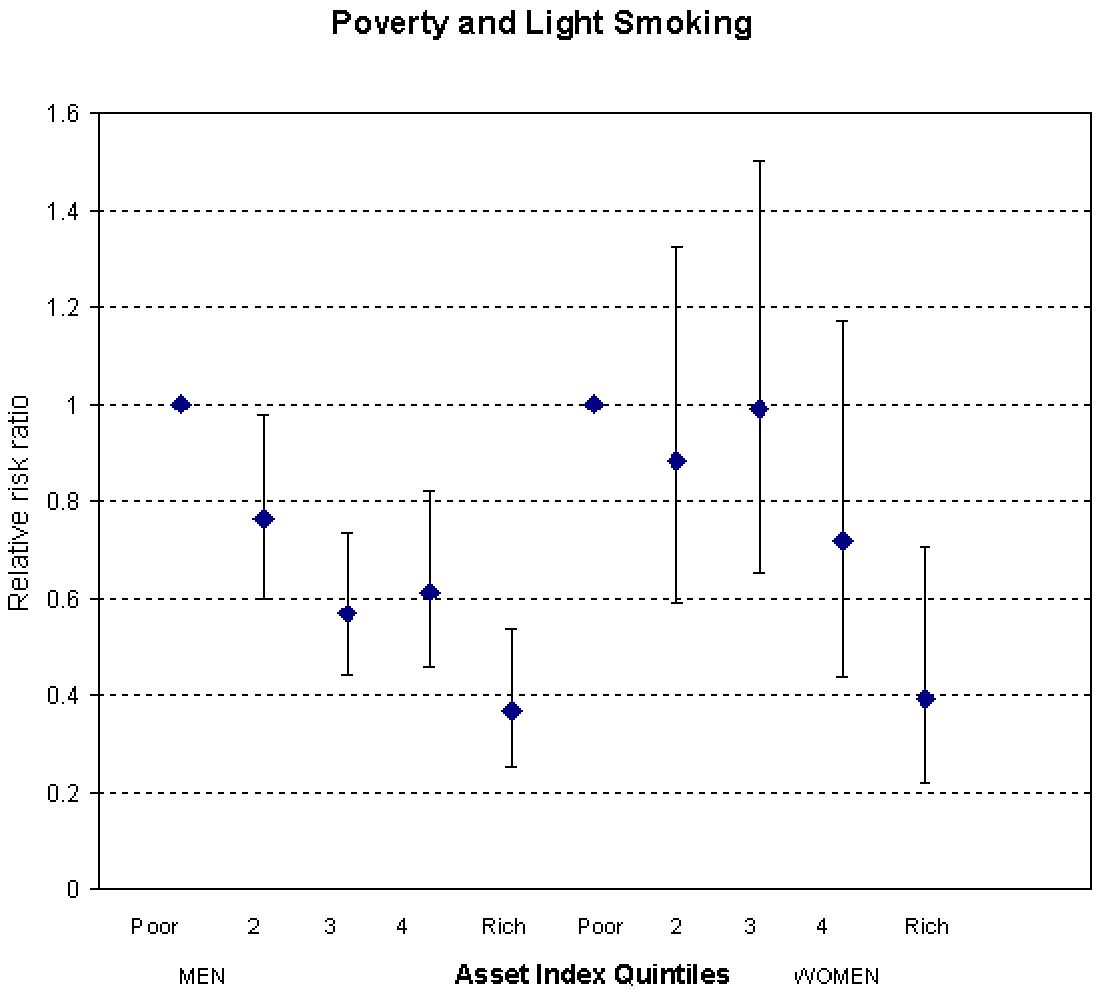

Poverty and Light Smoking
Relative risk ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

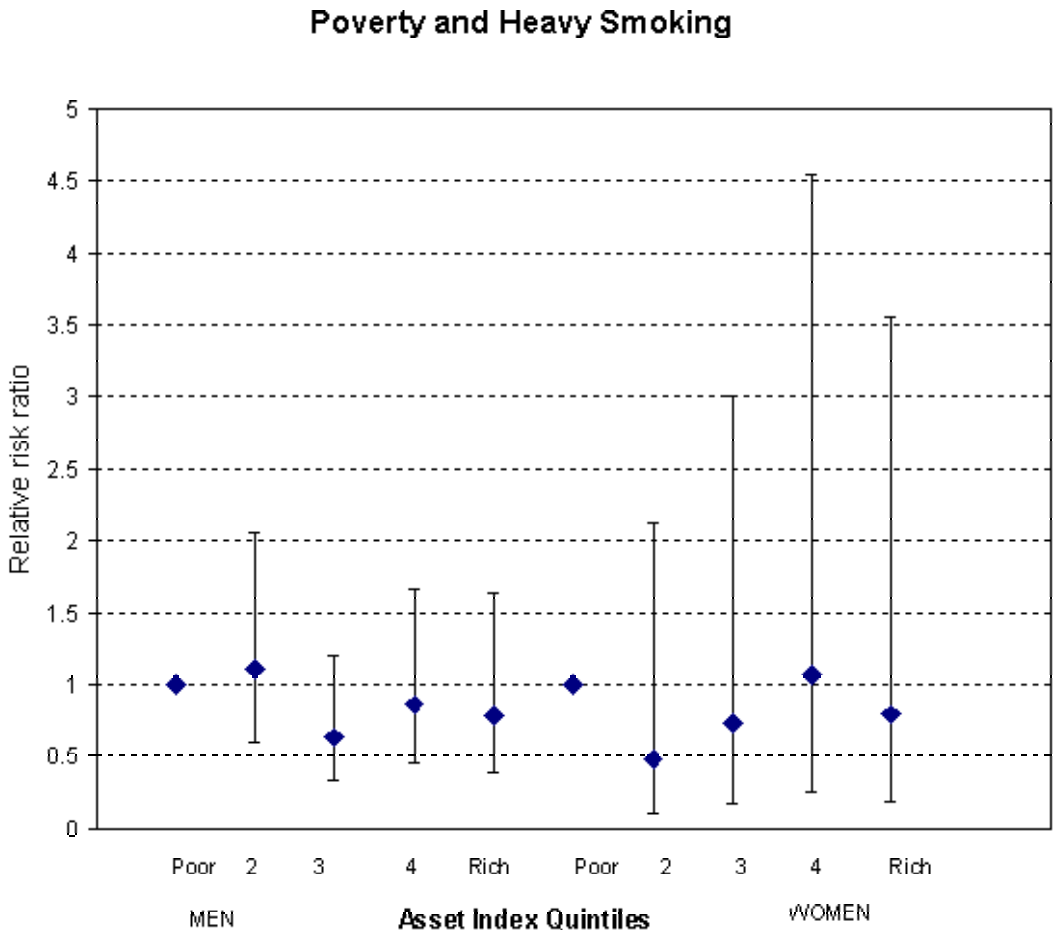
Figure 4.7a

Table 4.7b: Poverty and Heavy Smoking (≥ 15 tobacco equivalents/day)*

Socio-Demographic Characteristics	*Relative Risk Ratio*	*95% Confidence Interval*	*P-value estimate*	*Relative Risk Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Heavy smokers=477 Non-smokers=2678			*Women: Heavy smokers=153 Non-smokers=6276*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.107	0.596 – 2.057	0.747	0.479	0.108 – 2.125	0.333
Middle group	0.635	0.334 – 1.207	0.165	0.727	0.176 – 3.005	0.659
Fourth poorest	0.861	0.447 – 1.660	0.655	1.069	0.252 – 4.542	0.927
Richest group	0.791	0.381 – 1.642	0.529	0.794	0.178 – 3.549	0.763
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.995	0.621 – 1.592	0.982	0.513	0.207 – 1.269	0.148
8 – 12 years	0.818	0.486 – 1.375	0.447	0.259	0.102 – 0.660	0.005
> 12 years	0.415	0.202 – 0.853	0.017	0.088	0.029 – 0.270	0.000
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	5.804	3.846 – 8.757	0.000	2.711	1.216 – 6.048	0.015
35 – 44 years	7.210	4.780 – 10.874	0.000	4.662	2.190 – 9.923	0.000
45 – 54 years	6.333	4.071 – 9.853	0.000	2.949	1.357 – 6.412	0.006
55 – 64 years	4.567	2.710 – 7.694	0.000	2.569	1.148 – 5.747	0.022
≥ 65 years	4.294	2.445 – 7.541	0.000	0.684	0.185 – 2.530	0.569
Population group						
African	1.00	-	-	1.00	-	-
Coloured	3.807	2.586 – 5.605	0.000	49.319	21.588 – 112.673	0.000
White	10.041	5.954 – 16.932	0.000	161.460	62.823 – 414.965	0.000
Asian	6.173	3.637 – 10.479	0.000	3.089	0.810 – 11.786	0.099
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.624	0.418 – 0.932	0.021	0.679	0.181 – 2.550	0.566

*****One tobacco equivalent was defined as one manufactured cigarette, one hand rolled cigarette, one pipe smoked, one cigar, cheroot, or cigarillo (about 1g of tobacco).

Figure 4.7b


Poverty and Heavy Smoking
Relative risk ratio
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

4.7a-b). Light and heavy smoking was associated with illiteracy and fewer years of education in both men and women.

Similar results were reported in the Cameroon study (Mbanya, 2001). In both men and women, light and heavy smoking was highest in the 35 - 44 year age group. African women smoke significantly less than women in the white and coloured population groups and this population group difference is particularly marked with heavy smoking. For light smoking, no differences were observed between white men and African men, but coloured and Asian men had significantly higher levels of light smoking than African men. For heavy smoking, coloured, white and Asian men showed significantly elevated levels compared with African men. Light smoking was highest in men and women living in urban areas. When it comes to heavy smoking, however, men in rural areas smoke less than those in urban areas but this difference is not significant in women (Tables 4.7a-b).

In this study, tobacco users were identified as essentially poor South Africans with low education levels, living in urban areas. Similar findings have been recorded for men in other low-income countries (Yach, 1995) who consistently had higher smoking prevalence rates than men in middle and high-income countries. However, previous studies in South Africa have suggested that the highest smoking prevalence rate of smoking was found in middle-income groups (Steyn, *et al.,* 1994*).* None of the studies referred to in this review include multivariate analyses to assess the impact of poverty related variables independently of the impact of other socio-demographic indicators, or consider the quantities smoked. Cigarette smoking was also reported more frequently by poor people in the Adult Morbidity and Mortality project established in Tanzania in 1992. In Tanzania, single cigarettes are sold for a few shillings making light smoking affordable even for the very poor (Setel, *et al.,* 2001).

Exposure to environmental tobacco smoke in the home

Exposure to ETS in the home increased with increasing wealth in men but the increase was not statistically significant. In women, risk for this type of exposure increased significantly in the second poorest and middle poverty quintile compared with the poorest group and then decreased with increasing wealth (Table 4.8 and Fig. 4.8). In men, education played a strongly protective role but this was not observed in women. For both men and women, the risk for ETS exposure in the home was highest in the youngest age group and decreased significantly with increasing age. Ethnic differences were observed, with coloured men and women showing more than a 3 fold increase in risk for ETS exposure compared with African men and women. Asian women also showed an increased risk compared with African women. Men and

women living in rural areas were less likely to be exposed compared with urban residents (Table 4.8).

Exposure to environmental tobacco smoke in the workplace

Several gender differences were observed with exposure to ETS in the workplace. Exposure to ETS increased with increasing wealth in men but was level across the poverty quintiles in women (Table 4.9 and Fig. 4.9). Once again, education played a protective role for this type of exposure in men but not in women. Occupational exposure to ETS increased with increasing age in men but this was not observed in women. Ethnic differences were observed only in women with coloured and Asian women at a significantly increased risk for this type of exposure compared with African women. A rural residence protected women but not men from exposure to ETS in the workplace (Table 4.9).

Domestic exposure to smoky fuels

Domestic use of smoky fuels (wood, coal and dung) for cooking and heating was strongly associated with poverty and was highest in the poorest group of men and women (Table 4.10 and Fig. 4.10). Similarly, the use of smoky fuels was strongly associated with no education and even a few years of education had a protective effect. Men in the youngest age group were more likely to report the use of this fuel than men in the older age groups. Women in the

15 - 24 year age group also had the highest use of this type of fuel but women in the older age groups were not at a significantly reduced risk for this type of exposure. Domestic exposure to smoky fuels was highest in African men and women, and lowest in white men and women. The use of smoky fuels was significantly more common in rural areas (Table 4.10).

Table 4.8: Poverty and Exposure of Non-Smokers to Environmental Tobacco Smoke in the Home

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Exposed=692 Unexposed=1986			*Women: Exposed=2000 Unexposed=4276*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.335	0.909 – 1.961	0.141	1.455	1.160 – 1.825	0.001
Middle group	1.229	0.829 – 1.823	0.304	1.293	1.007 – 1.659	0.044
Fourth poorest	1.573	0.982 – 2.518	0.059	1.231	0.917 – 1.654	0.167
Richest group	0.866	0.484 – 1.548	0.626	1.191	0.804 – 1.765	0.383
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.853	0.532 – 1.368	0.510	1.252	0.999 – 1.569	0.051
8 – 12 years	0.553	0.334 – 0.916	0.021	0.992	0.770 – 1.277	0.947
> 12 years	0.417	0.198 – 0.881	0.022	0.695	0.467 – 1.034	0.072
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	0.472	0.344 – 0.648	0.000	0.889	0.739 – 1.070	0.213
35 – 44 years	0.348	0.228 – 0.530	0.000	0.821	0.683 – 0.987	0.036
45 – 54 years	0.147	0.093 – 0.232	0.000	0.663	0.536 – 0.820	0.000
55 – 64 years	0.309	0.183 – 0.522	0.000	0.664	0.514 – 0.857	0.002
≥ 65 years	0.246	0.140 – 0.431	0.000	0.583	0.426 – 0.797	0.001
Population group						
African	1.00	-	-	1.00	-	-
Coloured	3.556	2.251 – 5.619	0.000	3.519	2.569 – 4.821	0.000
White	1.712	0.875 – 3.352	0.116	0.984	0.618 – 1.567	0.947
Asian	1.658	0.903 – 3.043	0.102	2.432	1.560 – 3.793	0.000
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.742	0.556 – 0.992	0.044	0.762	0.616 – 0.943	0.012

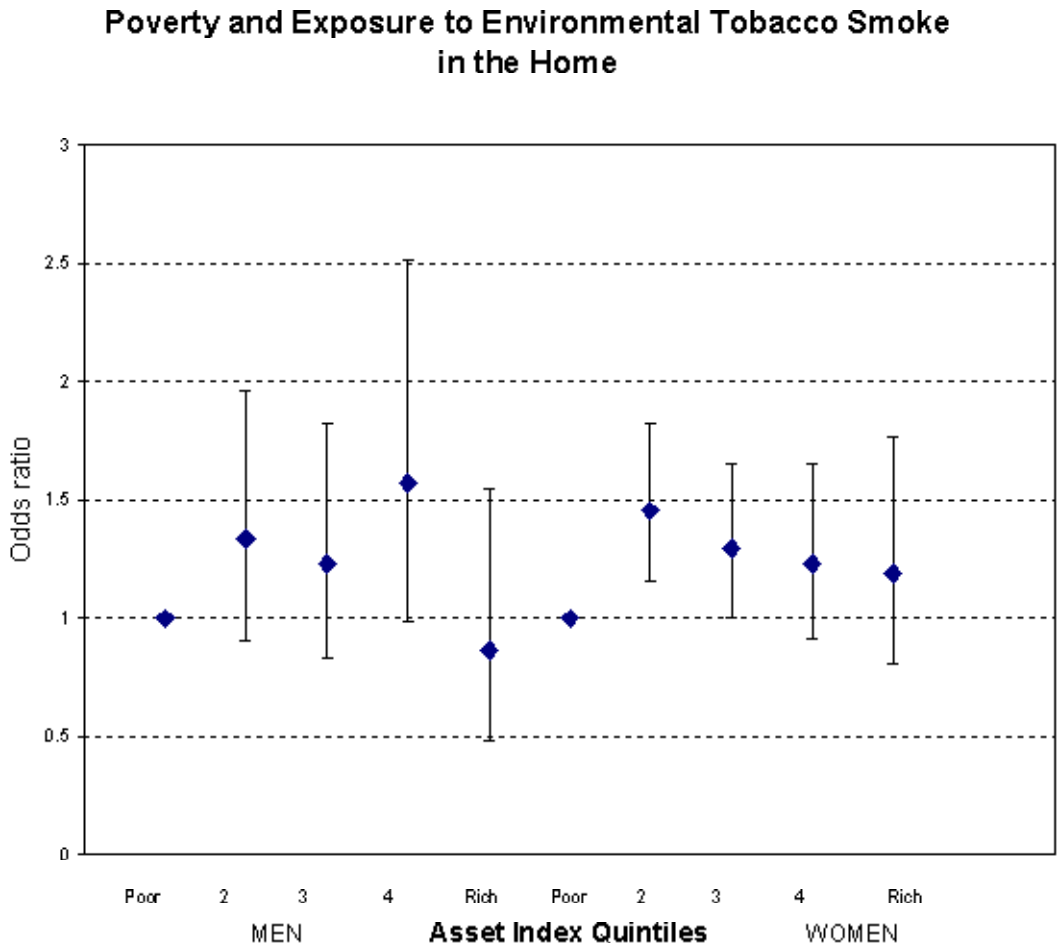

Poverty and Exposure to Environmental Tobacco Smoke in the Home
Odds ratio
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.8

Table 4.9: Poverty and Exposure of Employed Non-Smokers to Environmental Tobacco Smoke in the Workplace

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Exposed=453 Unexposed=500			*Women: Exposed=531 Unexposed=1015*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.984	0.496 – 1.954	0.964	1.060	0.572 – 1.964	0.853
Middle group	1.103	0.578 – 2.104	0.766	0.974	0.533 – 1.780	0.931
Fourth poorest	1.733	0.883 – 3.399	0.110	1.169	0.608 – 2.248	0.640
Richest group	2.198	1.001 – 4.827	0.050	0.941	0.457 – 1.941	0.870
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.560	0.290 – 1.079	0.083	1.082	0.617 – 1.898	0.782
8 – 12 years	0.496	0.257 – 0.953	0.035	1.150	0.660 – 2.004	0.622
> 12 years	0.356	0.167 – 0.760	0.008	0.941	0.476 – 1.861	0.860
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	1.937	1.228 – 3.056	0.005	0.942	0.645 – 1.376	0.757
35 – 44 years	1.592	0.968 – 2.620	0.067	1.367	0.926 – 2.016	0.115
45 – 54 years	2.031	1.184 – 3.486	0.010	0.928	0.601 – 1.433	0.736
55 – 64 years	1.117	0.613 – 2.036	0.717	1.200	0.666 – 2.162	0.543
≥ 65 years	5.546	1.869 – 16.454	0.002	0.525	0.100 – 2.751	0.445
Population group						
African	1.00	-	-	1.00	-	-
Coloured	1.145	0.660 – 1.988	0.629	2.054	1.313 – 3.213	0.002
White	0.772	0.435 – 1.368	0.374	0.948	0.545 – 1.647	0.849
Asian	1.048	0.471 – 2.333	0.908	3.149	1.653 – 5.998	0.001
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	1.217	0.807 – 1.835	0.349	0.663	0.468 – 0.940	0.021

Figure 4.9

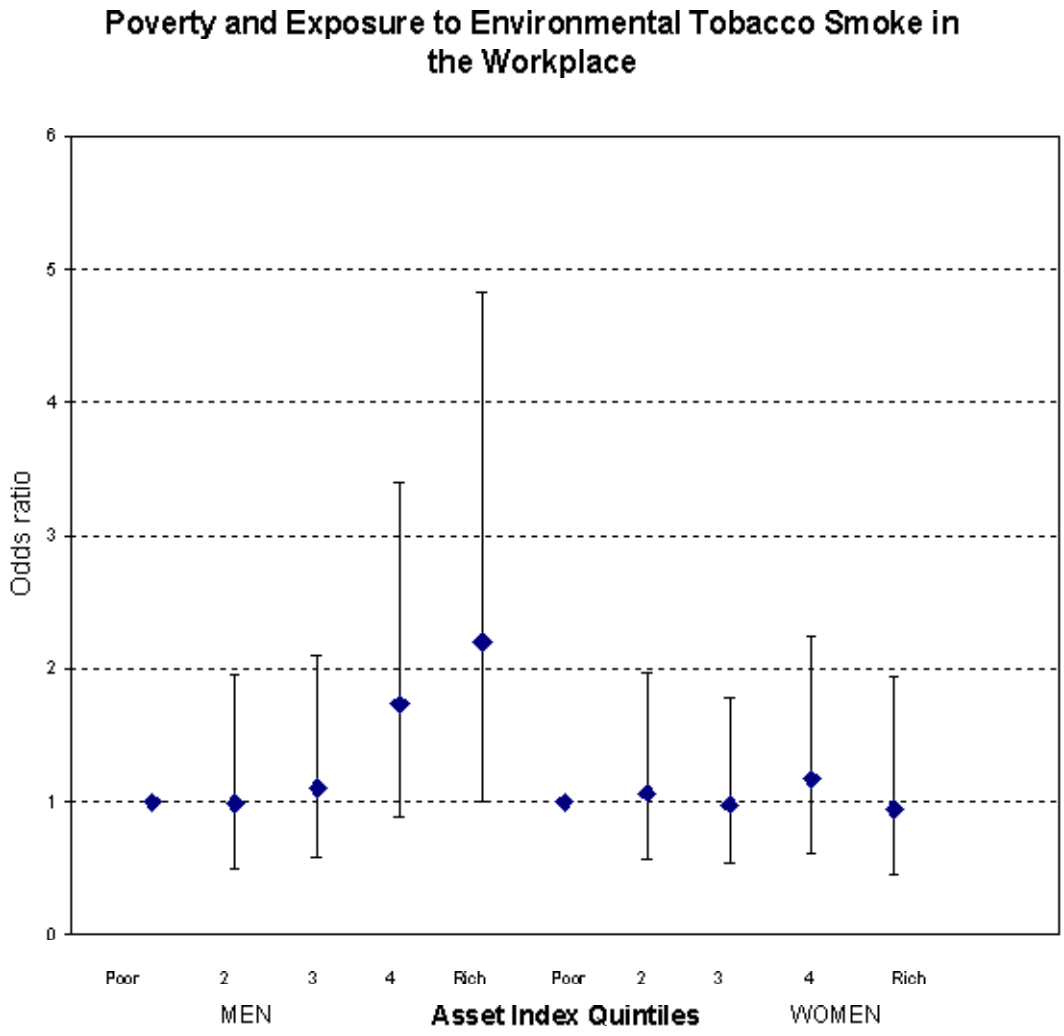

Poverty and Exposure to Environmental Tobacco Smoke in the Workplace
Odds ratio
0
1
2
3
4
5
6
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Table 4.10: Poverty and Domestic Exposure to Smoky Fuels (Burning wood, coal or dung)

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: smoky fuel users=1874 Non-users=3879			*Women: Smoky fuel users=3082 Non-users=4991*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.379	0.290 – 0.496	0.000	0.299	0.231 – 0.387	0.000
Middle group	0.245	0.178 – 0.336	0.000	0.216	0.161 – 0.291	0.000
Fourth poorest	0.244	0.165 – 0.362	0.000	0.200	0.135 – 0.297	0.000
Richest group	0.082	0.040 – 0.167	0.000	0.066	0.031 – 0.140	0.000
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.505	0.379 – 0.672	0.000	0.612	0.486 – 0.771	0.000
8 – 12 years	0.362	0.265 – 0.495	0.000	0.422	0.318 – 0.561	0.000
> 12 years	0.356	0.198 – 0.638	0.001	0.466	0.271 – 0.799	0.006
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	0.684	0.527 – 0.888	0.004	0.695	0.576 – 0.838	0.000
35 – 44 years	0.513	0.396 – 0.666	0.000	0.757	0.611 – 0.938	0.011
45 – 54 years	0.535	0.388 – 0.738	0.000	0.703	0.560 – 0.884	0.003
55 – 64 years	0.798	0.552 – 1.152	0.228	0.804	0.598 – 1.081	0.148
≥ 65 years	0.685	0.488 – 0.960	0.028	0.838	0.607 – 1.157	0.282
Population group						
African	1.00	-	-	1.00	-	-
Coloured	0.730	0.475 – 1.123	0.152	0.630	0.391 – 1.014	0.057
White	0.254	0.080 – 0.804	0.020	0.158	0.053 – 0.468	0.001
Asian	0.163	0.020 – 1.363	0.094	0.309	0.070 – 1.368	0.122
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	4.716	3.487 – 6.379	0.000	4.261	3.147 – 5.768	0.000

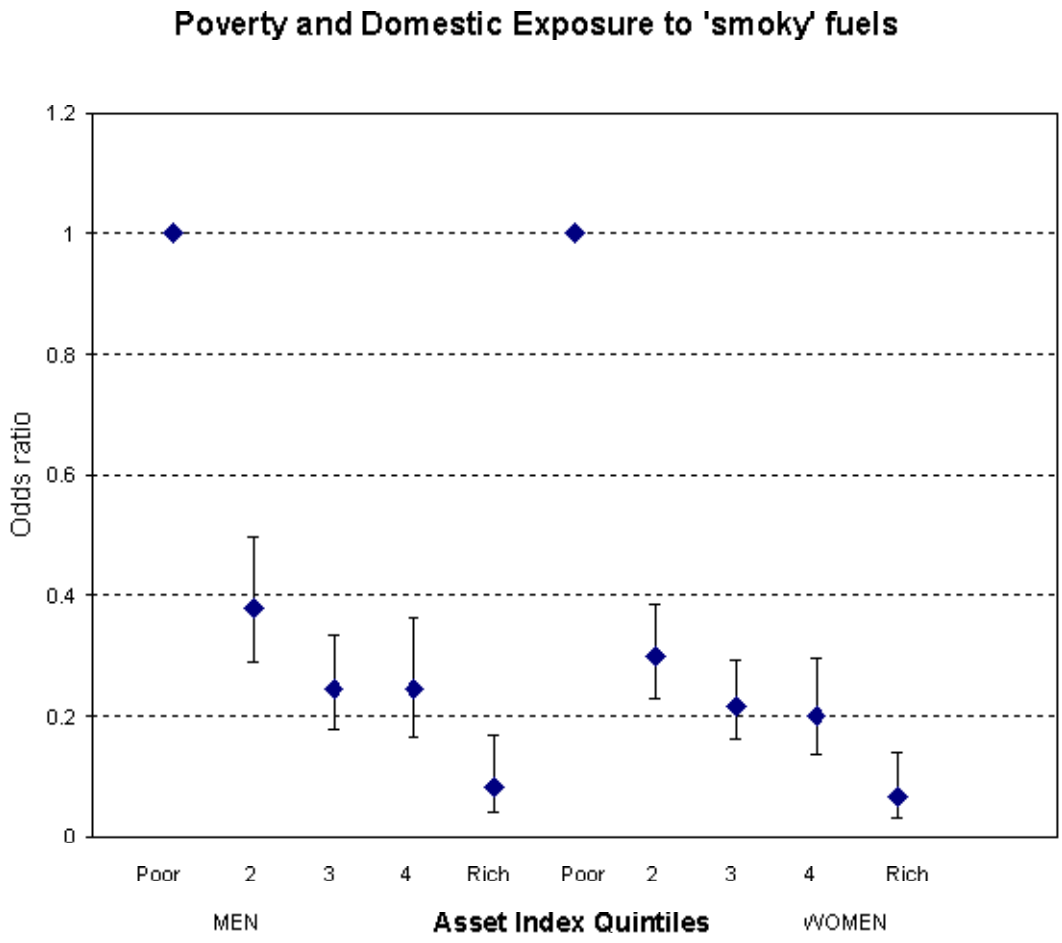

Poverty and Domestic Exposure to 'smoky' fuels
Odds ratio
1.2
1
0.8
0.6
0.4
0.2
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.10

Occupational exposure to polluted air

The risk for this type of exposure seemed to increase with increasing wealth in women but the reverse was true for men (Table 4.11 and Fig. 4.11). This gender difference was also observed for education with men in the higher education levels having the lowest occupational exposure while in women education did not play a protective role. As expected, occupational exposure was lowest in the youngest age group and increased significantly with increasing age. White and Asian men and white, coloured and Asian women were at an increased risk for this type of exposure compared with African men and women. Occupational exposure was not associated with geographic setting (Table 4.11).

Alcohol dependence

Alcohol dependence (at least two positive responses to the CAGE questions) was significantly lower in men and women in the richest group compared with the poorest group (Table 4.12 and Fig. 4.12). Although alcohol consumption is usually higher in men and women with a higher education as reported in Cameroon (Mbanya, 2001), it is not to be confused with alcohol dependence in this study. Alcohol dependence was strongly associated with illiteracy in women in this study and men with a tertiary education had significant protection from alcohol dependence. Alcohol dependence increased with increasing age but the increase was not significant in the oldest age group. Alcohol dependence was lowest in white men. Coloured women were at an increased risk of alcohol dependence compared with African women while Asian women showed a significantly lower risk for alcohol dependence than African women. A rural residence protected women from alcohol dependence (Table 4.12).

High sodium intake

Salty food intake seemed to increase with increasing wealth although the increase was not statistically significant in the more affluent quintiles (Table 4.13 and Fig. 4.13). The intake of salty food seemed to increase with increasing education, but the increase was only statistically significant in women with a secondary education compared with women with no education. High sodium intake was highest in young people and decreased significantly with increasing age in both men and women. The intake of salty food was a more common habit among African people, with all other population groups at a significantly reduced risk. Men living in rural areas were protected from a high salt diet compared with their urban counterparts (Table 4.13).

*Table 4.11: Poverty and Occupational Exposure to Polluted Air**

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Occupational exposure=1640 Normal=4113			*Women: Occupational exposure=783 Normal=7290*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	0.784	0.601 – 1.023	0.073	1.240	0.789 – 1.948	0.351
Middle group	0.758	0.575 – 1.000	0.050	1.514	0.992 – 2.311	0.055
Fourth poorest	0.663	0.469 – 0.937	0.020	1.837	1.081 – 3.123	0.025
Richest group	0.750	0.508 – 1.108	0.148	1.801	1.047 – 3.099	0.034
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.822	0.638 – 1.059	0.129	0.857	0.656 – 1.121	0.259
8 – 12 years	0.458	0.343 – 0.612	0.000	0.810	0.599 – 1.096	0.172
> 12 years	0.196	0.126 – 0.306	0.000	0.720	0.470 – 1.103	0.131
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	8.300	5.997 – 11.489	0.000	4.409	2.916 – 6.667	0.000
35 – 44 years	14.571	10.577 – 20.074	0.000	6.906	4.509 – 10.576	0.000
45 – 54 years	17.485	12.632 – 24.204	0.000	6.020	3.887 – 9.325	0.000
55 – 64 years	14.190	10.010 – 20.114	0.000	6.987	4.550 – 10.729	0.000
≥ 65 years	13.222	8.943 – 19.547	0.000	4.898	3.021 – 7.942	0.000
Population group						
African	1.00	-	-	1.00	-	-
Coloured	1.165	0.809 – 1.667	0.413	2.212	1.624 – 3.013	0.000
White	4.985	3.258 – 7.628	0.000	5.063	3.496 – 7.332	0.000
Asian	4.451	2.661 – 7.445	0.000	2.618	1.679 – 4.084	0.000
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.996	0.781 – 1.271	0.977	0.879	0.609 –1.270	0.493

*Exposure to smoke, dust or fumes, or having worked in a mine for at least 1 year. (Occupational exposure to environmental tobacco smoke was excluded as most working people experienced such exposure).

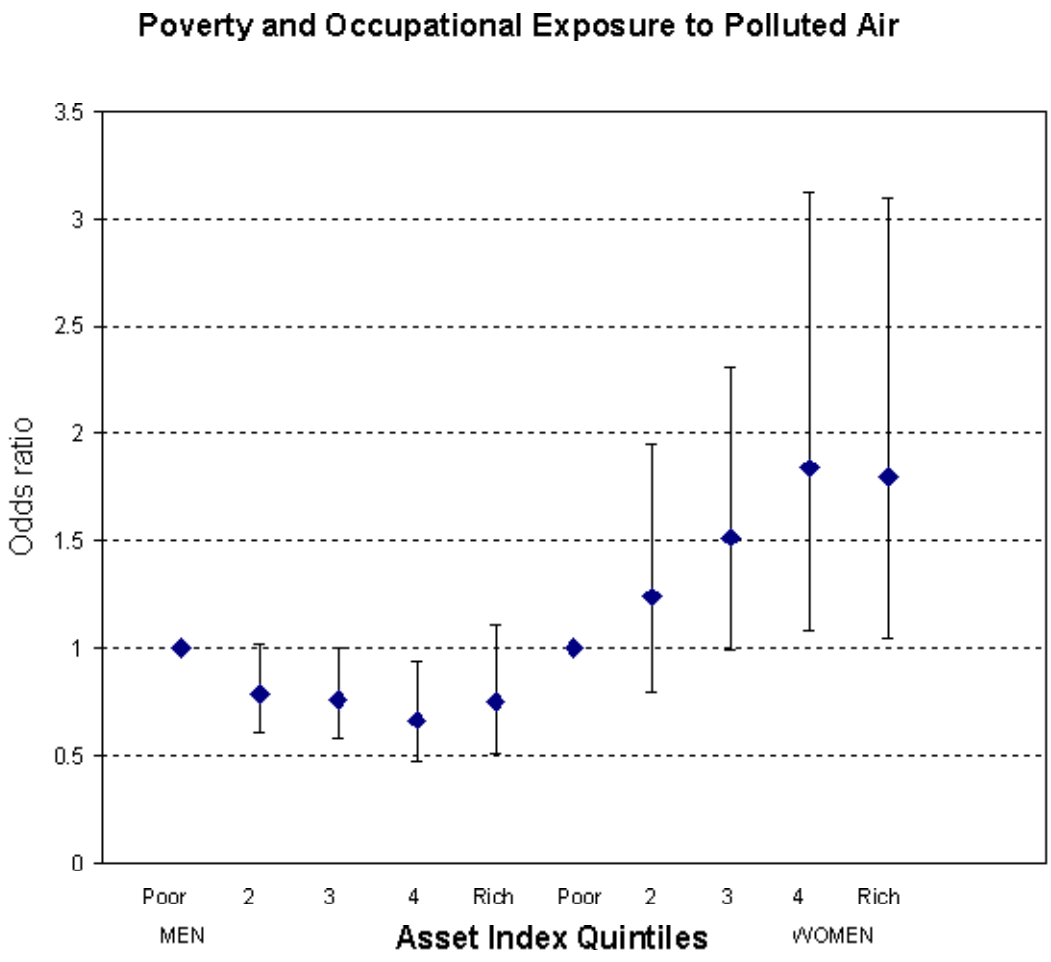

Poverty and Occupational Exposure to Polluted Air
Odds ratio
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.11

Table 4.12: Poverty and Alcohol Dependence (Positive responses to at least 2 questions on the CAGE questionnaire)

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: Alcohol Dependent=1712 Normal=4041			*Women: Alcohol Dependent=840 Normal=7233*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.059	0.816 – 1.373	0.667	0.959	0.727 – 1.266	0.767
Middle group	0.820	0.629 – 1.070	0.143	0.905	0.669 – 1.226	0.519
Fourth poorest	0.927	0.681 – 1.261	0.627	1.003	0.693 – 1.452	0.986
Richest group	0.654	0.452 – 0.947	0.024	0.551	0.339 – 0.898	0.017
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	0.991	0.782 – 1.256	0.941	0.597	0.465 – 0.766	0.000
8 – 12 years	0.802	0.625 – 1.030	0.083	0.379	0.282 – 0.511	0.000
> 12 years	0.593	0.402 – 0.875	0.008	0.245	0.143 – 0.420	0.000
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	2.587	2.116 – 3.163	0.000	1.568	1.143 – 2.152	0.005
35 – 44 years	2.965	2.416 – 3.637	0.000	1.798	1.321 – 2.447	0.000
45 – 54 years	2.275	1.754 – 2.950	0.000	1.830	1.309 – 2.558	0.000
55 – 64 years	1.813	1.375 – 2.391	0.000	1.159	0.800 – 1.678	0.436
≥ 65 years	1.314	0.973 – 1.774	0.075	1.342	0.961 – 1.873	0.084
Population group						
African	1.00	-	-	1.00	-	-
Coloured	1.263	0.930 – 1.714	0.134	2.479	1.849 – 3.322	0.000
White	0.377	0.249 – 0.572	0.000	1.307	0.734 – 2.327	0.363
Asian	0.761	0.491 – 1.180	0.222	0.238	0.081 – 0.700	0.009
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.864	0.695 – 1.074	0.187	0.668	0.505 – 0.883	0.005

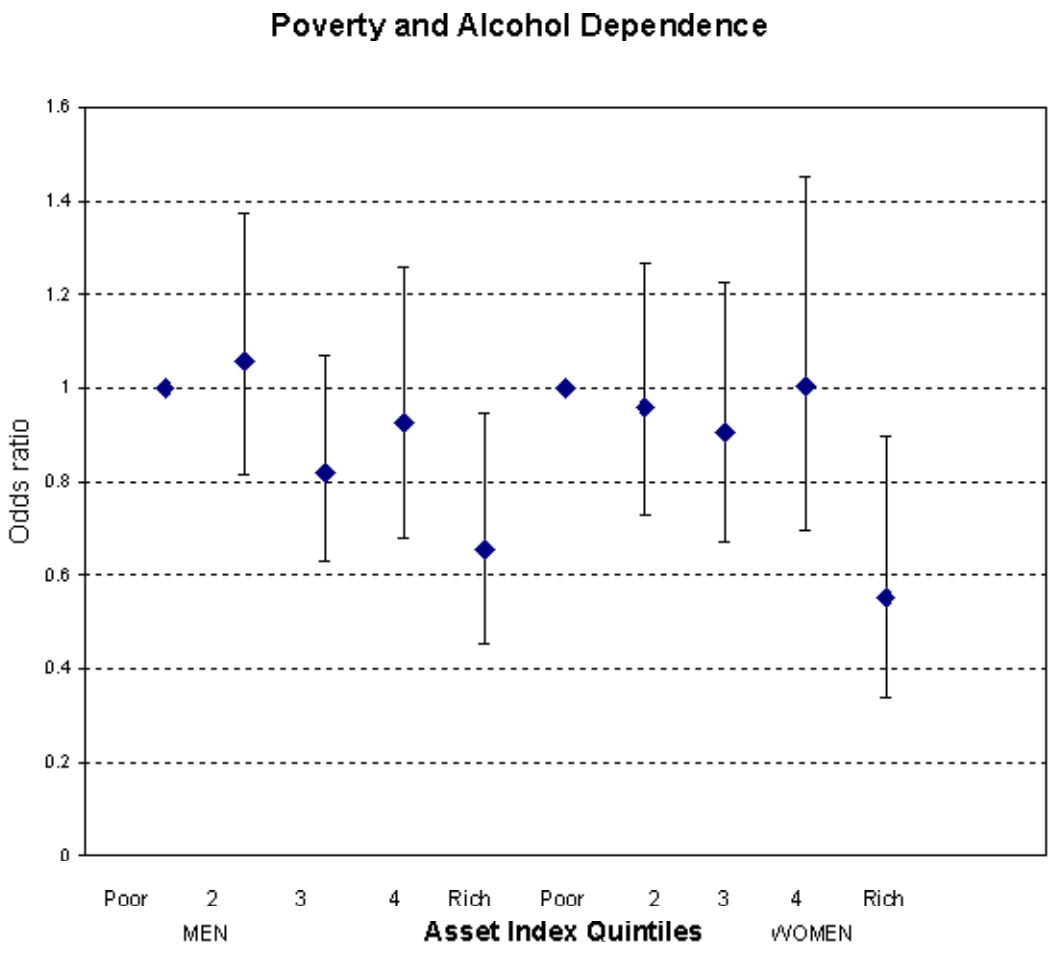
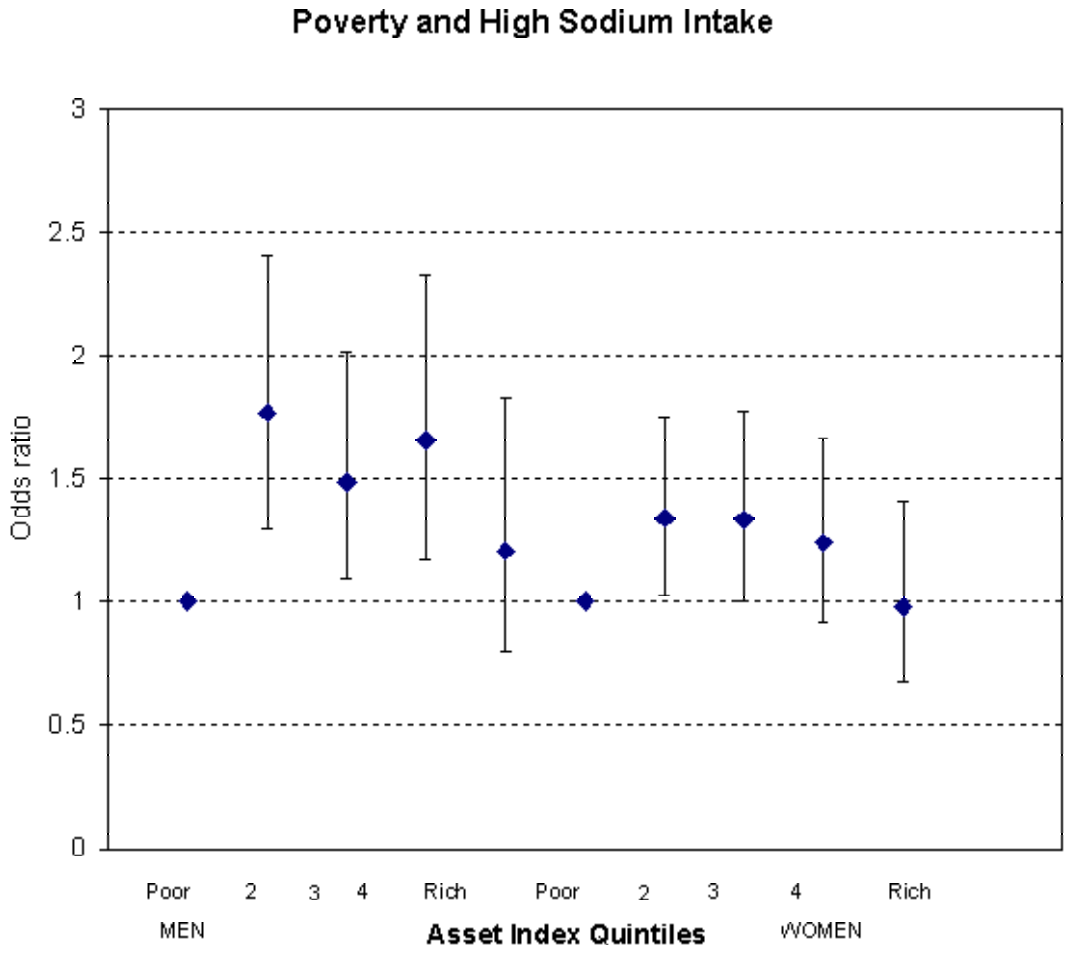

Poverty and Alcohol Dependence
Odds ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

Figure 4.12

Table 4.13: Poverty and High Sodium Intake (self reported addition of salt to served food plus eating at least 3 salty snacks per week)

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Men: High Sodium intake=1322 Normal intake=4431			*Women: High Sodium intake=1601 Normal intake=6472*		
Asset Index (Quintiles)						
Poorest group	1.00	-	-	1.00	-	-
Second poorest	1.770	1.300 – 2.409	0.000	1.341	1.029 – 1.748	0.030
Middle group	1.487	1.096 – 2.019	0.011	1.334	1.003 – 1.776	0.048
Fourth poorest	1.656	1.176 – 2.332	0.004	1.241	0.913 – 1.668	0.168
Richest group	1.207	0.798 - 1.827	0.373	0.977	0.677 – 1.411	0.902
Education						
None	1.00	-	-	1.00	-	-
1 – 7 years	1.190	0.836 – 1.694	0.333	1.105	0.861 – 1.420	0.432
8 – 12 years	1.375	0.963 – 1.965	0.080	1.368	1.061 – 1.764	0.016
> 12 years	1.023	0.626 – 1.671	0.928	1.144	0.769 – 1.700	0.507
Age						
15 – 24 years	1.00	-	-	1.00	-	-
25 – 34 years	0.866	0.700 – 1.073	0.188	0.761	0.636 – 0.910	0.003
35 – 44 years	0.635	0.507 – 0.797	0.000	0.464	0.375 – 0.575	0.000
45 – 54 years	0.416	0.308 – 0.561	0.000	0.376	0.296 – 0.478	0.000
55 – 64 years	0.249	0.166 – 0.374	0.000	0.302	0.224 – 0.408	0.000
≥ 65 years	0.189	0.127 – 0.281	0.000	0.152	0.107 – 0.215	0.000
Population group						
African	1.00	-	-	1.00	-	-
Coloured	0.305	0.216 – 0.430	0.000	0.290	0.203 – 0.413	0.000
White	0.775	0.513 – 1.170	0.224	0.667	0.457 – 0.973	0.035
Asian	0.413	0.228 – 0.745	0.003	0.437	0.253 – 0.755	0.003
Geographic setting						
Urban	1.00	-	-	1.00	-	-
Rural	0.752	0.594 – 0.952	0.018	0.915	0.735 – 1.138	0.423

Figure 4.13


Poverty and High Sodium Intake
Odds ratio
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
Poor
2
3
4
Rich
MEN
Asset Index Quintiles
WOMEN

3.4 Poverty and treatment status of hypertension

Awareness of hypertension

Awareness of hypertension among hypertensive subjects increased significantly with increasing wealth (Table 4.14 and Fig. 4.14). Women with hypertension showed 3.6 (95% CI 2.7 – 4.6) fold higher levels of awareness compared with hypertensive men. There was no significant association between awareness of hypertension and education among hypertensive subjects. There were also no population group differences in awareness of hypertension and membership of a medical aid did not increase awareness of hypertension among hypertensive subjects. Hypertension awareness increased significantly with age and adults living in urban areas were more aware of their condition compared with their rural counterparts (Table 4.14).

Use of hypertension medication

The use of hypertension medication among hypertensive subjects increased with increasing wealth and was highest in the richest group (Table 4.15 and Fig. 4.15). There were no differences between urban and rural groups or among educational levels. The use of hypertension medication increased with increasing age. As expected, use of this type of medication was significantly higher among adults with medical aid membership. Asian people were more likely to be on this medication compared with the African population. Women were more likely to be on this medication than men (Table 4.15).

Control of hypertension

The control of hypertension (BP< 160/95mmHg and an anti-hypertensive medication) among hypertensive subjects increased with increasing wealth and was highest in the richest group (Table 4.16 and Fig. 4.16). The control of hypertension remained level among the different education groupings and there were no differences between urban and rural groups. Control was significantly higher among subjects with medical aid membership. Asian men and women with hypertension had higher levels of control than African men and women. Women with hypertension showed a 2.0 (95% CI 1.5 – 2.6) fold increase in control compared with hypertensive men. Control of hypertension increased with increasing age (Table 4.16).

Table 4.14: Poverty and Awareness of Hypertension

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Hypertension: Aware=1101 Unaware=878		
Asset Index (Quintiles)			
Poorest group	1.00	-	-
Second poorest	1.057	0.665 – 1.680	0.813
Middle group	1.691	1.090 – 2.624	0.019
Fourth poorest	1.621	1.002 – 2.623	0.049
Richest group	2.247	1.238 – 4.079	0.008
Education			
None	1.00	-	-
1 – 7 years	1.164	0.863 – 1.571	0.319
8 – 12 years	1.130	0.805 – 1.588	0.480
> 12 years	1.552	0.834 – 2.889	0.165
Age			
15 – 24 years	1.00	-	-
25 – 34 years	14.001	2.060 – 95.173	0.007
35 – 44 years	16.027	2.531 – 101.502	0.003
45 – 54 years	36.412	5.742 – 230.891	0.000
55 – 64 years	38.022	5.824 – 248.226	0.000
≥ 65 years	31.863	5.025 – 202.035	0.000
Population group			
African	1.00	-	-
Coloured	1.052	0.716 – 1.544	0.797
White	1.155	0.650 – 2.052	0.622
Asian	1.313	0.714 – 2.415	0.380
Geographic setting			
Urban	1.00	-	-
Rural	0.696	0.529 – 0.916	0.010
Gender			
Men	1.00	-	-
Women	3.545	2.734 – 4.595	0.000
Medical Aid			
Membership	1.00	-	-
Non membership	0.828	0.549 – 1.247	0.365

Figure 4.14

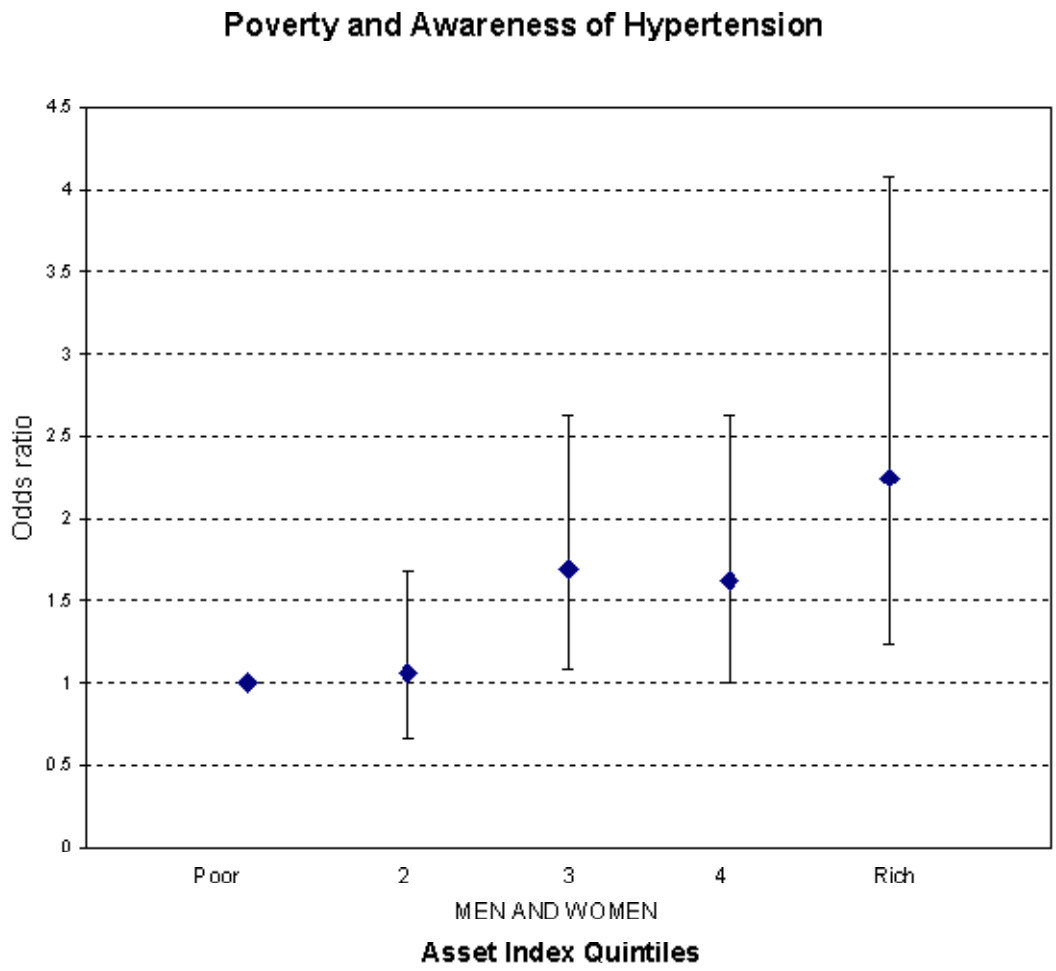

Poverty and Awareness of Hypertension
Odds ratio
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
MEN AND WOMEN
Asset Index Quintiles

Table 4.15: Poverty and Use of Hypertension Medication

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Hypertension, Using Medication=915 Not Using=1064		
Asset Index (Quintiles)			
Poorest group	1.00	-	-
Second poorest	1.049	0.614 – 1.793	0.861
Middle group	1.750	1.069 – 2.864	0.026
Fourth poorest	2.149	1.231 – 3.753	0.007
Richest group	3.485	1.824 – 6.660	0.000
Education			
None	1.00	-	-
1 – 7 years	1.277	0.933 – 1.747	0.126
8 – 12 years	1.245	0.889 – 1.743	0.203
> 12 years	1.632	0.869 – 3.064	0.127
Age			
15 – 24 years	1.00	-	-
25 – 34 years	15.426	2.433 – 97.814	0.004
35 – 44 years	25.412	4.530 – 142.573	0.000
45 – 54 years	58.364	10.433 – 326.500	0.000
55 – 64 years	64.725	11.464 – 365.443	0.000
≥ 65 years	60.926	10.826 – 342.870	0.000
Population group			
African	1.00	-	-
Coloured	1.159	0.759 – 1.769	0.495
White	1.295	0.743 – 2.254	0.361
Asian	2.808	1.531 – 5.149	0.001
Geographic setting			
Urban	1.00	-	-
Rural	0.835	0.612 – 1.139	0.254
Gender			
Men	1.00	-	-
Women	2.459	1.873 – 3.229	0.000
Medical aid			
Membership	1.00	-	-
Non membership	0.568	0.374 – 0.862	0.008

Figure 4.15

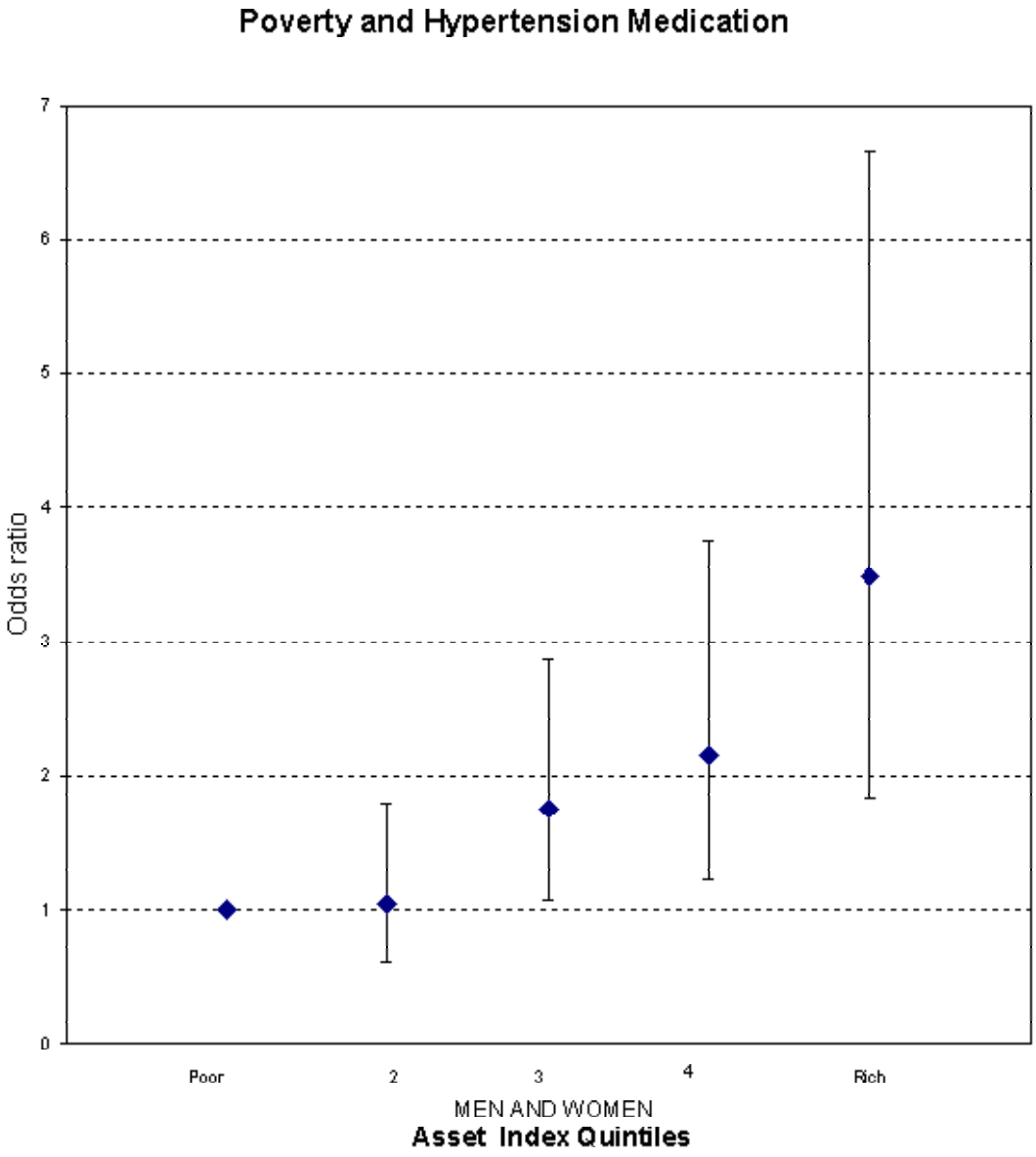
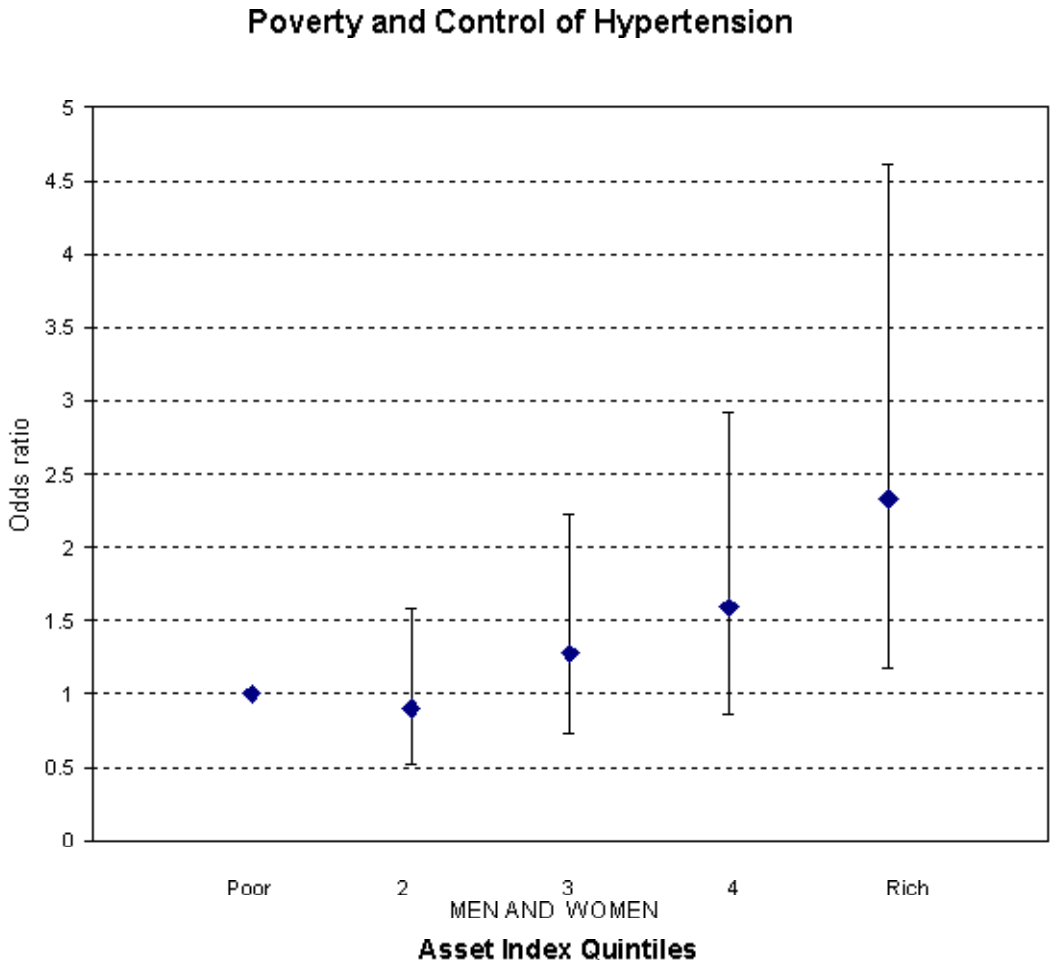

Poverty and Hypertension Medication
Odds ratio
0
1
2
3
4
5
6
7
Poor
2
3
4
Rich
MEN AND WOMEN
Asset Index Quintiles

Table 4.16: Poverty and Control of Hypertension (BP ≤160/95 mmHg) + anti-hypertensive medication

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	Hypertension, Controlled=636 Uncontrolled=1343		
Asset Index (Quintiles)			
Poorest group	1.00	-	-
Second poorest	0.905	0.517 – 1.585	0.726
Middle group	1.276	0.731 – 2.228	0.391
Fourth poorest	1.591	0.866 – 2.921	0.134
Richest group	2.327	1.173 – 4.616	0.016
Education			
None	1.00	-	-
1 – 7 years	1.372	0.977 – 1.925	0.068
8 – 12 years	1.247	0.872 – 1.784	0.227
> 12 years	1.326	0.674 – 2.609	0.413
Age			
15 – 24 years	1.00	-	-
25 – 34 years	10.725	1.850 – 62.173	0.008
35 – 44 years	14.212	2.637 – 76.589	0.002
45 – 54 years	28.904	5.475 – 152.574	0.000
55 – 64 years	28.488	5.367 – 151.204	0.000
≥ 65 years	26.360	4.916 – 141.351	0.000
Population group			
African	1.00	-	-
Coloured	1.161	0.749 – 1.801	0.504
White	0.957	0.557 – 1.645	0.874
Asian	1.764	1.032 – 3.015	0.038
Geographic setting			
Urban	1.00	-	-
Rural	0.954	0.617 – 1.474	0.831
Gender			
Men	1.00	-	-
Women	2.006	1.529 – 2.631	0.000
Medical aid			
Membership	1.00	-	-
Non membership	0.587	0.377 – 0.914	0.018

Figure 4.16


Poverty and Control of Hypertension
Odds ratio
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Poor
2
3
4
Rich
MEN AND WOMEN
Asset Index Quintiles

3.5 Poverty and treatment of airflow limitation

Use of “asthma” medication

The use of “asthma” medication among people with airflow limitation increased with increasing wealth although the increase was not statistically significant in the richest group (Table 4.17 and Fig. 4.17). Similarly, the use of this type of medication increased with increasing education but the increase was not significant in the tertiary education group. Use of “asthma” medication increased with increasing age and was highest in the oldest group. Ethnic differences were observed, with the coloured and Asian population groups showing more use of medication compared with the African group. Women were significantly less likely to be on “asthma” medication than men if affected by this condition. Use of “asthma” medication among subjects with airflow limitation was significantly higher in adults with medical aid membership. No differences between geographic settings were observed (Table 4.17).

Table 4.17: Poverty and Use of "Asthma" Medication

Socio-Demographic Characteristics	*Odds Ratio*	*95% Confidence Interval*	*P-value estimate*
	"Asthma", Using Medication=232 Not Using=906		
Asset Index (Quintiles)			
Poorest group	1.00	-	-
Second poorest	1.808	0.966 – 3.385	0.064
Middle group	2.464	1.225 – 4.955	0.012
Fourth poorest	2.764	1.152 – 6.633	0.023
Richest group	2.143	0.783 – 5.870	0.138
Education			
None	1.00	-	-
1 – 7 years	2.208	1.230 – 3.964	0.008
8 – 12 years	2.074	1.043 – 4.121	0.037
> 12 years	2.261	0.646 – 7.908	0.201
Age			
15 – 24 years	1.00	-	-
25 – 34 years	1.650	0.768 – 3.546	0.199
35 – 44 years	2.014	0.972 – 4.174	0.060
45 – 54 years	2.242	0.977 – 5.145	0.057
55 – 64 years	3.973	1.820 – 8.675	0.001
≥ 65 years	5.200	2.428 – 11.136	0.000
Population group			
African	1.00	-	-
Coloured	3.566	2.0163 – 6.305	0.000
White	1.895	0.684 – 5.250	0.218
Asian	3.435	1.500 – 7.867	0.004
Geographic setting			
Urban	1.00	-	-
Rural	1.086	0.543 – 2.174	0.814
Gender			
Men	1.00	-	-
Women	0.651	0.452 – 0.937	0.021
Medical Aid			
Membership	1.00	-	-
Non membership	0.472	0.262 – 0.848	0.012

Figure 4.17

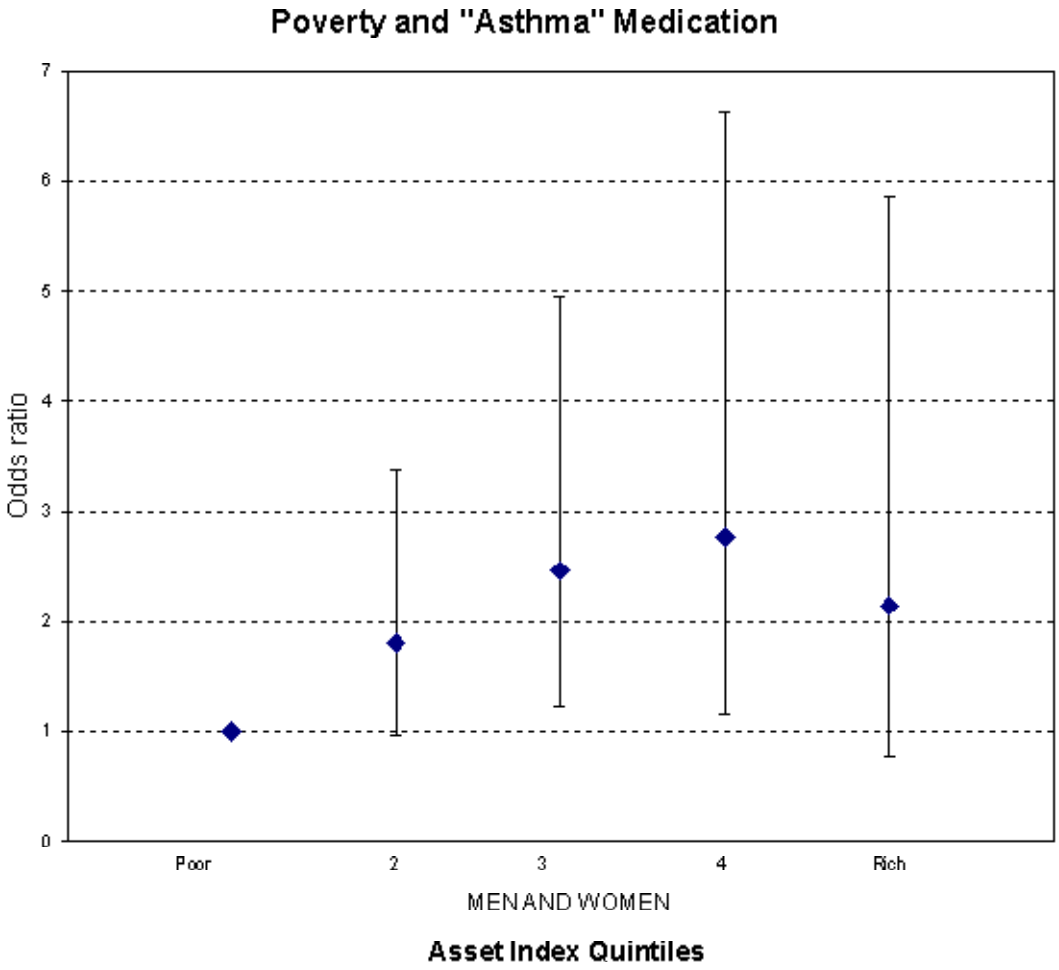

Poverty and "Asthma" Medication
Odds ratio
0
1
2
3
4
5
6
7
Poor
2
3
4
Rich
MEN AND WOMEN
Asset Index Quintiles

Table 4.18: Predicted Proportions of SADHS Participants for Respiratory Conditions, Risk and Lifestyle Factors by Asset Index Quintiles

	Men: Asset Index Quintiles					*Women: Asset Index Quintiles*				
	Poorest	*Second*	*Middle*	*Fourth*	*Richest*	*Poorest*	*Second*	*Middle*	*Fourth*	*Richest*
Respiratory Conditions (%)										
Abnormal Peak Flow	3.3	3.5	3.3	4.2	2.3	3.6	3.4	3.0	5.3	2.7
"Asthma"	5.9	7.0	4.1	5.6	4.0	8.2	7.5	6.5	7.6	7.2
Chronic Bronchitis	3.0	1.9	1.4	1.5	1.1	5.1	3.2	2.2	1.0	1.0
Risk Factors (%)										
Hypertension	5.4	6.3	6.6	8.3	9.4	8.1	8.7	9.3	11.1	10.0
Obesity	3.3	2.0	3.3	4.2	7.8	16.7	20.0	23.2	27.4	29.4
Lifestyle Factors (%)										
Light smoking	48.7	43.4	38.1	37.0	25.2	10.6	8.4	9.3	5.9	3.3
Heavy smoking	4.8	6.9	4.8	6.8	6.6	0.5	0.3	0.3	0.6	0.6
Exposure to ETS in the home	21.0	25.6	24.7	27.9	18.2	26.0	35.0	33.9	31.8	28.0
Exposure to ETS in the workplace	33.7	38.2	44.1	52.3	54.3	26.8	34.0	34.8	36.6	32.4
Domestic exposure to "smoky" fuels	54.7	33.6	24.6	20.6	6.1	66.4	38.2	30.3	24.3	7.6
Occupational exposure to polluted air	26.0	19.8	19.9	18.8	19.7	4.1	5.8	7.1	7.9	9.1
Alcohol dependence	29.8	30.2	28.4	30.2	22.5	10.3	9.6	9.3	9.2	6.1
High sodium intake	15.8	24.0	21.0	22.7	16.9	15.1	19.3	17.8	18.2	14.4
Treatment Status of Hypertension (%)										
Awareness of hypertension*	24.9	28.5	37.5	38.9	45.2	51.9	56.4	66.1	67.4	72.8
Use of hypertension medication*	16.3	20.0	30.0	34.0	47.8	31.7	37.4	50.6	55.1	68.6
Control of hypertension*	12.4	14.3	19.4	22.0	31.9	22.2	25.3	32.8	36.4	48.7
Treatment of Airflow Limitation (%)										
Use of "asthma" medication*	14.1	16.3	18.4	22.5	22.3	12.7	14.8	16.7	20.5	20.3

Adjusted for education, age, population group and place of residence.

*Also adjusted for medical aid membership.

4 CONCLUSION

The results from this study are summarized in Table 4.18 and show a comparison of the proportion of participants in each quintile of the asset index with a given characteristic after adjusting for age, education, population group and place of residence. In addition, the proportions describing the airflow limitation and hypertension treatment status were adjusted for medical aid membership.

The results of the analysis show a complex picture, particularly relating to education: some risk factors were more prevalent in the poor or illiterate while for others the reverse was true.

These data show that the simplistic notions of chronic diseases as diseases of affluence are false. High levels of risk factors and lifestyle factors for these conditions exist across the socio-economic spectrum.

The prevalence of chronic bronchitis was highest in the poor and decreased with increasing wealth, while the other markers of respiratory disease were not associated with income. Both risk factors studied, namely hypertension and obesity, were associated with wealth. Hypertension, however, was highest among women with no education and decreased with increasing education while women with no and high education were protected against obesity compared with women with some education. Most of the lifestyle factors for chronic diseases such as light smoking, domestic exposure to 'smoky' fuels and alcohol dependence were associated with poverty. The complexity was further accentuated by gender differences observed for certain lifestyle factors. Exposure to environmental tobacco smoke in the home and workplace increased with increasing wealth in men but not in women and education played a protective role for this type of exposure in men only. Occupational exposure to polluted air, however, increased with increasing wealth in women and was highest in the most affluent group of women while this type of exposure was highest in the poorest group of men. The health care indicators studied were all associated with wealth. The use of "asthma" and hypertension medication among affected individuals increased significantly with increasing wealth. For the treatment status of hypertension, control and awareness of hypertension were both associated with increased wealth.

Much of the projected rise in chronic diseases is preventable, particularly that due to smoking, a poor diet and obesity. Early action in some population groups at high risk and reduction in established levels of some of these lifestyle and risk factors could prevent the expected surge of chronic diseases in developing countries.

CHAPTER 5

Overview, Policy Implications And Recommendations

Krisela Steyn & Debbie Bradshaw

1 POVERTY AND ITS MEASUREMENT

While the number of poor people has remained more or less constant globally, the number in Africa has risen, and the sub-Saharan African region has the highest prevalence of poverty in the world. Estimates of the levels of poverty in South Africa are variable with the prevalence of poverty ranging from 11% to 57%, depending on the poverty line and the method employed. The poverty estimates published by Statistics South Africa, based on a poverty line of a household income of R800 per month, puts the percentage of households living in poverty in 1996, the census year, at 52%. Since then, access to basic facilities, such as housing, water and sanitation have increased slightly (StatsSA, 2000c). However, levels of unemployment have increased, suggesting that the poverty levels are unlikely to have declined in South Africa since 1996.

This study has focused on the consumption or income-based concept of poverty, as a starting point to investigate the relationship between poverty and chronic diseases in South Africa, although the capability approach to the measurement of poverty has very important developmental implications. This type of investigation has never been done before because of the lack of appropriate data.

The proportion of households living in poverty in a geographic area was used to define magisterial districts as rich or poor. This enabled a comparison of the profile of the causes of death between the rich and poor areas of the country. A factor analysis of the socio-economic variables included in the South African and Demographic and Health Survey (SADHS) data yielded an asset index, based on 14 household items. This index explains a large part of the variation between households, and provides a robust indicator of poverty that correlates reasonably well with indicators based on income and expenditure data at provincial level. The index also correlates well with subsets of the SADHS variables, a sign of reliability in such an index. The resulting asset index provides a socio-economic index in the absence of income and expenditure data, and a mechanism for analysing the health-related data of the SADHS in relation to poverty.

The mortality data and the other health-related data were analysed using poverty indicators derived from different data sources and constructed in completely different ways. However, the rank correlation between the poverty index used in the analysis of the mortality data and the asset index, based on the SADHS at provincial level, is 0.933. This suggests that not withstanding the extreme limitations of the method used to analyse the mortality data, and the lack of data on the death certificates, there is a degree of coherence in the measures of poverty that have been used to analyse the different data sets.

2 CHRONIC DISEASES AND POVERTY

The data presented in this report show a complex picture of mortality, morbidity, risk factor and unhealthy lifestyle patterns in South Africa – an amalgam of a stratified society undergoing the health transition at a rapid pace. The current mortality pattern of chronic diseases reflects a lifetime's exposure to unhealthy lifestyles. The resulting risk factors were also poorly diagnosed and inadequately treated. South Africa has not escaped the protracted-polarised model of the epidemiological transition. In Chapter 3 the 1996 mortality pattern shows a strongly polarised pattern, with the rich having a more typical westernised pattern where chronic diseases dominate, though exceedingly high levels of trauma-related death were also found among men. In contrast, the mortality picture of the poor could be described as a typical example of the protracted-polarised pattern of mortality with a combination the disease types. The increased number of early adult female deaths is probably due to the emergence of the AIDS epidemic and can be seen in both the poor and wealthy areas.

Morbidity, measured by abnormal peak flow, and symptoms of "asthma" were not correlated with levels of wealth and poverty as reflected by the asset index, while chronic bronchitis was more common among the poor. Risk factors, such as hypertension and obesity, tended to increase in the wealthier groups. In contrast, the prevalence of unhealthy lifestyles, and exposures such as smoking (albeit light smoking) exposure to smoky fuels and alcohol dependence, tended to occur more frequently among the poor. This profile suggests that the poor are also likely to develop risk factors for chronic diseases as a result of their current unhealthy lifestyle. In addition, any alleviation of poverty leading to an increase in wealth may also contribute to additional increase in risk factors.

3 THE MORTALITY PATTERNS IN RICH AND POOR SOUTH AFRICANS

This analysis has highlighted the fact that mortality data are worse in the poor than in the wealthy areas. The proportion of ill-defined mortality is also much higher in the poor areas. These poor areas are predominantly rural, and, consequently, these results emphasise the need to improve the reporting of the specific diagnoses of the cause of death, along with the need to have higher rates of death reporting in the rural areas. Such efforts will contribute to the improvement of the overall mortality reporting in the country.

The comparison of disease mortality between the poor and rich segments of South African society, according to broad disease types, leaves little doubt that chronic disease mortality was the predominant cause of death in 1996 in the rich sector of society compared to the poor sector. The high proportion of mortality in the rich sector as a result of external causes may be a consequence of higher levels of violence and injuries in urban areas. It is not clear how the increasing AIDS mortality will influence these patterns, though it is anticipated that the poor might be affected more than the rich.

The comparison of the specific groups of chronic diseases, shown in Table 3.1, is particularly interesting. For cardiovascular mortality it was noted that stroke mortality was roughly four times higher than the ischaemic heart disease mortality rates in the poor group. In the rich group, on the other hand, the proportions of stroke and ischaemic heart disease were comparable. This supports the concept of a progressing health transition related to a changing risk factor pattern. It would be anticipated that the predominant risk factors for CVD in the poor group will be hypertension, while in the richer group the typical risk factor patterns would be increasing rates of hypercholesterolaemia, along with the presence of hypertension and smoking. This suggestion is corroborated by the fact that lung cancer occurred more frequently in the rich group compared to the poor group for males and females, (suggesting higher smoking rates in the past). Also, hypertensive heart disease was more common in the poor than in the rich group.

Comparison of the cancer mortality rates between the rich and poor shows that oesophageal cancer occurs far more frequently in the poor and predominantly rural group, compared to the rich group. These data emphasise the immense problem of oesophageal cancer in South Africa. Although extensive research has been done on this cancer in South Africa, these findings suggest that little progress has been made to reduce its burden and further investigation is needed to find successful preventive measures to reduce its incidence. Cancer

of the oesophagus is usually diagnosed too late to achieve a cure, and thus the high mortality pattern reported here.

Death due to cancer of the cervix is the commonest cause of cancer deaths among poor women, and account for a quarter of the years of life lost by these women. If adequate health services were in place to diagnose and treat this cancer through early pap smears or visual examination of the cervix (where pap smears are not available) the condition can be cured and/or death prevented. The National Department of Health in South Africa has recently introduced a policy for screening patients at primary health care services in the public sector. However, logistical impediments to implement this policy in poor, rural clinics are enormous and need urgent attention.

For poor men the high death rates due to liver cancer also suggest the preventive measure of hepatitis B vaccination has not been adequate among them in the past. This need has now been addressed by South Africa's National Department of Health since the hepatitis B vaccination has recently been incorporated in the department's *Expanded Programme of Immunisation,* and all children who are vaccinated now receive this vaccine.

A most unfortunate sequence of events has inadvertently exposed a group of children living in poor areas to exposures to a carcinogenic mycotoxin, Aflatoxin, which increases their risk of developing liver cancer in later life. The School Feeding scheme for children attending primary schools in poor areas, introduced by President Mandela since 1994, included the use of large amounts of peanuts. In some regions, the necessary quality control to ensure that these peanuts were not contaminated with the mycotoxin Aflatoxin was not done. Exposure to Aflatoxin among people who also are carriers of the hepatitis B virus results in an exponentially increased risk to develop liver cancer. As the programme to vaccinate young children against hepatitis B was only recently introduced, there is a cohort of children exposed to Aflatoxin in peanuts who have not received this vaccine. There is currently a suggestion that this cohort of children be vaccinated against hepatitis B, although some scientists argue that it may be too late and will not provide the necessary protection for these children exposed to Aflatoxin.

Smoking-related causes of death account for a higher proportion of mortality is higher in the rich compared to the poor, particularly in the case of women. Mortality due to lung cancer featured for poor men as well as rich men, suggesting that despite limited resources, poor men do indeed spend their limited resources on tobacco products, competing with food or other essential items. Tobacco use is also implicated in the

COPD mortality. However, it is likely that poor people have significantly more exposure to indoor air pollution, resulting from burning wood or coal for cooking and heating during the winter. This is borne out by the findings reported in Table 4.9, where it was found that the poorest group of men and women were more exposed to environmental air pollution the better off. Similar findings were reported in a study conducted in the Northern Province (Mzileni, *et al*., 1999).

The high proportion of asthma mortality found in the poor compared to the rich, suggests inadequate asthma control in the poor in South Africa. Well-controlled asthma, with sufficient and correct anti-inflammatory and bronchodilator medication, has been shown to reduce mortality because of fewer acute episodes, which could lead to death. Table 4.17 showing the pattern of "asthma" medication use in the different socio-economic groups indeed confirmed that the lowest level of "asthma" medication was used in the poorest and least educated groups.

4 RESPIRATORY DISEASES AND EXPOSURE TO TOBACCO AND RELATED LIFESTYLE FACTORS

Peak expiratory flow rate was used as an independent measure of respiratory disease, while airflow limitation ("asthma") and chronic bronchitis were identified using standardized questionnaires of symptom patterns. The prevalence of abnormal peak expiratory flow rate, shown in Table 4.2, was similar across all the groups determined by the asset index, while a higher level of education was associated with significantly lower abnormal peak expiratory flow rate in men and women, independent of the other demographic variables. This finding suggests that being richer, by having access to durable goods, does not mean that the required healthy lifestyles are followed, protecting them against lung disease. In fact, these data suggest that the adoption of a healthier lifestyle is associated with increasing education. A similar pattern was found with the analyses for the "asthma" symptom complex as shown in Table 4.3, as well as for heavy tobacco use (15 or more tobacco equivalents per day) as in Table 4.7b. This is not surprising since severe respiratory disease due to tobacco use, is dose-dependent. In contrast, the presence of chronic bronchitis, as seen in Table 4.4, was found to be worse in the poor and in the uneducated. Sir Richard Peto emphasised that chronic bronchitis, as defined by questionnaires, such as that used in the SADHS, should not be considered as a symptom of severe lung disease but purely as an excessive sputum production precipitated by any exposure to tobacco smoke or other airway irritants (personal communication 2001). This view is partially supported by the data reported here. It was found that the prevalence of light smoking (less than 15 equivalents of tobacco per day, (Table 4.7a)

and the prevalence of exposure to smoky fuels (Table 4.10) were significantly higher in the poorest group and those with no education.

The SADHS data were collected before the implementation of South Africa's excellent tobacco control legislation, signed into law by President Mandela. The extent of smoking emphasises the necessity of these laws to ban advertisements and sponsorship of popular events by the tobacco industry and protect the population against initiating tobacco use and the resulting nicotine addiction. It is particularly the impressionable young, the poor, and the newly urbanised, who are rapidly adopting the typical unhealthy lifestyles of urban people, with their higher smoking rates, who need protection against tobacco companies' promotional material. African women are a case in point where traditionally tobacco smoking by pre-menopausal women was taboo and consequently low tobacco use rates were found in African women. However, it has been shown that African women who have lived in the cities for large parts of their lives are ignoring these taboos and are smoking more frequently than their rural counterparts (Steyn, *et al*., 1994). In the recent past this large group of South African women, was particularly targeted by the tobacco industry as a possible future market for their deadly product. They will now be protected from these promotions by law. Since the overall tobacco consumption is still low in the poorer groups, this means that increased tobacco tax and advertisement bans will impact this group more than other group. These are highly cost-effective measures in contrast to the more expensive interventions needed for addicted people, such as nicotine replacement therapy.

As seen in Table 4.10, the use of smoky fuels occurs predominantly in rural African people. In a study conducted in the Northern Province of South Africa, Mzileni, *et al*. (1999) showed that such exposure is related to lung cancer among Africans. Electrification of the rural areas should be high on the agenda in planning for better health for poor South Africans. In addition, the use of smoky fuels has contributed to massive deforestation across Africa, and reduction in their use will certainly improve the environment.

Table 4.17 show, in addition to the low levels of appropriate medication use for "asthma" among the poor, that young people, African and white people, women and people without medical aid (predominantly public sector patients) are most in need of having appropriate medication prescribed for their asthma. It is surprising that women with asthma were using medication significantly less than men with this condition. This is in stark contrast to the pattern of medication use for hypertension (Table 4.15) where women with hypertension, more frequently than men with hypertension, were receiving appropriate medication.

5 HYPERTENSION, OBESITY AND RELATED RISK FACTORS

In both men and women, age was by far the strongest predictor of hypertension as seen in Table 4.5. In men, hypertension was significantly more prevalent in the rich compared to the poor, after adjusting for other demographic variables. In women, the coloured group had the highest prevalence of hypertension. As expected, obesity, which disposes to the development of hypertension, shown in Table 4.6, also occurred more in the rich men than in the poor. For women, low levels of hypertension were found in rural women, who also had the least obesity. Similarly, women with tertiary education had less hypertension, and also tended to be less obese. The most obesity was found in women who had completed some years of schooling, but who did not have tertiary education. African women had by far the most obesity of any group.

High salt intake predisposes to the development of hypertension, particularly in salt sensitive individuals and populations. Generally, the level of salt intake by people is established early and continues throughout their life. People of African descent have been found to exhibit a strong tendency toward salt sensitivity and hypertension (Graudal, *et al*., 1998).

In Table 4.13 it is shown that South Africans who prefer salty food, are the youngest group, the Africans, and the urban men. The poorest and the richest group prefer less salty food than the middle three quintiles of the asset index. This suggests that as the poorest group experience upward social mobility, more salty food will be consumed, predisposing to higher levels of hypertension, particularly in the African group. South African bread is known to have a particularly high level of salt, and salt is frequently used as a cheap preservative in South African foods. The National Department of Health has no formal policy or regulations to control the amount of salt used in commercial preparation of food in South Africa. The DASH study (Sacks, *et al*., 2001) has clearly shown that less salt intake reduces BP levels. The data presented here sketch a worrying picture with regard to the future prevalence of hypertension in the large African population. The young and upwardly mobile population are moving to the cities in large numbers, and are consuming fast foods. While the formal and informal food industry have a free hand to use salt, the cheapest preservative available. A national policy regarding the use of salt in food preparation is long overdue.

SADHS has limited information regarding diet. Only some questions reflecting salt and alcohol intake was included. However, it seems reasonable to assume that the excessive calorie intake reflected in the many obese participants, along with the salt and alcohol intake, suggests a dietary pattern that does not fulfil the requirements of a healthy, prudent diet that

will protect against the development of chronic diseases. In fact, previous dietary studies in South Africa have shown that the coloured, Asian and white community consume a typical westernised diet that predisposes to the development of nutrition-induced chronic diseases (Voster, *et al*., 1997). Although the African community still consumes a more prudent diet than the other groups, those who have lived in the city for most of their lives no longer follow a prudent diet, and are at risk of developing nutrition-related chronic diseases (Bourne & Steyn, 2000, Bourne, *et al*., in press).

The newly urbanised African people are going to be exposed to the promotion of unhealthy Western food, while influencing them to desire such food and downplaying the healthy, traditional diet. While the more affluent groups of African people will certainly follow the diet promoted by the food industry advertisements, the poor will also seek out cheap food products that frequently contain high levels of fat and salt. Such food products are freely available from street vendors or the small spaza shops in the African townships.

The Directorate of Nutrition Intervention of the National Department of Health acknowledges the importance of nutrition in the development of chronic diseases in their Integrated Nutritional Policy (Department of Health, 1994). However, no specific guidelines have been developed for optimal nutrition and the prevention of chronic diseases. Guidelines have focused on the prevention and treatment of under-nutrition in children. At the recent Health Summit organised by the South African National Department of Health in November 2001 the topic of "Malnutrition" was on the agenda, but the discussions focussed exclusively on under-nutrition. The Nutrition Society of South Africa has formulated food based dietary guidelines for South Africa which emphasise an integrated approach for South Africa. These dietary guidelines need to be adopted nationally.

Another known risk factor for hypertension is excessive alcohol use. In Table 4.12 the relationship of those who are classified as possible excessive alcohol users according to the internationally standardised CAGE questionnaire, is shown (Erwing, 1984). For men and women the poorest group had the highest rate of excessive alcohol use, as did those with little or no education. People from 25 years to retirement age had significantly higher excessive alcohol use than the youngest group. White men and Indian women showed the least excessive alcohol use, while coloured women were 2.5 times more likely to have excessive drinking, compared to African women. Urban women had higher rates than rural women, while men showed a similar tendency. Again the observed pattern of excessive alcohol use is a matter of concern, not only for its association with hypertension, but also for the many other associated pathologies. In South Africa there is very little control of the promotion of alcohol

sales. All the issues previously related to the promotion of tobacco products that legislation has barred are continuing unabated for alcohol products. In South Africa, not only hypertension, but also violence, trauma and motor vehicle accidents will continue, and cause endless suffering and death, unless the promotion of alcohol products is approached in the same way as tobacco products.

6 TREATMENT STATUS OF HYPERTENSION

Traditionally, the treatment status of hypertension involves the reporting of the proportion of patients with hypertension, who are aware of their condition, who are taking anti-hypertensive medication, and those, whose blood pressure is under control. A conservative cut-off point identifying controlled hypertension (BP < 160/95 mmHg and on anti-hypertensive medication) was chosen for this report. At the time of the survey this was the suggested BP level of the South African Hypertension Society used to define hypertension (in the absence of other risk factors or end organ damage) (Opie & Steyn, 1995).

Tables 4.14 and 4.15 show the regression analyses and Figs. 4.14 and 4.15 specifically show the distribution of the level of awareness, using appropriate anti-hypertension medication and BP control across the quintiles of the asset index. Although the older persons with hypertension had by far the highest level of awareness, treatment and control of hypertension, both awareness, treatment and BP control tended to increase in the richer groups compared to the poor groups. Women were also more aware, used more medication and had better hypertension control than men. After correcting for the other socio-demographic characteristics, no differences were found in awareness of BP or hypertension among the different population groups, but the use of medication and BP control was significantly more frequent in the Asian community compared to all other groups. Rural participants with hypertension had lower levels of awareness, suggesting that fewer are diagnosed, but the level of medication use and attained hypertension control was no different from that of their urban counter parts. Participants belonging to a medical aid or fund had significantly higher rates of BP medication use and better-controlled hypertension, although their awareness of hypertension was not significantly different of those patients with hypertension. This suggests that patients attending private health care services received hypertension management that was more effective than those received at public sector services, despite the fact that hypertension was identified at an equal rate in the public and private health care sector.

These data emphasise that the poorest level of hypertension awareness, treatment and control are found among younger persons with hypertension, and particularly in younger men. It could be suggested that young women with hypertension should be identified when they

attend health care services, particularly those who attend private and public health care facilities during pregnancy. The real challenge is to improve the diagnosis and treatment of young men with hypertension, since this group rarely attends health services. Efforts to identify them need to focus on the workplace. However, a large proportion of young men, particularly young Africans, are unemployed and poor, representing a substantial challenge for the health services to find ways to diagnose hypertension and to maintain appropriate medical care for hypertension.

7 LIMITATIONS OF THE ADULT SECTION OF THE SOUTH AFRICAN DEMOGRAPHIC AND HEALTH SURVEY

The SADHS has provided, for the first time, morbidity, risk factor and lifestyle data on a truly national random sample of South Africans. In terms of the contribution of these data to the overall information on chronic diseases in adults the largest drawback has been that detailed nutritional data and biochemical data from the analysis of a blood sample could not be collected. The logistic complexity, participant burden and cost did not allow for such data to be collected. The drawback of this is that the nutritional transition currently occurring in the African South Africans will not be documented. Also, it will not be possible to calculate the burden of total cardiovascular disease (CVD) risk suffered by South Africans. In order to use the formulae, mostly based on data from the Framingham study, to calculate the total CVD risk it is necessary to, additionally to the SADHS data, measure serum cholesterol levels and to diagnose diabetic participants at least by doing a fasting blood glucose level.

8 RESEARCH

This analysis of the mortality data and the SADHS data has identified a number of areas that require further research. In the first instance, there is a need to improve the epidemiological data and related information on determinants of health and to expand this database to enable improved monitoring of the relationship between poverty and health. As it is difficult to predict the impact of HIV/AIDS on the burden of chronic diseases, it is important to collect comprehensive data. The following areas need attention:

- The registration of deaths amongst the poor and in rural areas needs particular attention in order to reduce underreporting of deaths and to improve the quality of the cause of death information. South Africa has made enormous strides in improving vital registration and universal coverage is within reach. The completeness of the socio-economic fields on the new death certificate needs attention so that future analyses can be individual based rather than ecological.

- The questions on the South African death certificates on tobacco use should be analysed in a timely fashion in order to follow the tobacco related mortality in the country. Such data will by extremely useful to assess the impact of the current tobacco control initiative and will also help identify groups needing specific interventions regarding tobacco use.

- There is a dearth of data in South Africa on morbidity patterns in all sectors of society. In situations where such data exists (eg records of medical aid societies of selected hospitals) they are seldom collated and presented in a format that could help inform the overall morbidity patterns. Research collaborations with private medical aid companies and the health services could start addressing this deficiency.

- For practical reasons, the SADHS included information on selected chronic diseases, risk factors and lifestyle factors and did not include data on other important aspects such as the presence of diabetes, hyperlipidaemia, dietary patterns and exercise patterns. The possibility of including these factors in the next SADHS must be investigated. Where this is not logistically possible, smaller surveys, conducted in typical South African settings, are needed in order to do total risk assessments for typical South African sub-populations. This will, at least allow the estimation of the total burden of chronic disease risk and the prediction of future mortality.

In the second instance, these analyses have highlighted the need for research to develop and evaluate interventions that will improve the health of the poor by early diagnosis and cost-effective management of current morbidity in order to reduce premature mortality. In addition, interventions need to be developed that will target the population to prevent and reduce unhealthy lifestyles. The multi-cultural dimension of South African society represents a particular challenge to develop culturally appropriate interventions. Further analysis of the SAHDS dataset to explore causal pathways and provide a deeper understanding of the different correlates of poverty would be useful to inform the development of interventions.

9 CONCLUSION

The data presented in this technical report provide examples of the usefulness of large national data sets like the South African mortality register and SADHS in assessing the impact of poverty on chronic diseases, their risk factors and associated lifestyles. Repeat

SADHS surveys at regular intervals will allow the South African health care providers to assess if any progress has been made to relieve poverty and if such progress has influenced chronic disease patterns in the country. In a recent series of editorials in the *Scandinavian Journal of Public Health* the value of an effective surveillance system for particularly poor countries has been discussed (Beaglehole & Bonita, 2001; Byass, 2001; Steyn & Bradshaw, 2001).

An Action-led approach (Sandiford, *et al*., 1992) has been proposed for surveillance systems as a way to ensure that useful information is collected. Through the clarification of the goals and objectives of the programmes and the identification of appropriate indicators, progress towards these goals can be monitored, and processes redirected if necessary to improve programmes. Van Herten and Gunning-Schepers (2000a, 2000b) argue that health targets can be used to give strategic direction in the health sector and that monitoring is an integral part of the process.

Steyn and Bradshaw (2001) suggested that a comprehensive surveillance system for developing countries must include indicators that monitor the prevention, the health service aspects of chronic disease care and the impact on the morbidity and mortality patterns in the country. In addition, the health service component of the surveillance system should contain indicators to facilitate management, including the required inputs, the processes that need to be followed, the outputs and the outcomes achieved (Heywood, *et al*., 1994) as well as the overall impact on the nation's health (Fig. 5.1).

Figure 5.1

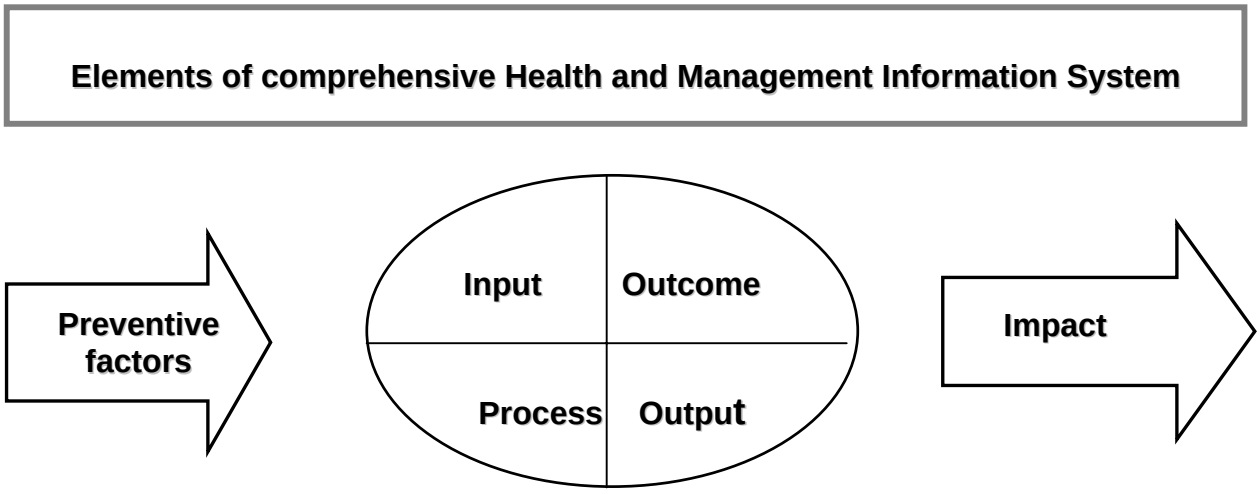


Table 5.1 shows how possible hypertension-related indicators can be generated using this model and obtaining data either from a vital registration system, a population-based survey, or surveys at primary health care facilities. These indicators address prevention, health service-related measures and the impact in terms of mortality. In the case of hypertension, obesity is considered as a preventable risk factor and mortality in the older age range of 50 – 65 years is identified as an impact indicator, since mortality in this age range should not be excessively influenced by the AIDS epidemic. The indicator, 15q50, is the probability that a 50-year-old person dies within the next 15 years before the age of 65 and is a useful summary of premature mortality that will impact on the workforce of the country. It will be important in forthcoming SADHS surveys to compare these indicators between different groups in society in order to ensure that the inequity shown in this report is eliminates in South Africa's health care services.

Table 5.1. Indicators for managing hypertension using expanded information model

Phase	**Indicator**
Prevention factors	% adults who are obese
Inputs	% of clinics with displayed hypertension therapeutic guidelines % examination facilities with normal and large cuffs for measuring blood pressure
Process	% hypertensive patients with sufficient medication dispensed % hypertensive patient files with recorded urine test for proteinuria % adults > 35 years with recorded blood pressure taken in last 12 months
Outputs	% registered hypertensive patients who received medication in previous month
Outcomes	% hypertensives with controlled blood pressure
Impact	15q50*
***** 15q50 is the probability of a 50-year-old person dying before the age of 65 years	

To ensure continuity, the selection of indicators and their collection processes needs careful consideration so that they are feasible and cost-effective for developing countries. It might be useful for other developing countries to assess which socio-economic variables are relevant in their setting for possible inclusion in an asset index appropriate for that country. As far as possible, these indicators should be extracted from routinely collected databases. For all of the indicators suggested above and many of those that have been presented in this technical report routinely collected data have been available along with data from the SADHS. Regular use of these indicators by the relevant levels of the health services will allow the evaluation of the impact of these health services on the poor. Monitoring over time will point out if poverty alleviation has been successful in improving the prevention, the care of chronic diseases and the impact on morbidity and mortality patterns of the poor in South Africa.

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