

https://dspace.org/

Life and death without trace: examining population dynamics and trends in mortality in rural South Africa

Tollman, Stephen Meir

2014-03-27
http://hdl.handle.net10539/14361

Downloaded from a DSpace repository. https://dspace.org/

LIFE AND DEATH WITHOUT TRACE:

EXAMINING POPULATION DYNAMICS AND TRENDS IN MORTALITY IN RURAL SOUTH AFRICA

Stephen Meir Tollman

A research report submitted to the
Faculty of Health Sciences, University of the Witwatersrand,
in partial fulfillment of the requirements for the degree
of
Master of Medicine in the branch of Community Health

Johannesburg, 1998

DECLARATION

I, Stephen Meir Tollman, declare that this research report is my own work. It is being submitted for the degree of Master of Medicine in the branch of Community Health in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.



11th day of December, 1998.

ABSTRACT

Population-based demographic and health information is essential to informed public health planning and the setting of research priorities. In the absence of functioning vital registration, a longitudinal community study was initiated in 1992 in the Agincourt subdistrict of Bushbuckridge, part of South Africa's Northern Province. The study aimed to provide valid baseline data on the health and demographic characteristics of a defined rural population, and to facilitate comparison of key population variables between the Agincourt area and sub-Saharan African countries. Following the baseline census, an in-depth study of mortality trends and patterns was undertaken. This included retrospective analysis of mortality based on history of maternal survival, and prospective study over the period 1992-1995, with verbal autopsies being conducted on almost all of the deaths in the subdistrict (n=1001). Although the Agincourt area displays many of the demographic features of low-income African settings, there is evidence that the area has progressed considerably further along the demographic transition. This notwithstanding, overall mortality in the area appears to be worsening. A reversal in the previously declining mortality among women of reproductive age was documented, with AIDS and related diseases most probably responsible. Findings from both the demographic and mortality studies highlight vulnerable sub-groups, in particular rural women, male migrants and adolescents. The findings also carry implications for South Africa's decentralising health system.

ACKNOWLEDGEMENTS

Research of the kind described here, undertaken in a distant and infrastructurally weak environment, cannot succeed without the effort and contributions of many individuals. It has been my privilege, as principal researcher, to direct the Agincourt Health and Population Research Programme since its inception in 1992.

In preparing this research report I acknowledge with pleasure the contributions of certain people:

Kathleen Kahn, of the Department of Community Health and Health Systems Development Unit of the Faculty of Health Sciences, University of the Witwatersrand, who led the verbal autopsy team, coordinated the diagnostic appraisal of verbal autopsies, and has been a source of strength and inspiration throughout;

My supervisor, John Gear, of the Department of Community Health and Wits Rural Facility, University of the Witwatersrand, who contributed incisive analytic insights, has supported the work throughout, and was always available to review the material on which this research report is based;

Michel Garenne, of the French Centre for Population and Development (CEPED), who introduced me to demographic methods, strengthened my understanding of the theoretical strengths of prospective community-based studies, and assisted me in the application of demographic and statistical analytic techniques to mortality and fertility data;

Kobus Herbst, of the Department of Community Health at MEDUNSA, who designed the original data entry programme in 1992, contributed to the layout of the database, introduced me to computerised data analysis, and has remained steadfastly available for extensions of the database system and assorted troubleshooting.

Recognition is due to members of the Agincourt community for their enduring but not uncritical support, and the Bushbuckridge and Northern Province Health Service for taking on a partnership role. The critical contributions of Obed Mokoena, Susan Khosa and the core field team, and the efforts of Mark Collinson, Muriel Corey, Chris Dolan, Mary Edginton, Andrew McKenzie, Judy McKenzie, Julia Moorman, Marc Pienaar, William Pick and Tom Bothwell are acknowledged with appreciation.

My thanks to Mary Edginton, Kathleen Kahn and William Pick for their comments on the draft of this report; thanks too to Ian Timaeus, of the Centre for Population Studies, London School of Hygiene and Tropical Medicine, for his contribution to estimating the trend in female mortality.

I should also like to express my appreciation to several funders who have taken a keen interest in this work: the European Union and Kagiso Trust, the Henry J Kaiser Family Foundation, and the Trust for Health Systems Planning and Development (South Africa).

Stephen Tollman was supported by the British Council and a Wellcome Trust Travelling Research Fellowship (049336/Z/96/Z) during the analysis and write-up of parts of this work.

TABLE OF CONTENTS

	Page
DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	x
1.0 INTRODUCTION	
1.1 Problem statement	1
1.2 Fieldsites for health and population research: a background note	1
1.3 Mortality in South Africa	3
1.4 The verbal autopsy	4
1.5 Purpose, aims and objectives of the study	5
1.5.1 Overall purpose	5
1.5.2 Aim	5
1.5.3 Objectives	6
1.6 Note on structure of the research report	7
2.0 METHODS: DEMOGRAPHIC AND HEALTH SURVEILLANCE	
2.1 The Agincourt field site	8
2.1.1 Selecting the Agincourt study site	8
2.1.2 Physical and social features	9
2.2 Study methods	11
2.2.1 Study design	11
2.2.2 Conducting the baseline (first round) and subsequent censuses	11
2.2.3 Data entry and information processing	14
2.3 Age reporting	16
2.4 Ethical considerations	16
2.4.1 Community consent	16
2.4.2 Informed consent	17
2.4.3 Data security	17

3.0 RESULTS OF THE BASELINE CENSUS, AND DISCUSSION OF IMPLICATIONS

3.1 The first round census – results 19
3.1.1 Population size and density 19
3.1.2 Age and sex profile 20
3.1.3 Adult female mortality 21
3.1.4 Fertility 21
3.1.5 Household composition 23
3.1.6 Migrant labour 25
3.1.7 Educational attainment 25
3.2 Discussion 29

4.0 ESTABLISHING TRENDS IN MORTALITY : APPROACH AND METHODS

4.1 Recording of death events 32
4.2 The verbal autopsy (VA) approach 33
4.2.1 The VA instrument 34
4.2.2 Making a diagnosis based on the VA 34
4.2.3 Piloting the VA 35
4.2.4 Validating the VA instrument and approach 36
4.3 Analysis of female mortality 36
4.4 A potential source of bias 38

5.0 EXAMINING TRENDS IN MORTALITY: RESULTS AND DISCUSSION

5.1 Cause of death profile: some key features 39
5.2 Trends in mortality 40
5.2.1 Age and sex patterns of mortality, 1992 – 1995 42
5.3 Cause of death 43
5.3.1 Death by injury 46
5.3.2 Undetermined causes 47
5.4 Discussion 47
5.4.1 Emerging picture 47
5.4.2 Data reliability and validity 49
5.4.3 Vulnerable subgroups 50
5.4.4 Health sector reform 51

APPENDICES

A.1 Map showing the Bushbuckridge area and Agincourt fieldsite 54
A.2 Census form 55
A.3 Note on quality of age reporting 56
A.4 List of operational definitions 57
A.5 Death form 59
A.6 Verbal autopsy interview schedule 60

REFERENCES 61

LIST OF FIGURES

Figure	Page
3.1 Population pyramid, Agincourt field site, 1992	20
3.2 Average number of years of education completed, by refugee status and age	28
5.1 Number of deaths by month, Agincourt, June 1992 - July 1995	40
5.2 Estimates of female mortality at age 20-44, Agincourt	41
5.3 Number of deaths caused by AIDS, pulmonary tuberculosis and chronic diarrhoea, Agincourt, July 1992 - April 1995	44
A.3 Frequency distribution of total population by age, as recorded by fieldteam	56

LIST OF TABLES

Table	Page
3.1 Selected fertility indicators, Agincourt 1992	22
3.2 Household composition contrasting total and permanent population	24
3.3 Highest education level achieved, by age group, Agincourt 1992	26
5.1 Changes in adult mortality, by age and sex, Agincourt 1992 – 1995	43
5.2 Number of deaths from AIDS, pulmonary tuberculosis and chronic diarrhoea, by age, sex and time period	46

1.0 INTRODUCTION

1.1 Problem statement

South African rural areas, as with most of sub-Saharan Africa, lack any form of functioning vital registration system. As a result, there is little empirical information available from which to derive measures of mortality and develop a deeper understanding of rural population dynamics. Use of health facility data, from hospitals and clinics, suffers from the serious bias that these facilities are selectively used by only a part of the population -- often those with greater means, better education or easier geographic access. Yet reasonably accurate measures of a population's health and social status are essential to guide policymaking and practice in the health, education and related sectors. Such understanding is also a prerequisite for advanced community-based research.

1.2 Fieldsites for health and population research: a background note

Over the past several decades, fieldsites based on demographic and health surveillance have emerged as an effective approach to partially filling this gap (1). These sites involve complete registration of a geographically defined population, with ongoing monitoring of demographic and health events, in particular births, deaths and in- and out-migrations.

Among the earliest fieldsites were those initiated by CC Chen to support teaching, research and practice at the Beijing Union Medical College in the 1920s and 1930s (2).

During the 1940s, work in the Pholela Health Centre, South Africa, laid the basis for "community-oriented primary health care" (COPC), a form of population health practice that links small-scale census and epidemiological studies, in a defined catchment area, with clinical primary care (3). Examples of COPC practice in research and operational settings are now widespread in Israel (4) the USA (5), and Spain (6), as well as various countries of Latin America (7).

Between the the 1950s and 1970s, such action-oriented initiatives were complemented by several research-focused endeavours. Among the best known are the Khanna Study, which examined fertility and family planning options in the Punjab (8); the cholera vaccine trials conducted in the Matlab field site of the International Centre for Diarrhoeal Disease Research, Bangladesh (9); and investigations into nutrition - infection interactions (the "three village studies") carried out in Guatemala under the auspices of the International Nutrition Institute for Central America and Panama (INCAP) (10). A number of sites have emerged in sub-Saharan Africa over the past decade (11). These include the Navrongo site in Northern Ghana, where the impact of Vitamin A supplementation has been examined (12), the Nouna site in Burkina Faso focused on the impact of a package of services and health reforms (13), and the Adult Morbidity and Mortality Project, in Tanzania, where the burden of disease has been assessed in both rural and urban settings (14).

The work referred to all took place in settings where vital registration was effectively absent. With a focus on health, nutrition and/or family planning, and a concern to evaluate the impact of interventions, singly or in combination, all attempted to define a suitable

study site and population, and introduced demographic and health surveillance as the basis for evaluating health impact.

1.3 Mortality in South Africa

Mortality data in South Africa have serious limitations. While routinely collected vital statistics are of variable quality, reflecting marked under-reporting of deaths and misclassification of their causes (15,16), unreliable census data undermine the population base necessary for calculation of rates[1] (17). Information is weakest for blacks[2], particularly in rural areas, and most especially in the former "homelands". Most of the published work on national black mortality is based solely on data from 34 'selected' magisterial districts - all urban (16, 17,18). The validity of this information is further compromised by the absence of reliable denominator data. No mid-year estimates of the populations of these areas have been available, other than for the census year once a decade (19,20).

Work by Bradshaw, Laubscher and Schneider (21) demonstrates the limits of current mortality data. Based on 1990 information from the Central Statistical Services, they found that the death category *Signs, Symptoms and Ill-defined* accounts for some 23% of all deaths in South Africa. However, in the country's predominantly rural north-east, the figures rise to 57% in Northern Province and 38% in Mpumalanga. Such limitations figure

[1] This situation should improve as results from the recent census (1997) become available.
[2] Use of the terms "black, white, Indian, coloured" follows policy and practices entrenched during South Africa's apartheid era. They are used here only in reference to data so categorised from that period.

even more starkly when it is appreciated that the Department of Health's district-based policy will increasingly re', on locally specific information (rather than provincially or nationally aggregated data) to support the district health system.

1.4 The verbal autopsy

Limitations in the origin, quality and representativeness of mortality data are shared by many developing countries. In an effort to address this, the verbal autopsy (VA) has been developed. Still a prototype technique, this involves obtaining information on the terminal illness from a family member, after the death, and then "clinically" assessing it to determine the cause (22, 23, 24, 25). Historically, verbal autopsies were used as early as the 1950s and 1960s, in Khanna (8), Narangwal (26), and the Gambia (27). Later, structured questionnaires were developed in Bangladesh (28), Senegal (22), and for maternal deaths (29). In general, these early applications of the verbal autopsy were for all ages. Recent efforts, however, have focused on childhood deaths (23, 25, 30, 31, 32,33), although some work in adult mortality has been done. (24)

Despite nearly 5 decades of experience with verbal autopsies, only a few validation studies have been conducted (34, 35, 36, 37, 38). In general, these demonstrate that the diseases most reliably diagnosed on VA have distinguishing signs and symptoms readily recognised by lay informants, for example measles, neonatal tetanus, malnutrition and accidents. Non-communicable diseases, more prevalent amongst adults, share signs and symptoms and are consequently more difficult to diagnose with the VA.

1.5 Purpose, aims and objectives of the study

1.5.1 Overall purpose

The study's overall purpose was (1) to derive valid population-based data for a part of rural South Africa that could then be contrasted with available information from elsewhere; and (2) to analyse and interpret recent trends in mortality. This in a typical, infrastructurally weak area that lacks any functioning system of vital registration.

Such understanding is essential to inform emerging health and social policy, and practice, at a time of political and administrative reorganisation (decentralisation). It is also necessary to establishing community-based research priorities. Work was sited in the Agincourt area of Bushbuckridge, a region of Northern Province bordering on the Kruger National Park and Mozambique (see map, Appendix A.1).

1.5.2 Aim

To derive, analyse and interpret baseline information on the demography of the Agincourt subdistrict population, Bushbuckridge, for the period 1992, and trend information on the health (mortality) status for the period 1992-1995; and to contrast this with similar information from neighbouring areas of Southern Africa, and further afield.

1.5.3 Objectives

(1) To provide baseline information, including reliable denominator data, on the characteristics and dynamics of the Agincourt subdistrict population in 1992 with respect to such variables as population size, age and sex breakdown, basic fertility indicators, household composition, migrancy and educational attainment.

(2) To derive and interpret retrospective and prospective trends in mortality by age and sex (in particular women), based on data gathered over the period 1992-1995.

(3) To develop expertise in application of the verbal autopsy technique as a critical tool in the effort to derive population-based measures of mortality in rural South Africa.

(4) Based on the use of verbal autopsies, to examine and interpret the pattern of cause of death in Agincourt over the period 1992-1995.

(5) To place the the information obtained in a sub-Saharan African perspective, and to contribute preliminary insights into its implications for health and development interventions, and further community-based research.

1.6 Note on structure of the research report

The report is based on data from two interrelated but distinct studies. Thus, rather than a single methods section, the methods, results and discussion relating to demographic and health surveillance are presented first (chapters two and three), this being followed by the methods, results and discussion relevant to the analysis of mortality (chapters four and five).

2.0 METHODS: DEMOGRAPHIC AND HEALTH SURVEILLANCE

2.1 The Agincourt field site

The Agincourt site is located within the Bushbuckridge area of the central lowveld, some 500 kilometres NE of Johannesburg (see map, Appendix A.1). The site has a population of over 60 000 people living in 20 villages, and is superimposed on a functioning sub-district health system. A network of four fixed clinics, a mobile clinic service and a reference health centre, with referral links to two district hospitals (Tintswalo and Mapulaneng), make up the sub-district health system. Bushbuckridge itself is today a local government area with ties to both the Northern and Mpumalanga Provinces [3], and adjacent to the western boundary of the Kruger National Park. Containing in excess of half a million people, largely Tsonga- and Sotho-speaking, as well as tens of thousands of (former) Mozambican refugees, the Bushbuckridge area is overcrowded and poor, prone to drought, with a population profile skewed by migrant labour.

2.1.1 Selecting the Agincourt study site

Several factors influenced choice of the Agincourt sub-district as a field research site, in particular its **location**, some distance from any tar road or township settlement; the

[3] In reality the area contends with considerable political uncertainty: although formally part of the Northern Province there is widespread popular support for the area to be administered through the Mpumalanga Province. The issue, a source of tension between the two provinces, continues unresolved at the time of writing.

presence of a **health centre** with satellite clinics, and unrealised potential to function within a referral network; the need to develop **rational referral patterns**, de-linked from constraints imposed by homeland boundaries; and the presence of large numbers of **Mozambicans** displaced by the recent civil war in Mozambique. The final decision was jointly reached by the Tintswalo District Health Service and the University of the Witwatersrand's Health Systems Development Unit.

2.1.2 Physical and social features

The social and physical features of Agincourt closely approximate those of Bushbuckridge:

Location. The area is bounded by the Drakensberg escarpment and commercial forestry plantations to the west, the Kruger National Park to the east, Hazyview and Mpumalanga to the south, and the Hoedspruit farming area to the north.

Geography. The area is dry with a mean annual rainfall of 1200mm in the west falling to 500mm in the east. On balance there is serious water shortage at least one year in three (39). Agincourt, with an area of 390 sq kms, and measuring 38 km by 16 km at its widest points, lies in a dry rainfall area of south-eastern Bushbuckridge.

Administration. Public administration is weak, a combination of the area's fragmented "homeland" heritage and currently uncertain political status [4]. This has seriously compromised the development of local administrative systems in the early post-apartheid years.

Economy. The limited data available puts average household income at about R520.00 per month, with as much as 54% spent on food (40). Unemployment is estimated at 40 to 50%. Formal sector activity involves migrant men who work on the mines and in larger towns, as well as on nearby plantations and farms. An important source of local employment is the public sector. Informal sector activities are widespread. Pension remittances form an important though under-quantified source of income. Electricity, telephone and water services, though seriously lacking, are benefiting from recent development initiatives.

Water and sanitation. Water problems consistently feature as the community's highest priority, with only some 13% stating that water is always available (41). Most households invest disproportionate effort in collecting domestic water and little remains for farming. Once on-tap, the Injaka dam should substantially improve water storage capacity in the area. Levels of household sanitation are poor (41) with pit toilets of varying quality the norm.

[4] Contested between the Northern and Mpumalanga Provinces.

2.2 Study methods

2.2.1 Study design

Overall design is a multi-round, prospective (longitudinal) community study covering the whole population of the Agincourt sub-district. Key variables under study relate to births, deaths, and in- and out-migrations. This report presents baseline results from the first round census (1992), and a mortality analysis based on data concerning all recorded deaths from the first three rounds (1992-1995) (methods for analysing mortality are presented in chapter 4).

Implications of study design.

Note that, as a consequence of this study design, the population under study consists of all members of the Agincourt sub-district since the first census round in 1992. No sampling is undertaken; the "study sample" corresponds exactly to the whole population of the sub-district (recognising that this population is not static but expands/contracts over time).

2.2.2 Conducting the baseline (first round census) and subsequent censuses

Fieldwork was initiated during 1992. Progress was satisfactory although transport difficulties, weak communication links, and limited infrastructure made conducting the census a testing experience. Subsequent censuses have occurred at (approximately) 12-month intervals.

Fieldteam.

Ten matric graduates (5 men, 5 women) from villages within Agincourt were recruited from over 50 applicants, and employed full-time for the duration of the study. An initial week-long training programme covered local health and development problems, the role of health statistics, data collection and the importance of quality control, techniques for village mapping, and role-plays in preparation for household interviews. The team was managed by a field supervisor, based at the Agincourt Health Centre, with a dedicated vehicle. She provided logistical and technical support, ongoing monitoring of field operations and quality control.

Village mapping.

The site consists of 20 discrete villages. Existing maps, obtained from the local Department of Agriculture, were incomplete. Thus, prior to data collection, a procedure to accurately hand-draw maps of each village was developed. The field team, working under supervision, then mapped each village, ensuring that every household was numbered, and features such as schools, shops, roads and natural geography were all included.

Fieldteam operations: the first round census.

Data collection spanned the period 11 March to 28 September 1992. Working in couples, fieldworkers visited each household in every village, interviewing the most senior adult present. Up to two revisits were conducted where necessary. All household members were systematically recorded according to the following key variables: age, sex, months lived at

home during 1991, mother alive or dead, highest educational standard achieved, and refugee status (see census form, Appendix A.2). Progress was monitored by the team supervisor.

Second and subsequent censuses, and vital registration.

The census is updated on an approximately annual basis[5] through the systematic visiting of every household. This is facilitated by computer printouts listing the known residents (derived from the previous census round) in every household. In addition, an enquiry is made into all birth, death and migration events that occurred over the preceding year (i.e. since the household was last visited). The death form is described in more detail in 4.1 below.

Quality control.

During the first and all subsequent rounds, the field supervisor re-visited a 2% random sample of households where she completed a duplicate census form. This was compared with the form from the original interview to assess discrepancies. Information so derived, along with on-site reviews by more senior members of the research team, was used to monitor and guide the work of the fieldteam. Considerable effort was also given to maintaining the motivation of the fieldteam, with the speedy resolution of problems, real or perceived, always being a concern.

[5] Four census/surveillance rounds have been completed since the study began, with the last of these in 1997. The fifth round is scheduled for mid-1999.

2.2.3 Data entry and information processing

Data capture and validation: round one.

Capture was carried out in batch format by a private company in Pretoria. On-site data capture, together with a two-stage system of manual checks of the raw data forms, was instituted from round two onwards. Validation rules were designed to restrict entry to a permissable range of values and fields, and to ensure acceptable relationships between fields (eg no-one under 10 can bear a child). As far as possible, where a record with an error was detected, the original record was retrieved and corrected. In addition, discussions with the field team clarified certain apparent errors. For example, several records showed persons described as permanent residents when they had resided in the Agincourt area for less than six months. In many cases the explanation was that the record referred to a child born in the six months preceding the census.

Data capture: round two and subsequently.

Since the second census round, data has been entered on-site onto a Microsoft Access database. The entry programmes are reviewed and further refined after each round. Refinements introduced include expanding the set of validation checks, as well as improving compatibility between the special event forms (birth, death, migration) and the computer entry screens.

Information processing and data analysis.

This was carried out on a 486 PC with 8 megabytes of RAM and a 500 megabyte hard-drive. Under the supervision of Dr Kobus Herbst of the Medical University of South Africa (MEDUNSA), entered data was transferred to a Foxpro 2.0 application for DOS which allowed individual records to be updated and provided a framework to run the validation routines.

Data analysis, by the author and Dr Herbst, was undertaken using a combination of Foxpro's built-in query facility and a Microsoft Excel spreadsheet run under Windows. Dr Michel Garenne assisted in applying the maternal orphanhood method to the pattern of survival of mothers as reported by their children. This is an indirect demographic technique for estimating adult female mortality from census data (see 4.3 below for further discussion of this technique) (44).

Comment on the database.

A "relational" database has been designed which allows all the records of each individual, irrespective of when entered, to be traced from a particular person's unique ID number recorded on an individual "master-file". This feature makes the computation of person-years possible, which can then be used as the denominator in the calculation of rates.

2.3 Age reporting

Accurate reporting of age is subject to many influences and presents a constant challenge. For older people an events calendar can be helpful. This was developed and often used by the field team. An analysis of age reporting is presented in Appendix A.3.

2.4 Ethical considerations

The University of the Witwatersrand's Committee for Research on Human Subjects (Medical) has reviewed and approved the research protocol (No. M 960720).

2.4.1 *Community consent*

The proposal to introduce population registration was politically sensitive and required thorough justification to community members and leadership. Their support, and agreement to proceed, was granted subject to two conditions: that research results be shared on an ongoing basis with local communities; and that the project contribute to identifiable health service improvement in the sub-district. This ongoing dialogue has contributed substantially to the almost negligible non-response rate during repeated censuses, and the process of community preparation, feedback and dialogue has become a key feature of the project.

2.4.2 Informed consent

It remains necessary to fully respect the principles of informed consent, and right of refusal to be interviewed, at the individual and household level. Fieldworkers are trained to carefully explain their purpose to the residents of each household and, where a respondent declines to participate, to accept this graciously.

2.4.3 Data security

Access to project computers and the data set is restricted, and a system of passwords has been introduced to provide greater assurance of confidentiality. However it is the case that, as the Agincourt programme expands, and a growing number of researchers have access to parts of the database, we need to regularly review our operating procedures.

3.0 RESULTS OF THE BASELINE CENSUS, AND DISCUSSION OF IMPLICATIONS

Results presented aim to provide a basic demographic understanding that is targeted towards planning and practice in the health sector, other social sectors and local government. Such information can contribute to a range of purposes including: estimating demand for services, allocating human and material resources, planning logistical support and referral networks, identifying the size and location of vulnerable groups, and evaluating coverage of services or interventions.

Comparisons are frequently made between the **total** population of the area, comprising all who regard the area as home, irrespective of any prolonged absence; and the **permanent** population, referring to those who were resident for six months or more in the year preceding the census (1991) (see Appendix A.4 for a list of operational definitions).

Detailed analysis of prospective data for the period 1992-1995, focused on the key population variables of births, deaths and migrations, is the subject of later work. Information on mortality and fertility presented in this section shows the possibilities, but also the limits, of what can be obtained from cross-sectional analysis.

3.1 The first round census - results

3.1.1 Population size and density

Measuring 389 sq kms, the site is made up of 20 village settlements containing 8 896 households with a total population of 57 609 persons. The permanent population constituted 86,1% of the total (49 626) while Mozambicans, largely refugees, made up over a quarter (26,4%). There were Mozambicans in all villages: in five, they comprised over half the inhabitants and in three villages - essentially refugee settlements - they comprised 80% or more. Average household[6] size among the local (host) community was 6,2 persons (range 1-26), contrasted with 6,5 among refugees (range 1-38). "Mixed" households, with both local and refugee members, could be defined where the average household size was 8,1 persons (range 2-35).

The area's population density of 148 persons per sq km contrasts with 19 per sq km in the adjacent Hoedspruit farming area and 31 for South Africa as a whole (39). This can be contrasted with the population density of France (103 per sq km), Italy (192 per sq km) and the United Kingdom (235 per sq km) (42). The Agincourt figure, reasonably typical of the former homeland areas of Mpumalanga and Northern Province, thus blurs conventional distinctions between rural and semi-urban settlement patterns.

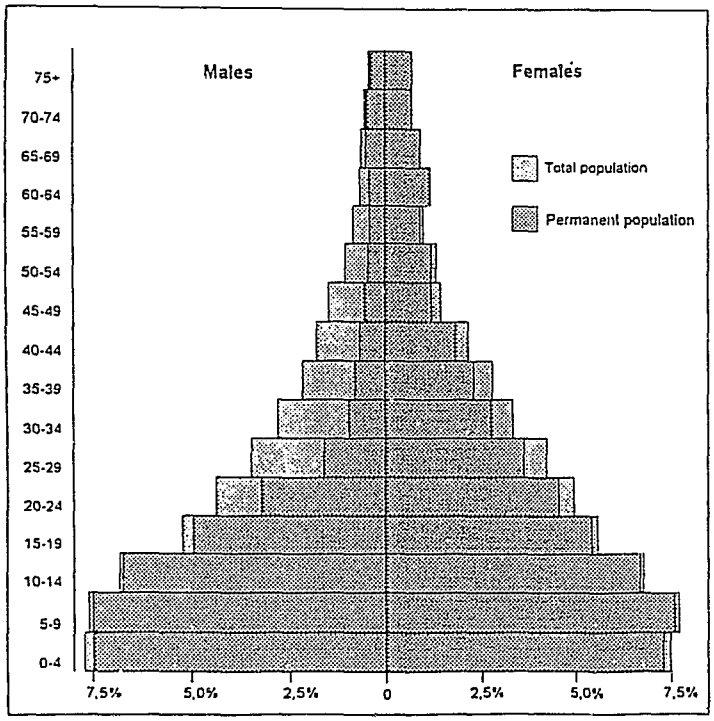
[6] 'Household' was defined as the group of people, living on the same property, who eat from the same "pot of food".

3.1.2 Age and sex profile

The population pyramid (Figure 3.1) corresponded with the general picture of a developing country. Some 44% of the population was under 15 years, characteristic of the world's low income economies and very similar to Lesotho (42%) and Zimbabwe (45%) (42). The proportion of children under-5 was 15% and the proportion 65 years and older, 4%.

Figure 3.1

Population pyramid, Agincourt field site, 1992



While the population pyramid confirmed a high overall rate of growth for the Agincourt population, the similarity in proportions of the 0-4 and 5-9 year age-groups (Figure1) indicated a pronounced fertility decline. The dependency ratio, approximating the ratio of youth and elderly to the (potentially) economically active population, was 93%. This corresponds to the average for sub-Saharan Africa in 1990 and is considerably higher than the average for middle- and low- income countries as a whole (67%) (43).

3.1.3 Adult female mortality

Application of the maternal orphanhood method to the Agincourt data suggests a moderate decline in mortality among adult women between the years 1977 and 1983, with a female life expectancy at birth of 67,6 years and 54,8 years at age 20 in 1983. This compares with 65,0 and 53,5 years in 1977 (45). It is difficult, however, to make definitive estimates without knowing the underlying pattern of mortality.

3.1.4 Fertility

Table 3.1 presents selected fertility indicators for the Agincourt population. Both the crude birth rate and general fertility rate describe the pattern expected in a lower middle-income country. Note, however, that both indices are underestimates as the numerators include only the number of *surviving* children under-1, and not infants who died prior to the census. Full maternity histories, conducted during the second round census, will allow more accurate calculation.

Table 3.1: Selected fertility indicators, Agincourt 1992

Indicator	Value
Child-woman ratio	622 children aged 0-4 yrs / 1000 women aged 15-49 yrs
Approximate crude birth rate using <1 yrs as numerator	31.3 / 1000 of the population
Approximate general fertility rate using <1 yrs as numerator	127.9 / 1000 women aged 15-49 yrs
Women of childbearing age (15-49) as percentage of all women	46.8%
% of women age 15-19 with own children living with them (approximate rate of teenage parenting)	15.5%

The number of children still living with their biological mothers, aged 40-44, averaged four. Recognising that a proportion of children live apart from their biological mothers, this figure provided a plausible estimate for the total fertility rate (TFR). It is considerably lower than the average for sub-Saharan Africa in 1992 (TFR = 6,5), but higher than that for less developed countries as a whole (TFR = 3,6) (43).

Teenage parenting was common: 16% of 17 year olds, a quarter of 18 year olds, and nearly 40% of 19 year olds (37,5%) have had at least one child. There was a clear association between complete lack of formal education and motherhood among teenagers ($p<0.01$, X^2 test)[7]. However the different levels of formal education[8] did not appear, in this setting, to exert a significant influence on the likelihood of pregnancy (45). The approximate rate of teenage parenting, obtained by computing the proportion of women 15-19 with their biological children living with them, is 15,5%, compared with 17,7% for Namibia in 1992 (46).

3.1.5 Household composition[9]

Migrant labour (and hence the need for cash income) is the primary influence on household composition because of the potential loss of at least one parent from the household. The impact of migrant labour on household composition can be gauged by contrasting the extent of single parenting in the permanent population with that in the total population (Table 3.2). The proportion of households where children have only a single parent or guardian rises four-fold from some 9% in the total population to 39% in the permanent ($p<0.001$, X^2 test). Nearly three quarters (73,4%) of these are headed by a

[7] In the age group 12-19 years, X^2 test used to compare the proportion of mothers with NO education (53/274), and the proportion of mothers WITH education, whether at primary, secondary or higher levels (445/3430)

[8] Levels of formal education: none; some primary; completed primary; secondary/higher.

[9] Analysis of household structure and composition can be complex. The perspective presented here is based on household membership derived from a census (a 'demographic' analysis). However contributions to household functioning (including income and child-rearing) may well involve a wider network of people and social relationships. An 'anthropological' analysis would seek to describe these.

single woman. There is a similar increase in single person households from around 50% to 65% of households without children ($p<0.001$, X^2 test).

Table 3.2: Household composition contrasting total and permanent population

Type	Total Population		Permanent Population	
Households without children	n=1252	14.1%	n=1064	12.3%
Single person households	625	49.9%	693	65.1%
Other households without children	627	50.1%	371	34.9%
Households with children	n=7644	85.9%	n=7572	87.7%
Single guardian/parent in household	670	8.8%	2957	39.1%
Other households with children	6974	91.2%	4615	60.9%
Total households	8896	100%	8636	100%

3.1.6 Migrant labour

Every facet of rural community life is affected by migrant labour[10] and its influence is pervasive. Between the ages of 25 and 59, 50% or more of all men were migrant workers, the figure rising to 60% between 30 and 49 years. Some 14% of women 30 to 49 were migrant workers. These women deliver, on average, one child less than their non-migrant counterparts. Although substantially fewer migrant workers have secondary or tertiary education, the overall patterns were not clear-cut (45). Many selection biases are associated with both migration and education, and further investigation is needed for a satisfactory understanding.

3.1.7 Educational attainment

The importance of education and science-based knowledge in enhancing the health and coping strategies of communities cannot be over-estimated (42). Table 3.3 gives a detailed description of educational attainment in the Agincourt community at the time of the baseline census:

[10] A migrant worker was defined as someone who lived and worked away from their home in the study area for more than 6 months in the preceding year. The term included those who returned home over weekends.

Table 3.3: Highest education level achieved, by age group, Agincourt 1992

Age group	6-9 yrs		10-14 yrs		15-24 yrs		25-59 yrs	
Education	n	%	n	%	n	%	n	%
None	1259	25.4	398	5.1	1229	10.6	7337	42.5
Sub A (7 yrs)	1598	32.3	471	6.0	146	1.3	350	2.0
Sub B (8 yrs)	1248	25.2	1055	13.4	329	2.8	780	4.5
Std 1 (9 yrs)	623	12.6	1528	19.4	521	4.5	1051	6.1
Std 2 (10 yrs)	188	3.8	1640	20.9	789	6.8	1129	6.5
Std 3 (11 yrs)	38	0.8	1216	15.5	902	7.8	948	5.5
Std 4 (12 yrs)			804	10.2	1090	9.4	1074	6.2
Std 5 (13 yrs)			472	6.0	1233	10.6	866	5.0
Std 6 (14 yrs)			188	2.4	1196	10.3	672	3.9
Std 7 (15 yrs)			59	0.8	1070	9.2	494	2.9
Std 8 (16 yrs)			12	0.2	959	8.3	525	3.0
Std 9 (17 yrs)			11	0.1	1202	10.4	490	2.8
Std10(18 yrs)			3	0.0	831	7.2	981	5.7
Higher					103	0.9	551	3.2
Total	6 928		7 857		11 600		17 248	

- In the age-group 25-59 years, being adults assumed to have concluded contact with the formal school system: over 40% have received no formal schooling, 6% have completed secondary school (Std 10), with only 3% proceeding to some form of post-secondary level education.
- Among those 15-24 years of age, a group that should have experienced some secondary education: almost all (90%) have attended primary school, with only 46% having successfully made the transition to secondary school.

- In the group 10-14 years: over 85% are enrolled in primary school and some have proceeded to secondary school. Thus a substantial majority of youngsters do enter the formal school system. However enrolment is frequently delayed, with some 25% of children 6-9 years having not yet completed sub-A.

In summary, most children (unlike the situation in the past) now enter primary school although their enrolment age is delayed. As of 1992, less than half had made the transition from primary to secondary school, and only a small minority benefited from any form of post-secondary education. This notwithstanding, levels of education have improved over the past few decades. Using United Nations conventions, "primary net enrolment"[11] in Agincourt is 70% contrasted with 54% in Malawi, 70% in Lesotho, 80% in Zambia and 100% in China (1990 data) (42). The adult literacy rate[12] is 66% among local people, falling to 24% among the refugees.

Up to the age of 18 the educational attainment of girls fully matches that of boys; indeed girls tend to perform slightly better with a greater proportion attaining their expected level of education at any given age. Between the ages of 20 and 34, however, a greater proportion of men have reached the last year of high school (standard 10).

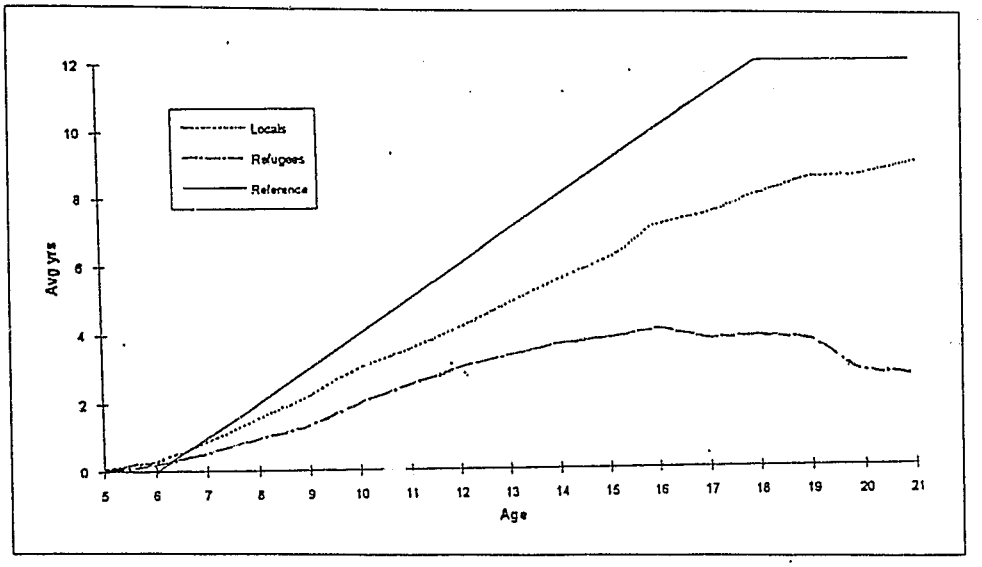
The level of education among Mozambican youth is considerably below that of the local population (Figure 3.2). For example, among 17 year olds, refugees have completed on

[11] Defined as the percentage of primary school-age children who are enrolled in school.
[12] Computed as the percentage of persons 15 years and older with at least four years of formal schooling. Functional literacy may be somewhat lower than these figures suggest.

average some four years of schooling compared with around seven and a half among local youth. In 12 of the 20 study villages, refugee children make up more than half of the children without any formal education.

Figure 3.2

Average number of years of education completed, by refugee status and age



The 'Reference' line describes desired progress in school-age educational achievement; it assumes that a child enrols in school sometime in their seventh year of age, and then successfully completes a year of schooling for each year's increase in chronological age.

3.2 Discussion

Results from the baseline census describe the complexity of one area of present-day rural South Africa. In Agincourt, three distinct communities co-exist: the permanent population of the area, comprising women, children and the elderly, together with adolescents and a minority of men; migrant workers, comprising the majority of economically productive men, and a minority of women; and Mozambicans, formerly refugees. Social interaction between these groups is dynamic, reflected, for example, in intermarriage between the refugee and host population, with the children of such unions now part of the local community.

Migrant labour among men, and its destructive consequences for rural family life, is generally acknowledged. Female migrant work, however, is less well recognised and poses important questions: is it increasing?; how does it differ from the male pattern?; what are its consequences for child health and child care?; to what extent does it impact on women's health?

If the Mozambicans are accepted as permanent members of the Agincourt community, able to contribute to local and even regional development, a targeted effort to address their particular health and educational needs becomes an issue for the district health service and local government. More broadly, the unusual situation in Agincourt provides an opportunity to contrast the evolving health status among self-settled refugees with that of their host population. This can inform an important policy debate: whether international

relief efforts should continue to emphasise parallel health programmes (with a sharp differentiation between refugee health programmes and those of local communities), or be re-directed towards strengthening local capacity and infrastructure.

How typical are the Agincourt findings? Certainly the emerging demographic and health picture can contribute to understanding health and social conditions across parts of Northern Province, Mpumalanga and North West Province. It will be helpful to contrast the Agincourt findings with those from the University of the North's Dikgale fieldsite near Pietersburg (47). But beyond this, the extent of true correspondence can only be established with further empirical work. From an African perspective, and while more detail is needed, these data point to a mortality and fertility transition that has progressed substantially further than most of rural sub-Saharan Africa. Thus, despite similarities, it is important not to under-estimate key differences in health and social development - particularly as South Africa's support to countries further north expands.

Baseline findings provided the basis for a process of feedback and dialogue with village communities and local health services. Efforts to link these two groups, by discussing the implications of the results for health provision, had mixed success. Information on teenage motherhood provoked heated debate among villagers, and was the only discussion in which women asserted themselves. Overall, the feedback experience reinforced our view that, for effective local action (a key element in health promotion initiatives), health issues must be understood in their local context. Whether the issue is teen parenting, adolescent

sexual activity, or educational achievement and school dropout, the active involvement of affected communities is central to effective action.

It is apparent that reliable, local information is essential for the management of decentralised public sector systems such as the district health system. In Agincourt/Bushbuckridge and elsewhere there has been a complete dearth of such. The argument advanced here - little different from the South African experience with designated "health recorders" in the 1940s (48) - is that adequately trained local personnel can competently collect demographic, health and other data of relevance to health care. There is much to justify local governments acquiring this capacity. The recently completed national census, although critical, serves a different purpose and cannot be a substitute.

4.0 ESTABLISHING TRENDS IN MORTALITY: APPROACH AND METHODS

4.1 Recording of death events

When, in the course of the annual census round (see 2.2 above), a death is reported in a household, this event is recorded on a "death form" by the fieldworker. The objective is to comprehensively record **all deaths** of Agincourt residents for the duration of the prospective study. The death form provides information on the age and sex of the deceased, where and when the death occurred, whether the death was registered and, in the case of a woman, details relevant to determining whether the event constitutes a maternal death (see Appendix A.5). Thereafter, every death is the subject of a "verbal autopsy" (VA).

In Agincourt, consent to the VA interview has never been witheld. "Non-respondents" have been those primary care-givers that could not be located, even after two re-visits to the deceased's household. One interpretation of this exceptionally high response rate is that it reflects care-giver's "appreciation" that people somehow connected with the health service are concerned about the circumstances of death of their loved ones.

4.2 The verbal autopsy (VA) approach

The verbal autopsy enquiry is administered by a trained lay fieldworker who interviews the closest caregiver of the deceased. Following a detailed interview, the VAs are then assessed by three medical officers who, initially blind to each other's findings, use a series of consensus criteria to arrive at a diagnosis[13]. Where a diagnosis cannot be reached, the cause of death is described as "undetermined". Five of the ten fieldworkers, selected on the basis of interpersonal qualities and interviewing ability, have received special training in conducting a "verbal autopsy" (VA). Training covers: the signs and symptoms of common diseases, the concept of underlying and immediate causes of death, administration of the questionnaire, and how to deal with overt grief reactions. Once active in the field, ongoing support of the team is necessary, partly to enhance the general quality of work carried out and also to respond to particular queries that arise.

The Agincourt VA instrument is an adaptation of that developed in the Niakhar fieldsite, in Senegal (22). It was modified to accommodate diseases prevalent in rural/homeland South Africa, and questions on lifestyle factors were added. As noted, the questionnaire is conducted with the person most closely involved with the deceased during their terminal illness, and guidelines have been drawn up to establish this.

[13] Verbal autopsies for this study were assessed by Drs K Kahn, S Tollman, J Gear and J Moorman.

4.2.1 The VA instrument

The questionnaire was translated from English into Tsonga, and then finalised after back-translation by three independent Tsonga speakers (see Appendix A.6). It was essential that only culturally accepted terminology be used.

The questionnaire has several parts, the most important being an open section where the respondent describes all symptoms and signs preceding death in his/her own words. This is followed by a series of filtering questions eg. "did the deceased cough?" When answered positively, detailed questions regarding that particular symptom are asked. If negative, the interview proceeds to the next filtering question. Further sections cover the use of modern and traditional treatments, and lifestyle practices.

4.2.2 Making a diagnosis based on the VA

The Agincourt approach is based on clinician assessment of the completed questionnaire, similar to that described in other studies[14] (22, 34, 36, 49). Two medical practitioners, blind to each other's assessment, reviewed the information, and assigned a diagnosis to each death. Where the same diagnosis was reached, this was accepted as the "probable cause of death". Where not, a third independent medical review was conducted. All three practitioners then reviewed the results of this third appraisal together. If two of the three

[14] Considerable effort is being invested in an alternative approach: appraising the validity of standardised VA instruments and diagnostic algorithms as a way of reaching a diagnosis of probable cause of death (50). The general applicability of this approach is, for the present, unclear.

diagnoses were in full (or near full) agreement, a probable cause of death was assigned. Where at least two out of three diagnoses were compatible, the VA findings were reviewed by all three medical practitioners; if all three could reach consensus on a diagnosis, this was then accepted as the probable cause of death. When agreement could not be achieved, the death was assigned to an "undetermined" category.

Where possible, a main (or underlying) cause, immediate cause, and contributory factors are identified. For example, where diarrhoea is the only problem in evidence, it would be classified as the 'main' cause of death. However, in cases where kwashiorkor and diarrhoea are both determined, and the diarrhoea continues until death, kwashiorkor would be classified as the 'main' cause and diarrhoea as the 'immediate' cause of death. Bottle-feeding might be a contributory factor. The resulting cause of death classification was derived directly from deaths in the area, and conforms to the International Classification of Diseases, 9th revision (ICD-9, 1975) (International Classification of Diseases 1977).

4.2.3 Piloting the VA

Piloting was carried out in the Agincourt site, with reference to recently deceased Agincourt residents who had died in the district referral hospital (Tintswalo Hospital). Modifications were made to the VA schedule and the interviewing skills of the fieldworkers were refined. The project team judged it inappropriate to pilot such interviews in villages not part of the study site as this would generate expectations, there

was little immediate benefit that would accrue to participants, and community consent to conduct VAs had not been sought outside of the study area.

4.2.4 Validating the VA instrument and approach

Given that the VA approach should still be considered a prototype technique, validation of the results obtained in Agincourt was essential. In a separate study, not presented here, verbal autopsy diagnoses were validated by comparing them with hospital reference diagnoses, and calculating the sensitivity and specificity for each cause of death. Review of hospital records from all three district hospitals in Bushbuckridge yielded 127 records of sufficiently high quality (ie detailed case notes, supporting investigations and clear description of diagnosis) to function as a gold standard when compared against the corresponding verbal autopsy. The findings (see 5.4.2 below) demonstrate that the cause of death profile derived from the verbal autopsies can be used with confidence (Kahn K, Tollman SM, Garenne M, Gear JSS. *Validation and application of verbal autopsies in a rural area of South Africa* (unpublished manuscript)).

4.3 Analysis of female mortality

During the baseline census in 1992, the survival status of the mothers of all those in the resident population was established as completely as possible. This allowed retrospective study of survival among adult women using indirect demographic methods (the maternal orphanhood technique); this technique estimates adult survivorship from the proportions

of respondents not orphaned. The method is based on an equation which relates the female probability of surviving from age x (eg 20) to x+n years, to the proportions of respondents (in contiguous age groupings) whose mother was still alive at the time of interview. From the resulting survivorship probabilities, lifetable estimates can be made (44). The approach adopted was that described by Timaeus (51) which improves on the methods of Brass and Hill-Trussell, (44) yielding more accurate estimates. MORTPAK-lite, demographic software developed by the United Nations Population Division, was used for the analysis.

The estimates of maternal survival were converted to estimates of the mortality quotient (probability of dying) for women between the ages of 20 and 44 years using United Nations model life tables (52). From the prospective data (not shown) the General Model Life Table was chosen as closest to the Agincourt situation. In the maternal orphanhood method the probability of dying estimated from the youngest age group of respondents (ie the most recent estimate) is insensitive to the choice of model lifetable. This choice can only affect the slope of the trend in the retrospective estimate. The indirect (retrospective) estimates were then compared with the direct (prospective) life table estimates for the same quotient (25q20)[15] derived from the routine demographic and health surveillance system. These estimates are comparable provided that the quality of the data is adequate.

[15] 25q20 is shorthand for the probability of dying during the 25 year period from age 20 onwards - ie the probability of dying between 20 and 44 years of age.

4.4 A potential source of bias

Anthropologists offer explanations as to why, in certain societies and cultures, deaths in very young children may not be publicly acknowledged (53). Similarly, drawing on insights from our fieldstaff, nursing colleagues and community associates, there is a reluctance to report death in the very young among the Tsonga/Shangaan people. Culture and superstition play a part in this, although there may be other reasons as well.

In Agincourt we are aware of an under-count in the still-birth and early infant death categories, although its extent is unclear. This will introduce an under-estimate to indices such as peri-natal and infant mortality rates. For this reason we have not, as yet, published death rates by age category and have made a special effort, during the most recent (fourth) round of data collection, to improve the yield of reported deaths in the youngest age-groups by checking and updating all maternity histories. Based on plausible death rates in all other age-groups, and drawing on model life tables, it is possible to substantially compensate for this event bias.

5.0 EXAMINING TRENDS IN MORTALITY: RESULTS AND DISCUSSION

Results presented below examine changes in mortality over the period 1992 - 1995 by age, sex and cause of death. Despite the short time period, clear changes can be discerned. They will impact on local health services and have wider implications for South Africa's new system of decentralised (district-based) health care. The data also contribute to closing major gaps in our understanding of mortality in sub-Saharan Africa (54), and South Africa in particular (21).

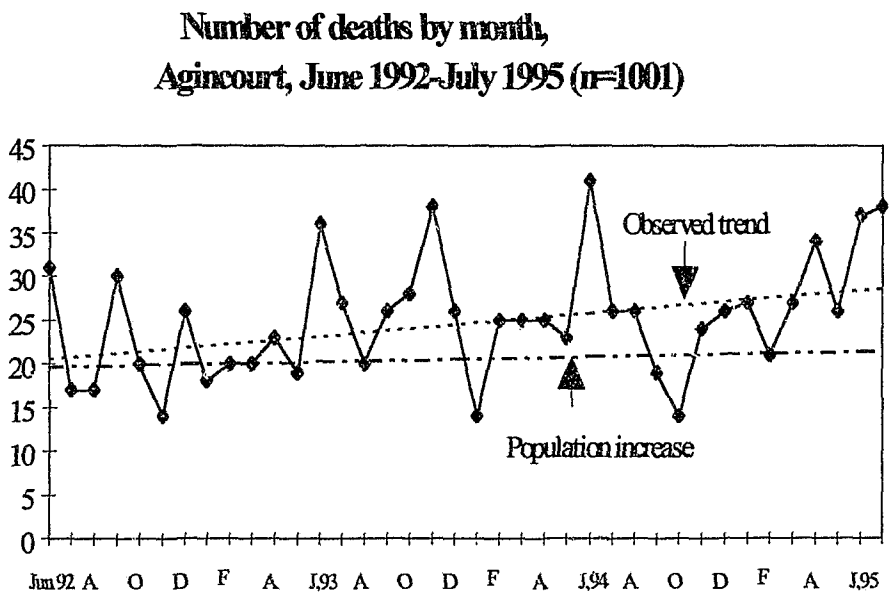
5.1 Cause of death profile: some key features

Three census rounds have resulted in a longitudinal data set covering deaths for the period 1992 - 1995. Verbal autopsies have been conducted on 937 of the 1001 deaths recorded over this time. Detailed analysis of the resulting sample of deaths gives insight into the cause of death pattern. Of note is the continuing high level of deaths from infectious and nutritional causes among children (diarrhoea and kwashiorkor), along of marked levels of household accidents (eg. paraffin poisoning), coupled with strikingly few deaths from the vaccine-preventable diseases and acute respiratory infections. Notable amongst adults is the high level of circulatory disease among the older middle-aged and young elderly (heart failure and cerebrovascular accidents); and an unexpectedly high level of violent death among young men, with deaths from motor vehicle accidents also prominent (Kahn K, Tollman SM, Garenne M, Gear JSS. *"Who dies from what": Determining cause of death in South Africa's rural northeast* (unpublished manuscript)).

5.2 Trends in mortality

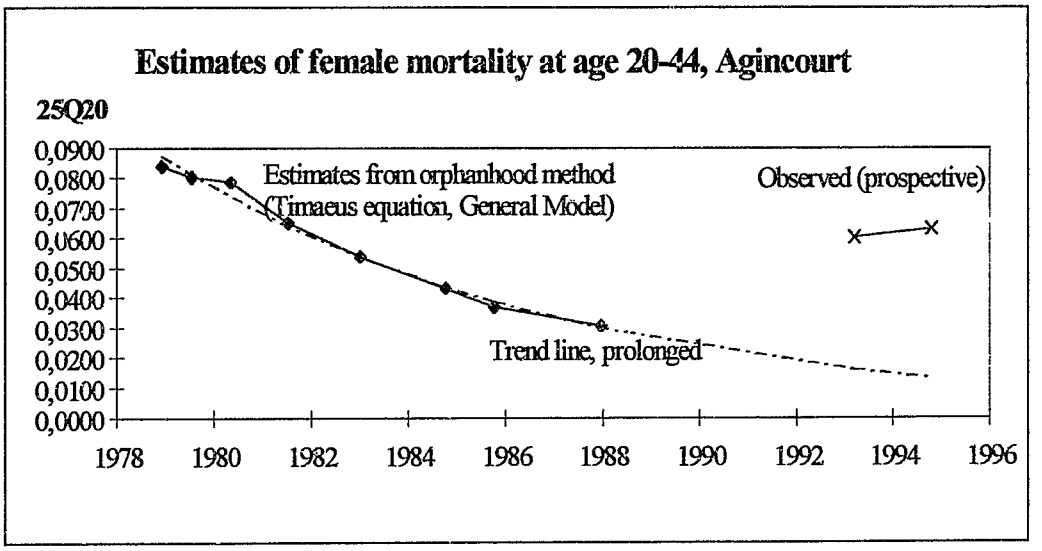
Figure 5.1 shows the number of deaths occurring in Agincourt each month over the period June 1992 to July 1995. The observed trend in mortality differs significantly from the trend that would be expected if deaths were increasing only because of population growth ($p<0,038$). This observation is independent of population migration (since the deaths recorded are a function of population size and composition) and indicates a relative increase in mortality over the three years 1992 to 1995.

Figure 5.1



Evidence of a steady, declining trend in adult female mortality for the 4 to 13 years prior to the study (1979-1988) was found (figure 5.2). In contrast, in the period of the prospective study (1992-1995), adult female mortality between 20 and 44 years was significantly higher (25q20 = 61,6 per 1000; p = 0,014) than the recent indirect estimates (46,5 per 1000 in 1984-1985), indicating a recent rise in the mortality of younger female adults. When the earlier trend is taken into account, the prospective estimates are 4,2 times higher than the 1979-1988 trend prolonged to 1992-1995. Even though the value of the slope based on indirect estimates can be questioned, the results suggest a serious reversal in the previously downward trend in mortality among women of reproductive age.

Figure 5.2



5.2.1 Age and sex patterns of mortality, 1992 - 1995

Based on data from the prospective study, life tables were prepared for the periods between the censuses ie between census 1 and 2 covering 19 months in 1992/3; and between census 2 and 3 covering 21 months in 1994/5.

Results show that most of the increase in mortality is concentrated in the 20-49 year age-group (Table 5.1). There was a slight decline in mortality among children under 15 years (not shown). However, in somewhat less than 2 years, the mortality increase in the age-group 20-49 years was 23% for both sexes combined, and slightly higher for males (+25%) than for females (+19%). There was no evidence supportive of mortality increase in the other age groups.

The increase in death rates between the two prospective periods selected (1992-93 and 1994-95) was not statistically significant. However, considering the significant increasing trend in deaths over the whole period, together with the evidence for a reversal in mortality among women 20-44, the results support a finding of continuous increase in mortality during the prospective period. This conclusion is reinforced when changes in the cause of death pattern are examined.

Table 5.1 : Changes in adult mortality, by age and sex, Agincourt 1992-1995

Age	1992-1993 (Census 1 to census 2) Quotient* (1)	Deaths	1994-1995 (Census 2 to census 3) Quotient (2)	Deaths	Relative risk (2/1)	P value
Both sexes						
20-49	0,09751	92	0,11966	127	1,23	0,135
50-74	0,40255	148	0,42224	177	1,05	(NS)
75-84	0,51572	59	0,53319	69	1,03	(NS)
Males						
20-49	0,12342	55	0,15385	79	1,25	0,070
50-74	0,50225	87	0,50210	97	1,00	(NS)
75-84	0,51201	26	0,60976	38	1,19	(NS)
Females						
20-49	0,07039	37	0,08384	48	1,19	0,424
50-74	0,30415	61	0,34496	80	1,13	(NS)
75-84	0,51834	33	0,47689	31	0,92	(NS)

*Quotient = probability of dying within age group.

5.3 Cause of death

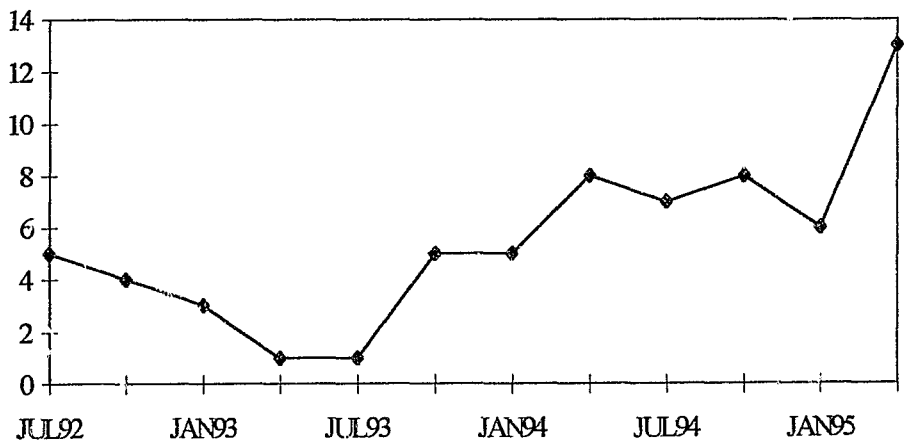
To examine possible changes in the cause of death profile during the period of prospective study (1992-1995), all deaths were classified into four main categories: infectious and parasitic, non-communicable, accidents and injuries, and undetermined causes. The two intercensal periods (1992/3 and 1994/5) were then compared, examining both changes in the relative number of deaths and the risk ratios for each of the main disease categories. This showed no major difference among the disease groupings, with the exception of the infectious and parasitic group. A detailed break-down of this category by disease type showed relative increases in AIDS and tuberculosis deaths in particular. In addition, the

number of deaths from undetermined causes showed a slight but sustained increase, suggesting that some AIDS-related deaths might have presented atypical clinical patterns that were not recognised by the verbal autopsies.

Figure 5.3 shows the pattern of deaths from AIDS, pulmonary tuberculosis and chronic diarrhoea combined (all age groups). In the period July 1992 to July 1993 there was a declining trend with all but one of the deaths due to tuberculosis. The trend reverses thereafter, with deaths due to AIDS and chronic diarrhoea[16] manifesting in the study area from August 1993 onwards.

Figure 5.3

Number of deaths caused by AIDS, pulmonary tuberculosis and chronic diarrhoea, July 1992 - April 1995



[16] Chronic diarrhoea was defined as persistent loose stools lasting for two weeks (14 days) or more.

Deaths from these causes affect primarily younger adults, and children to a lesser extent (Table 5.2). AIDS deaths are concentrated in the middle to younger ages. While in the first period there was only a single AIDS death, an adult woman, there were 20 in the second period, 11 males and 9 females. Thirteen were adults 15-49, and seven were children under the age of 2 years. The youngest child died at 4 months, the oldest at 19 months, with an average of 12 months. Adult AIDS deaths ranged from 22 to 47 years, the average being 35 years. The four cases of chronic diarrhoea were all in the second period and mainly among young children. The increase in tuberculosis between the two periods (+ 10 deaths) affected males and females similarly and was concentrated among younger men and older women.

Table 5.2: Number of deaths from AIDS, pulmonary tuberculosis, and chronic diarrhoea, by age, sex and time period

Age group (years)	Males 1992-1993 (Census 1 to census 2)	Males 1994-1995 (Census 2 to census 3)	Females 1992-1993 (Census 1 to census 2)	Females 1994-1995 (Census 2 to census 3)
AIDS				
0-14	0	1	0	6
15-49	0	10	1	3
50+	0	0	0	0
Tuberculosis				
0-14	0	1	1	0
15-49	1	6	2	2
50+	14	13	1	7
Chronic diarrhoea				
0-14	0	2	0	2
15-49	0	0	0	0
50+	0	0	0	1
Total	15	33	5	21

Note: Numbers in the table are small and so should be interpreted with some caution. Nevertheless, the changes are predominantly in one direction and suggestive of an emerging trend.

5.3.1 Death by Injury

The mortality profile (referred to in 5.1 above) reveals violent death (suicide and homicide, especially in young men) and accidents (motor vehicle and household accidents) to be of major public health importance. The level of mortality from violent deaths, though, shows little change when the periods 1992/3 and 1994/5 are compared. Close

examination of homicide deaths does indicate an increase in the number of female deaths 15 years and over, from 2 to 7. This computes to a relative risk of 3,25 accentuating the issue of physical violence as a threat to women's health and raising the possibility of a rising trend. The circumstances of death range from domestic violence (n=3) to accusations of witchcraft (n=3).

5.3.2 Undetermined causes

Combining deaths for both sexes, the relative risk for the ages 15-49 and 50+ is 1,25 and 1,21 when the 1994/5 period is compared with 1992/3. These figures, in light of the rising mortality from AIDS and related diseases, may include further deaths, difficult to diagnose, that are AIDS-related.

5.4 Discussion

5.4.1 Emerging picture

The results presented cover a relatively short period, 1992 to 1995. Nevertheless, they are of much value as they relate to a period of immense social and political change, and open a window on a situation and context for which information on mortality is largely unavailable (15, 18, 54). The most striking finding is the steep rise in adult female mortality (over 40%) between the late 1980's and the early 1990's. Evidence for this increase is compelling since it cannot be attributed to the demographic model chosen, is

unlikely to be due to defects in the retrospective data (which are consistent over the many age groups considered), and is consistent with other available epidemiological data.

As documented in Zambia and the Ivory Coast (55,56), reversals of what was once assumed to be a generally declining trend in mortality are being recognised. Although AIDS and its sequelae are arguably the prime factors responsible, it is important to examine the evidence for other potential contributors. In Zambia in 1993, persisting levels of poor nutrition, and declining access and availability of western health services (affecting rural areas particularly), have been cited as partial explanations for worsening child mortality[17] (56). Agincourt evidence highlights AIDS-related mortality, particularly among younger to middle-age adults, but also among infants and young children in parts of NE South Africa. The impact of AIDS-associated mortality on mortality rates in rural Zimbabwe, Tanzania and Uganda has been documented in a few district or provincial settings (69-72). In Tanzania, in a fairly low HIV prevalence population (4%), HIV was shown to increase overall adult mortality by over 50% during the two-year period 1991/2 and 1993/4. (70) Similar results were obtained in Masaka district, Uganda, over the single year 1989/90 to 1990/1 (72); while mortality findings from the Rakai district, between 1990 and 1991, complement these results, showing a gradation of population attributable risk percent from 83% in high prevalence trading centres (HIV prevalence 35%), to 59% in intermediate trading villages, to 48% in lower prevalence (11,8%) rural villages. (71)

AIDS and related diseases, in particular tuberculosis, as well as homicide, affecting both men and women, can be identified as key emerging health problems in Agincourt. It is now possible to begin quantifying their extent, examining the risk factors, assessing their implications for policy and practice, and evaluating the impact of interventions. However, attention to these emerging concerns must be balanced against the major burden of illness posed by long-standing problems (diarrhoea, kwashiorkor and household accidents in children) and the weakly recognised contribution of circulatory disease in adults.

[17]Several analysts have attributed rising child mortality to World Bank failure to particularise its structural adjustment programmes in sub-Saharan Africa, so as to protect vulnerable sub-groups and/or retain subsidies on essential foodstuffs (see Cornia et al (57), Werner and Sanders (58), Curtis E (59)).

5.4.2 Data reliability and validity

The demographic finding of increasing mortality is consistent with the epidemiological data available. Progression of the AIDS epidemic in South Africa has been well-documented, primarily in urban settings (60, 61), but with consideration for the mode of spread into rural populations. Recent estimates of HIV seroprevalence amongst antenatal clinic attenders in the public sector show a steady increase nation-wide, with a figure of 17,7% in 1996 for this part of South Africa (62).

Verbal autopsy interviews were assessed in the same fashion throughout the study. Validation of 127 verbal autopsies, involving comparison with hospital reference diagnoses (see 4.2.4 above), showed relatively high sensitivity (82%) and specificity (93%) for infectious and parasitic diseases overall. For pulmonary tuberculosis alone, the sensitivity was 92% and specificity 99%, while for diarrhoea these were 83% and 99% respectively. Numbers of hospital deaths from AIDS were too low to permit such calculations. (Kahn K, Tollman SM, Garenne M, Gear JSS. *Validation of verbal autopsies in a rural area of South Africa* (unpublished manuscript).)

5.4.3 Vulnerable subgroups

5.4.3.1 Women

The evidence points to a likely worsening of mortality among women[18]. Deaths from AIDS, TB and their sequelae are presently at low levels but rising; deaths from homicide in rural women have been little recognised. Rural South African society depends heavily on its women-folk where, as elsewhere, they play the central role in maintaining and (often) supporting the family. The consequences of worsening health among women for childrearing, the health of families and the productive functioning of households, could be severe indeed. The health sector carries a special responsibility to respond to this emerging reality and, in so doing, develop greater awareness of how changes in women's health status will impact on their social roles (63).

5.4.3.2 Male migrants

This phase of emerging AIDS in north-eastern South Africa points to young and middle-aged men, the majority of whom are migrant workers, as at particular risk. It is likely that considerable HIV has already been contracted through heterosexual relations in urban areas from whence it is transmitted to partners based in rural locations. There is a critical need for further research to better understand the sexual behaviours of migrant men, and

[18] Note that data were not available to undertake any retrospective analysis of survival among men.

thereby to strengthen the basis for AIDS (and sexually transmitted disease) prevention efforts in both rural and urban settings.

5.4.3.3 Young children and adolescents

The number of AIDS and related deaths in the youngest age groups signals the importance of perinatal HIV transmission in this community. Further, albeit indirectly, the results starkly underline the importance of focusing attention on adolescents where a growing pool of HIV positivity can be expected.

5.4.4 Health sector reform

It is essential to locate the evolving pattern of mortality within the context of change in South African health care. The country is moving rapidly towards a decentralised health system involving the devolution of resources and authority to the district level (64, 65). If the Agincourt findings are sustained, the brunt of responsibility for coping with the added - and changing - disease burden will fall onto local and district health services, and their associated communities. In anticipation, there are important initiatives that can be taken. These include: drawing on lessons and experience from elsewhere in Africa and beyond; taking deliberate steps to suitably enskill health personnel; strengthening health centre and outreach services and supporting home-based and other forms of non-institutional care (66); and introducing demonstration programmes designed to inform the rural public health sector on a range of feasible and appropriate responses.

5.4.4.1 National health statistics

South Africa lacks a vital registration system able to adequately cover its rural population as well as expanding urban centres. However a number of recent initiatives offer the opportunity to substantially strengthen access to population-based information and, in some cases, disaggregate from national averages to provincial and/or district-specific levels. Achieving this will require a coordinated effort to effectively link three related activities: i) current efforts to strengthen the vital registration system; ii) networking the three existing fieldsites based on demographic and health surveillance[19], coupled with strategic development of additional field and/or facility-based surveillance sites (67, 68); and iii) the just-introduced annual national household survey. The cost implications, when weighed against the substantial investments already committed, may well not be excessive. In the longer run, however, developing a nation-wide, comprehensive vital registration system is vital to supporting the country's emerging local government and decentralising health system.

[19] In addition to Agincourt, other South African fieldsites based on demographic and health surveillance include University of the North's Dikgale fieldsite, near Pietersburg, and the new Hlabisa site in northern KwaZulu-Natal, managed by a consortium of eastern sea-board institutions and the South African Medical Research Council.

APPENDICES

APPENDIX A.1 Map showing the Bushbuckridge area and Agincourt fieldsite

APPENDIX A.2 Census Form

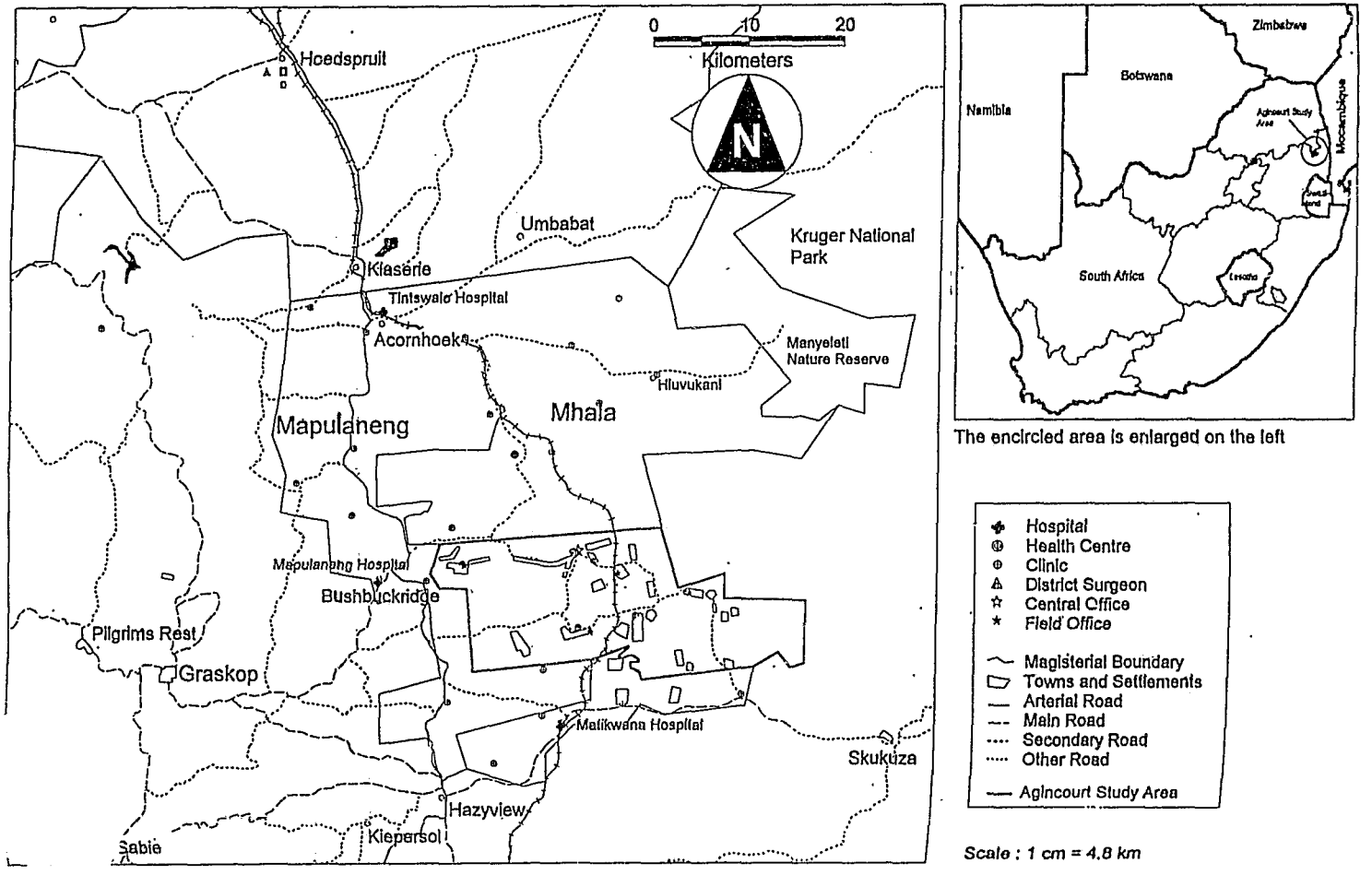
APPENDIX A.3 Quality of age reporting

APPENDIX A.4 Operational Definitions

APPENDIX A.5 Death Form

APPENDIX A.6 Verbal autopsy interview schedule

APPENDIX A.1 **Section of Northern Province/Mpumalanga, showing Bushbuckridge area and Agincourt fieldsite**



APPENDIX A.2 Census Form

Community Practice Project

Census Form

#N / #Name?

Date of Visit:

Name of household head:

Births:

Deaths:

Migrations IN:

Field worker:

Migrations OUT:

Id/Seq#	Surname	Name1	Gender	DoB	Mother Id/Seq#	Mother Status	Res Months	Edu-cation	Refugee Res Status	Last Event

Mother Status V - Same Village; A - Same Area;
H - Same Household; O - Elsewhere; D - Died

Education N - None; A - Sub A; B - Sub B; 1 - Std 1; 2 - Std 2; 3 - Std 3; 4 - Std 4;
5 - Std 5; 6 - Std 6; 7 - Std 7; 8 - Std 8; 9 - Std 9; 0 - Std 10; H - Higher

Res Status P - Permanent; V - Visitor;
M - Migrant; O - Other

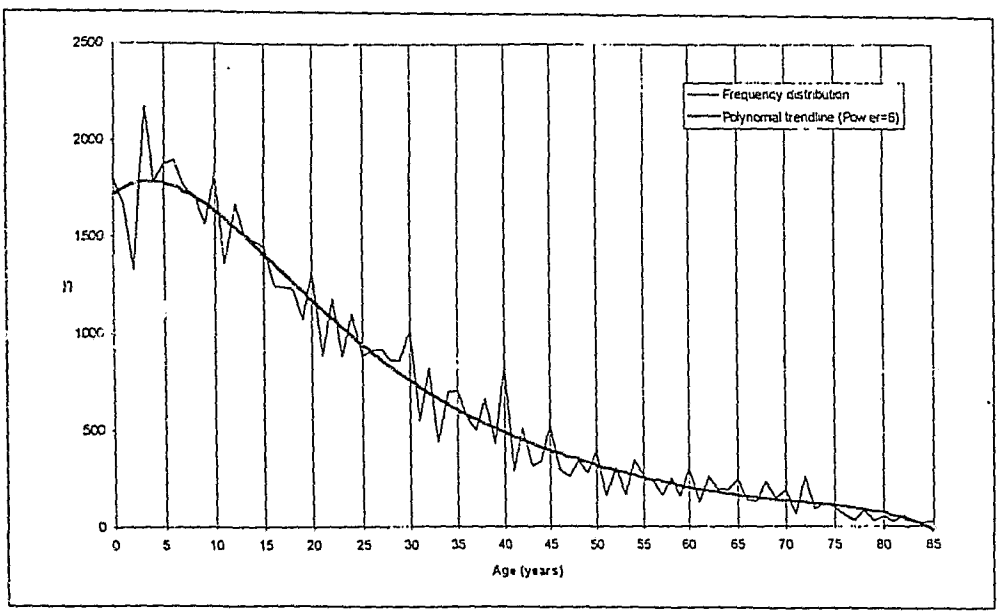
Last Event N - No Change, B - Birth; D - Death; M - Migration; I - missed las census

Id/Seq Number new persons in this household sequentially starting from 1.

APPENDIX A.3 Quality of age reporting

In virtually all longitudinal studies, and much cross-sectional work, age is a critical variable. Where vital registration is deficient, it can be extremely difficult to obtain accurate responses. The mis-recording of age is a function of two separate processes: mis-reporting and digit preference by community members, and defective questioning by fieldworkers. Review of figure A.3 shows mild to moderate "age heaping" at ages ending in "0" and "2", as well as at ages 3, 24, 45, 54, 68 years, although there is no evidence of this at ages ending in "5" as has been noted elsewhere.

Figure A.3 Frequency distribution of total population by age, as recorded by fieldteam



APPENDIX A.4 Operational Definitions

Village	- one of the 20 village settlements of the Agincourt field site.
Household	- the group of people, living on the same property, who eat from the same pot of food.
Household number	- each household (HH) is assigned a unique number indicated on the specially drafted village map.
Individual number	- each individual within a household is assigned a unique number.
Name	- first name (as given by household head) and last (family) name.
Months at home during 1991	- the number of complete months spent at home during the year 1991. - 0 corresponds to less than a month. - for babies less than 1 year old : number of complete months spent at home to date. - if a new resident (i.e. resident in the study area less than 1 year) number of months spent in new household.
Resident status	- permanent : six months or more spent at home in the past year, where home is in the Agincourt study area. - temporary : less than six months spent at home in the past year, where home is in the study area. - migrant worker : lives and works away from a home in the study area. Includes those adults who work away during the week, but return home on weekends. - visitor: has another household, outside the study area, which (s)he considers to be home.
Mother	- refers to biological mother.
Highest education	- refers to the highest level of education *passed.*
Refugee	- a person from Mozambique who lives in that part of a village set aside for refugees; or a person who describes him/herself as a refugee no matter where or with whom (s)he might live.

In certain instances, ascribing "refugee" or "local" status to a parent is not clear-cut. To address this a series of decision rules were introduced :-

Decision rules : where a man is a refugee, his local wife is classed as a "refugee" *if* their offspring are regarded, by the couple, as refugees. She will be classed as a "local" if their offspring are considered to be local. Conversely, where a woman is classed as a refugee, her local husband is classed as "local" *if* their offspring are regarded (by the couple) as local. He will be classed as a "refugee" if they consider their children to be refugees.

APPENDIX A.5 Death Form

Death

Village:	Household:	FieldWorker:
Date Visit:		

Surname:	Id:
Name:	

Gender:	M - Male; F - Female	Date of birth:

Date of Death:	Death Date Estimated:	Y - Yes; N - No

Age	Years:	Months:	Days:

Died At:	Home = H; Clinic - C; health ceNtre = N; Hospital = +; V = vehicle Accident site; Elsewhere=E
If Hospital:	T=Tintswalo; MP=Mapulaneng; MT = Matikwane; O = Other
Else Place Name:	
If Female:	P=Pregnant at time of death; D=Died during delivery; B=Died within 42 days of delivery; O=None of the above
Death Registered:	Y - Yes; N - No

Comments:

APPENDIX A.6 Verbal autopsy interview schedule

Given the length of the verbal autopsy schedule, it has been placed at the end of this report, following the references.

REFERENCES

1. Das Gupta M, Aaby P, Garenne M, Pison G (eds). *Prospective community studies in developing countries.* Oxford: Oxford University Press - IUSSP Series, 1997.

2. Chen CC with Bunge FM. *Medicine in Rural China.* Berkeley: University of California Press, 1989.

3. Kark SL, Steuart GW (eds). *A Practice of Social Medicine.* Edinburgh: E&S Livingstone, 1962.

4. Kark SL. *The practice of community-oriented primary health care.* London: Appleton-Century-Crofts, 1981.

5. Nutting PA and Connor EM (eds). *Community Oriented Primary Care: A Practical Assessment.* Vol 1: The Committee Report; Vol 2: Case Studies. Washington DC: National Academy Press, 1984.

6. Kark SL, Kark E, Abramson JH, Gofin J (eds). *Atencion Primaria Orientada a la Comunidad.* Barcelona: Ediciones DOYMA SA, 1994.

7. Tollman SM. Community oriented primary care: origins, evolution, applications. *Soc Sci Med* 1991; **32**(6): 633-642.

8. Wyon JB, Gordon JE. *The Khanna Study: Population problems in the rural Punjab.* Cambridge: Harvard University Press, 1971.

9. Aziz KMA, Mosley WH. The history, methodology and main findings of the Matlab Project in Bangladesh. Paper presented to the seminar, "Socio-cultural determinants of morbidity and mortality in developing countries: the role of longitudinal studies". IUSSP Committee on Anthropological Demography and ORSTOM. Senegal, 1991.

10. Scrimshaw NS and Guzman MA. A comparison of supplementary feeding and medical care of preschool children in Guatemala, 1959-1964. In: Das Gupta M, Aaby P, Garenne M, Pison G (eds). *Prospective Community Studies in Developing Countries.* Oxford: Clarendon Press, 1997: 133-156.

11. Kahn K, Tollman S. A collation of selected information on field sites in Africa, Asia, Latin America and the Middle East. Paper/database presented to the constituting meeting of the INDEPTH Network[20], Dar es Salaam, November 1998. Monograph available from the Department of Community Health, University of the Witwatersrand, Johannesburg.

[20] INDEPTH: The International Network of fieldsites for the Demographic Evaluation of Populations & Their Health in developing countries.

12. Ghana VAST Study Team. Vitamin A supplementation in northern Ghana: effects on clinic attendances, hospital admissions, and child mortality. *Lancet* 1993; **342**: 7-12.

13. Krause G, Benzler J, Heinmuller R et al. Performance of village pharmacies and patient compliance after implementation of an essential drug program in rural Burkina Faso, West Africa. *Health Policy and Planning* (in press).

14. Ministry of Health, Tanzania. Policy implications of adult morbidity and mortality. End of phase 1 report. Mack Printers, Dar es Salaam, Tanzania. ISBN: 9987 634 01 X.

15. Bradshaw D, Dorrington RE & Sitas F. The level of mortality in South African in 1985 - what does it tell us about health? *S Afr Med J* 1992; **82:** 237-240.

16. Botha JL & Bradshaw D. African vital statistics - a black hole? *S Afr Med J* 1985; **67:** 977-981.

17. Yach D & Buthelezi G. Health status. In *South African Health Review 1995*. Health Systems Trust and the Henry J. Kaiser Family Foundation, Durban, 1995.

18. Herman AAB & Wyndham CH. Changes in infant mortality rates among whites, coloureds and urban blacks in the RSA over the period 1970-1983. *S Afr Med J* 1985; **68:** 215-218.

19. Wyndham CH. Trends in the mortality rates for the ten leading causes of death among White, Coloured and Asian children under 5 years of age in the RSA, 1968-1977. *S Afr Med J* 1984; **66,** 719-725.

20. Wyndham CH. Mortality trends in the populations of the RSA from causes commonly observed in developing communities, 1968-1977. *S Afr Med J* 1984; **66,** 945-950.

21. Bradshaw D, Laubscher R & Schneider M. *Estimated cause of death profiles for the nine new provinces based on 1990 data.* CERSA, Medical Research Council, South Africa, 1995.

22. Garenne M, Fontaine O. Assessing probable causes of death using a standardized questionnaire: A study in rural Senegal. In: Vallin J, D'Souza S, Palloni A (eds). *Measurement and Analysis of Mortality. New Approaches.* Oxford: Clarendon Press, 1990: 123-142.

23. Ross DA. Monitoring cause-specific infant and child mortality rates in areas where death certification systems are weak. WHO/UNICEF consultation on the measurement of overall and cause-specific mortality in infants and children. World Health Organisation, Geneva, 1992.

24. Chandramohan D, Maude G, Rodrigues L & Hayes R. Verbal autopsies for adult deaths: Issues in their development and validation. *Int J Epidemiol* 1994; **23:** 213-222.

25. Snow B & Marsh K. How useful are verbal autopsies to estimate childhood causes of death? *Health Policy and Planning* 1992; **7:** 22-29.

26. Kielmann AA, Taylor CE, Faruqee R et al. *Child and maternal health services in rural India. The Narangwal Experiment*, Vols 1 and 2. Baltimore: The Johns Hopkins University Press, 1983.

27. Greenwood BM, Greenwood AM, Bradley AK et al. Deaths in infancy and early childhood in a well-vaccinated, rural West African population. *Ann of Trop Paeds* 1987; **7:** 91-99.

28. Zimicki S. Approaches to assessment of the cause structure of mortality: a case-study from Bangladesh. In: Vallin J, D'Souza S, Palloni A (eds). *Measurement and Analysis of Mortality. New Approaches.* Oxford: Clarendon Press, 1990: 99-122.

29. Fortney JA, Susanti I, Gadalla S et al. Reproductive mortality in two developing countries. *Am J Public Health* 1986; **76:** 134-138.

30. Snow RW, Basto de Azevedo I, Forster D et al. Maternal recall of symptoms associated with childhood deaths in rural East Africa. *Int J Epidemiol* 1993; **22:** 677-683.

31. Gray RH, Smith G & Barss P. The use of verbal autopsy methods to determine selected causes of death in children. Occasional Paper No. 10. Baltimore: The Johns Hopkins University School of Hygiene and Public Health, 1990.

32. Bang AT, Bang RA & the SEARCH team. Diagnosis of causes of childhood deaths in developing countries by verbal autopsy: suggested criteria. *Bulletin of the World Health Organisation* 1992; **70:** 499-507.

33. Royaume de Maroc, Ministere de la Sante Publique (1991). Etude Nationale sure les causes et les circonstances de la mortalite infanto-juvenile (ECCD) 1988-1989.

34. Snow RW, Armstrong JRM, Forster D et al. Childhood deaths in Africa: Uses and limitations of verbal autopsies. *Lancet* 1992; **340:** 351-355.

35. Kalter HD, Gray RH, Black RE & Gultiano SA. Validation of postmortem interviews to ascertain selected causes of death in children. *Int J Epidemiol* 1990; **19:** 380-386.

36. Todd J, De Francisco A, O' Dempsey T & Greenwood B. The limitations of verbal autopsy in a malaria-endemic region. *Ann Trop Paediatr* 1994; **14:** 31-36.

37. Mirza NM, Macharia WM, Wafula EM, Agwanda RO & Onyango FE. Verbal autopsy: A tool for determining cause of death in a community. *East Afr Med J* 1990; **67:** 693-698.

38. Datta N, Mand M & Kumar V. Validation of causes of infant death in the community by verbal autopsy. *Indian J Pediatr* 1988; **55:** 599-604.

39. Dolan C. *Hea i situation analysis of the Bushbuckridge area f the Eastern Transvaal.* Jc annesburg: University of the Witwatersrand (Health Systems Development Unit, NETHWORC, Wits Rural Facility), December, 1992.

40. Development Bank of Southern Africa. *Statistics on living standards and development. Regional poverty profile: eastern and northern Transvaal.* Policy Working Papers No 3, November, 1993.

41. Waltensperger KZ. *Agincourt environmental health survey.* Internal report. Johannesburg: Health Systems Development Unit, Department of Community Health, University of the Witwatersrand, 1994.

42. World Bank. *Investing in health. World Development Report 1993.* New York: Oxford University Press, 1993.

43. World Bank. *Better health in Africa: experience and lessons learned.* United States of America: The International Bank for Reconstruction and Development/The World Bank, 1994.

44. Department of International Economic and Social Affairs, United Nations. Population Studies No. 81. *Manual X. Indirect techniques for demographic estimation.* New York: United Nations, 1983.

45. Tollman S, Herbst K, Garenne M. *The Agincourt demographic and health study: Phase 1.* Johannesburg: Health Systems Development Unit, Department of Community Health, University of the Witwatersrand, 1995. ISBN 1-86838-173-0

46. Katjiuanjo P, Titus S, Zauana M, Ties Boerma J. *Namibia demographic and health survey, 1992.* Ministry of Health and Social Services, Windhoek, Namibia. Columbia, Maryland USA: Macro International Inc, 1992.

47. Alberts M. *Dikgale demographic study - Phase 1: population census.* Sovenga: Health Promotion Action Group, Faculty of Health Sciences, University of the North, 1996.

48. Tollman SM. The Pholela Health Centre - the origins of community-oriented primary health care (COPC). *S Afr Med J* 1994; **84**: 653-658.

49. Dowell SF, Davis HL, Holt EA et al. The utility of verbal autopsies for identifying HIV-1-related deaths in Haitian children. *AIDS* 1993; **7**: 1255-1259.

50. Workshop report: Verbal autopsy tools for adult deaths. London School of Hygiene and Tropical Medicine, January 1996.

51. Timaeus IM. Estimation of adult mortality from paternal orphanhood: A reassessment and a new approach. *Population Bulletin of the United Nations* 1992; **33**: 47-63.

52. United Nations. *Model life tables for developing countries.* New York: United Nations, 1984.

53. Paul BD (editor). *Health, Culture and Community.* Case studies of public reactions to health programs. New York: Russell Sage Foundation, 1955.

54. Timaeus I. Adult Mortality. In: Foote KA, Hill KH, Martin LG (eds). *Demographic change in Sub-Saharan Africa.* Washington, D.C: National Academy Press, 1993: 218-255.

55. Gaisie K, Cross AR, Nsemukila G. *Zambia Demographic and Health Survey 1992.* University of Zambia and Central Statistical Office, Zambia, Columbia, Maryland USA: Macro International Inc, 1993.

56. Garenne ML, Madison M, Tarantola D et al. *Mortality impact of AIDS in Abidjan, 1986-1992. AIDS* 1996; **10:** 1279-1286.

57. Cornia GA, Jolly R, Stewart F (eds). *Adjustment with a human face.* Vols 1 and 2. Oxford: Oxford University Press, 1988.

58. Werner D, Sanders D. *Questioning the solution: The politics of primary health care and child survival.* Palo Alto: HealthWrights, 1997.

59. Curtis E. Child health and the international monetary fund: the Nicaraguan experience. *Lancet* 1998; **352**: 1622-1624

60. Schoub BD. Estimations of the total size of the HIV and Hepatitis B epidemics in South Africa. *S Afr Med J* 1992; **81:** 63-66.

61. Jochelson K, Mothibeli M, Leger JP. Human immunodeficiency virus and migrant labour in South Africa. *Int J Health Services* 1991; **21:** 157-173.

62. Department of Health, South Africa. Seventh national HIV survey of women attending antenatal clinics of the public health services, October/November 1996. Pretoria, 1997.

63. Vlassof C. Gender inequalities in health in the third world: Uncharted ground. *Soc Sci Med* 1994; **39(9):** 1249-59.

64. Department of Health, National District Health Systems Committee. A policy for the development of a district health system for South Africa. Health Policy Coordinating Unit and Department of Health, 1995.

65. Tollman S, Rispel L. Organisation, planning and management. In: South African Health Review 1995. Durban: Health Systems Trust and the Henry J. Kaiser Family Foundation, 1995: 75-88.

66. Schopper D, Walley J. Care for AIDS patients in developing countries: a review. *AIDS CARE* 1992; **4:** 89-102.

67. Sitas F, Zwarenstein M, Yach D, Bradshaw D. A national sentinel surveillance network for the measurement of ill-health in South Africa: a prerequisite for epidemiological research and health planning. *S Afr Med J* 1994; **84:** 91-94.

68. Morse SS, Rosenberg BH, Woodall J, for ProMED Steering Committee Drafting Subgroup. ProMED Global monitoring of emerging diseases: design for a demonstration program. *Health Policy* 1996; **38:** 135-153.

69. Gregson S, Anderson RM, Ndlovu J et al. Recent upturn in mortality in rural Zimbabwe: evidence for an early demographic impact of HIV-1 infection? *AIDS* 1997;**11**:1269-1280.

70. Todd J, Balira R, Grosskurth H et al. HIV-associated mortality in a rural Tanzanian population. *AIDS* 1997;**11**:801-807.

71. Sewankambo NK, Wawer MJ, Gray RH et al. Demographic impact of HIV infection in rural Rakai District, Uganda. *AIDS* 1994;**8**:1707-1713.

72. Mulder DW, Nunn AJ, Wagner HU. HIV-1 incidence and HIV-1 associated mortality in a rural Ugandan population cohort. *AIDS* 1994;**8**:87-92.

APPENDIX A.6 Verbal autopsy interview schedule

NO RESPONDENT ____ REASON_____

FOMO YA RIFU

DEATH FORM

Village_____ Gender _Male Female_

Household_____ Age_____

FW initials_____ Date of Int. _____
d d m m y y

****

Xana una xona xitifiketi xa rifu kumbe fomo ya rifu ? INA__ EE__
Do you have a death certificate or death registration form?

If yes, CAUSE OF DEATH recorded on form_____

_____

Contributing causes_____

duration until death_____

Underlying causes_____

duration until death_____

If yes, but form unavailable, where can it be found?

_____

Xana rifu ritsarisiwile ka hofisi ya majisitarata?
Was death registered at a magistrate's office?

Ina___ Ee___ AT___

Loko kuri ina, ritsarisiwe, ka hofisi yihi?_____
If yes, at which magistrate's office?

rini (siku)
when (date)?

d d m m y y

Muhlamuli: manana bava kokwana nuna/nsati makwavo n'wana van'wana_____
Respondent: mother father grandma spouse sibling child other_____

Xibangelo (Hi ku bona ka n'wina / ndyangu) _____
Cause (as declared by family)

****

<<>> [To FW: Ask only if deceased did not die at clinic or hospital]

Xana mufi u yisiwile e xibedhlele kumbe ekliniki evuvabyini bya yena? INA____ EE____
Was the person taken to clinic or to hospital during this illness?

Loko mi nwi yisile, mi n'wi yise kwihi :
If yes, where (name):

Hi siki rihi :
Date: d d m m y y

<<>> [If taken to clinic or hospital more than once, please write as many dates as possible]

****

MATIMU YA VUVABYI LEBYI NGA VANGELA RIFU
HISTORY OF THE DISEASE LEADING TO DEATH

XANA MUFI U LOVE KA NGOZI INA EE
Was this an accident Yes No

<<>> [To FW: if yes, complete the history, the page for an accident, and sections 25, 26, 27, 28.]

Loko mufi angalovanga kangozi, u vabye nkarhi wa ku fika kwihi? (masiku, mavikhi, tinhweti, malembe)
If this was not an accident, what was the duration of the illness?

_____

Xana ku ve na vuvabyi byin'wana ke handle ka lebyi byi nga vanga rifu?
Was there any previous illness? Ina____ Ee____

Loko kuri ina, hlamusela_____
If yes, describe

_____

Xana ka vuvabyi lebyi bya vumbhiri, uvabye ku fikela rini? _____
Duration of this illness.

COMPLETE IN THE CASE OF AN ACCIDENT ONLY

If a CAR ACCIDENT:

Where did the car accident occur? URBAN AREA ___
RURAL AREA ___
OTHER_____

Was the deceased a PEDESTRIAN ___
the DRIVER ___
PASSENGER ___

Had the deceased been drinking alcohol at the time of the accident?
Ina___ Ee___ AT___

If the deceased not the driver, was driver drinking alcohol at the time of the accident?
Ina___ Ee___ AT___

What vehicle was involved? TAXI ___
PRIVATE CAR___
OTHER _____

Was the deceased wearing a seat belt? Ina___ Ee___ AT___

What part(s) of the body were injured?_____

_____

****

If an ASSAULT:

Had the deceased been drinking alcohol at the time of the assault?
Ina___ Ee___ AT___

Had the attackers been drinking alcohol at the time of the assault?
Ina___ Ee___ AT___

Were the injuries caused by STABBING ___
GUNSHOT ___
FIGHTING ___
OTHER _____

Was the violence DOMESTIC (family)___
POLITICAL ___
POLICE ___
OTHER _____

What part(s) of the body were injured?_____

_____

2. KU CHULUKA INA EE ANDZI TIVI
DIARRHOEA/DYSENTERY

Nkarhi (masiku, mavhiki, tinhweti) _____
Duration (days, weeks, months)

A swi sungule rini_____
When did it start

A swi herile rini_____
When did it stop

Xana mufi aa chuluka swa mati? Ina___ Ee___ AT___
Were stools very liquid?

Xana thyaka ari huma na matheketheke ke? Ina___ Ee___ AT___
Mucous in stools?

Xana ngati ayi huma ke? Ina___ Ee___ AT___
Blood in stools?

Xana mufi a tshamela ku chuluka (ku tlula ka ntsevu hi siku) Ina___ Ee___ AT___
Were stools very frequent?

Ku oma ka nomo/ torha le ri kulu Ina___ Ee___ AT___
Dry mouth/very thirsty

Mahlo yo nghena endzeni Ina___ Ee___ AT___
Sunken eyes

Ku vuna ka nhlonge Ina___ Ee___ AT___
Loss of skin elasticity

<<>> [Ask the next question if the deceased is a child less than two years of age]

Rhavarhava yo nghena endzeni Ina___ Ee___ AT___
Sunken fontanelles

****

3. KU HLANTA INA EE ANDZI TIVI
VOMITING

Nkarhi (masiku, mavhiki, tinhweti)_____
Duration

U hlante rini hi nkarhi wo va bya_____
When during illness

Muhlobo wa mahlanta_____
Color

Mahlanta a ma hlangene ni ngati ke? Ina___ Ee___ AT___
Was there blood in the vomit?

Xana a huma khuvi hi nomo
Frothing at the mouth Ina___ Ee___ AT___

Rhavarhava a yi pfimbile (loko n'wana ari hansi ka malembe mambiri)
Swollen fontanelle Ina___ Ee___ AT___

Xana mufi ari na ma vabyi a switshetshela?
Was this epilepsy? Ina___ Ee___ AT___

Loko xana mufi uve na swi tshetshela nkari wo tani hikwi?
If yes, for how long did the person have epilepsy?

_____

U tshunguriwile? Ina___ Ee___ AT___
Was the person treated?

Loko a tshunguriwile kwihi? (xibedlhele, kliniki, n'angeni)
If yes, where? (hospital, clinic, traditional healer)

_____

****

5. KUTIKERIWA KU HEFEMULA INA EE ANDZI TIVI
DIFFICULT BREATHING

Nkarhi (masiku, mavhiki, tinhweti)_____
Duration

Swi sungule rini_____
When did it start

Swi hele rini_____
When did it stop

Ku hefemula hi kuhatlisa Ina___ Ee___ AT___
Rapid breathing

Ku tikeriwa ku hefemula Ina___ Ee___ AT___
Difficult breathing (suffocating)

Ku hefemula a kuri na huwa xana Ina___ Ee___ AT___
Breathing was noisy

Tinhompfu ta yena a tipfuleka-pfuleka xana Ina___ Ee___ AT___
Nostrils flaring

Xana xifuva xa yena a xi vuyela endzeni Ina___ Ee___ AT__
Chest indrawing

Xana a dzuka nyuku kutlurisa na vusiku? Ina___ Ee___ AT___
Night sweats?

Xana vuvabyi lebyi a kuri TB? Ina___ Ee___ AT___
Was this TB?

Loko kuri ina, xana atshunguriwile exibedlhela? Ina____ Ee____ AT____
If yes, was it treated at hospital?

****

7. SWIRHUMBANA INA EE ANDZI TIVI
RASH

Nkarhi (masiku, mavhiki, tinhweti)_____
Duration

Swi sungule rini?_____
When did it start?

Swi herile rini_____
When did it stop?

A swiri ka swirho swihi swa miri ? _____
Where on the body?

A swi sungule ka swirho swihi swa miri? _____
Where did it start?

A swi sungule nkarhi wun'we kumbe a ya landzelelana_____
Started at the same time or sequentially

A swi humele ehenhla kumbe a swi nga humelanga ehenhla_____
Flat or raised

A swi ri makulu kumbe a ya ri matsongo _____
Large or small

Xana swirhumbana a swi ri na mati Ina___ Ee___ AT___
Contained clear fluid

Xana swirhumbana a swi n'wayisa Ina___ Ee___ AT___
Itchy?

Xana swirhumbana a swi horile mufi anga si lova
Healed before death
Ina___ Ee___ AT___

Xana nhlonge ya mufiayi dzuvuka Ina___ Ee___ AT___
Desquamation of skin

<<>> [To FW: Mark more than one answer if necessary]

A swiri ka swirho swihi swa miri?
What parts of the body

mahlakala (ankles)_____ xikandza (face)_____ khwiri (abdomen)_____

tintiho (fingers)_____

****

11. KUTIKERIWA LOKO A TSAKAMISA INA EE ANDZI TIVI
DIFFICULTY IN URINATING

Nkarhi (masiku, mavhiki, tinhweti)_____
Duration

A swi sungule rini_____
When did it start

Swi hele rini_____
When did it end

A twa ku vava loko a tsakamisa Ina___ Ee___ AT___
Pain on urinating

Xana a tsakamisa nkarhi na nkarhi Ina ___ Ee___ AT___
Frequent urination

Loko ku ri na kutikeriwa ku n'wana loku nga kona hi kwihi
Any other problems, explain

_____

****

12. MUHLOVO WA MUXIXITI LOWU WU NGA TOLOVELEKANGIKI
ABNORMAL COLOUR OF URINE

INA EE ANDZI TIVI

Vula muhlobo wa mutsakamiso_____
Specify colour

Swi endleke rini enkarhini wa vuvabyi_____
When during illness

Muxixito a wu n'na ngati ke? Ina___ Ee___ AT___
Was there blood in the urine?

****

16. XANA KU NA MANANA ANGA LOVA A TIKILE
DEATH DURING PREGNANCY (before labour)

INA EE ANDZI TIVI

<<>> [To FW: If YES, do section 19 only, then go to section 22]

---

17. XANA KU NA MANANA ANGA LOVA A RI KARHI A BEBULA
DEATH DURING LABOUR

INA EE ANDZI TIVI

<<>> [To FW: If YES, do section 19, then go to section 22]

---

18. XANA KU NA MANANA ANGA LOVA ENDZHAKU KA KU BEBULA
DEATH AFTER DELIVERY

INA EE ANDZI TIVI

Loko ku ri ina, xana u love masiku mangani endzhaku ka ku veleka (masiku ma le hansi ka 42)
If yes, exactly how many days after delivery (not more than 42 days or 6 weeks)

months_____ weeks_____ days_____

<<>> [To FW: If YES and not more than 42 days or 6 weeks, do sections 19, 20, 21.
If YES and more then 42 days or 6 weeks, go to section 22.
If NO , go to section 22.]

****

19. KU TIKA
PREGNANCY

Nkarhi wo tika - khwiri a riri na tinhweti tingani loko manana a lova kumbe loko n'wana a velekiwa (tinhweti)?
Duration of pregancy when mother died or baby born (months)

_____

Xana manana u tikile ka ngaki a nga si kuma khwiri leri ro hetelela?
How many pregnancies did she have before this last one? _____

Xana manana a vabya hi nkari wo tika? Ina___ Ee___ AT___
Was the mother ill during pregnancy?

Loko kuri Ina, hlamusela_____
If yes, specify

_____

_____

Xana uve vabya loko a tikile Ina___ Ee___ AT___
Was she sick during previous pregnancies?

Loko kuri Ina, hlamusela_____
If yes, specify
_____

A n'wa ngopfu byala Ina___ Ee___ AT___
Excessive alcohol use

A dzaha sikireti fole loko atikile Ina___ Ee___ AT___
Did she smoke cigarettes during her pregnancy?

****

20. KU KUMA N'WANA
DELIVERY

Xana n'wana u tswaleriwe kwihi (ekaya, exibedlele)?
Where was the baby born (home, hospital etc)?
_____

Xana a kuri na ku tikeriwa hinkarhi wo veleka
Any difficulties or complications during delivery

Ina___ Ee___ AT___

Loko kuri Ina, hlamusela_____
If yes, specify
_____

Mahahlwa Ina___ Ee___ AT___
Multiple birth, (eg. twins, triplets)

Uteke nkarhi wo tani hikwi ku veleka (awara, masiku)_____
Duration of labour

Ku hume nhloko ku sungula Ina___ Ee___ AT___
Head came out first

Loko ku nga ri nhloko ku rhange yini? _____
If no, what part came out first?

Yindlu ya nwana yi humili xana, Na swona a yi helerili ke?
Was the placenta expelled normally and complete

Ina___ Ee___ AT___

Xana n'wana a hefemula kahle a ha ku velekiwa
Did it breathe normally after birth Ina__ Ee__ AT__.

A tsakamisa kahle
Did it urinate normally Ina___ Ee___ AT___

A huma kahle
Did it defecate normally Ina___ Ee___ AT___

A mama kahle
Did it breast feed Ina___ Ee___ AT___

Xana nkava wa n'wana a wu bolanga xana
Did the cord get infected/smell bad Ina___ Ee___ AT___

****

22.

<<>> [To FW: This section is to be answered by all respondents UNLESS the deceased is a child younger than 2 years.]

Ku vava ka xifuva Ina___ Ee___ AT___
Chest pain

Loko kuri Ina, Nkarhi_____
If yes, duration

Ku vava ka miri Ina___ Ee___ AT___
Body pain

Loko kuri ina, Nkarhi_____
If yes, duration

Ku vava ka khwiri Ina___ Ee___ AT___
Stomach-ache

Loko kuri Ina, Nkarhi_____
If yes, duration

Ku pandza ka nhloko Ina___ Ee___ AT___
Headache

Loko kuri Ina, Nkarhi_____
If yes, duration

Ku ka u nga voni kahle Ina___ Ee___ AT___
Trouble seeing

****

Xana a ome miri kumbe swirho Ina___ Ee___ AT___
Paralysis of body or of limbs

Loko kuri ntiyiso, xirho xihi xa miri
If yes, which part of the body

_____

Ku lahlekeriwa hi mieleketo u nga koti no vulavula.
Coma, loss of consciousness
Ina___ Ee___ AT___

Loko ku ri ntiyiso, a swi endleka rini hi nkarhi wo vabya
If yes, when during illness

_____

Ku juluka Ina___ Ee___ AT___
Sweating

Xana mavoko, milenge, nhamu, a swi cince muhlobo
Did the hands, feet, neck change colour Ina___ Ee___ AT___

Xana nhlonge a xiguvukela
Peeling, scaling of skin Ina___ Ee___ AT___

Loko kuri ina, a kuri eka swirho swihi swa miri?
If yes, which parts of the body?

_____

Ku dya misava kumbe nkuma
Eating soil or ash Ina___ Ee___ AT___

A qumbha
Constipation Ina___ Ee___ AT___

Ku na van'wana lava nga na swi kombiso swo fana na leswi hi nkarhi lowo
Did other people have the same symptoms at the same time

Ina___ Ee___ AT___

Loko ku ri ntiyiso, hi le ka ndhawu yihi (hlamusela)?
If yes, in which place

_____

<<>> [To FW: ask only if deceased is a child less than 5 years.]

Misisi yo tshuka yi tlhela yi olova
Soft, reddish hair Ina___ Ee___ AT___

Xana n'wana a ha mama bodlhela? Ina___ Ee___ AT___
Was child still bottle feeding?

A dzaha fole INA___ EE___ AT___
Smoking

Loko kuri ntiyiso, a dzaha mafole mangani hisiku___ _____
If yes, how many cigarettes a day?

U dzahe nkari wotani hikwi (malembe)_____

For how long (years)

Loko kuri boxer, xana phakithi ari heta masiku mangani?
If boxer, how long does the packet last?

_____

A dzaha swidzidzirisi (eg. mbangi) xana INA___ EE___ AT___
Was he abusing substances eg. dagga?

Loko kuri ina, xana a tirhisile xidzidzirisi xihi? (eg. mbangi, glue, petirolo, mandrax etc.) If yes, what substances?

_____

Vutiolori/kutirhisa miri
Physical activity

Xana munhu loyi a kumeka a tshamile nkarhi wo tala?
Was the person sitting most of the day?
Ina___ Ee___ AT___

Xana munhu loyi ari loyi a tirhisaka miri wa yena masiku layo tala? (eg. ku famba, ku hlakula, ku tsema tihunyi, ku rhwala mati etc)
Was the person physically active most of the day? (eg. walking, hoeing, cutting wood, carrying water?

Ina___ Ee___ AT___

Xana ari l'a ti tirhisaka ku kondza mbilu ya yena yi ba hiku hatlisa, xana a dzuka nyuku?
So active that heart beat fast, and person was sweating?
Ina___ Ee___ AT___

<<>> To FW: this section is specifically about the treatment for the illness from which the deceased died.
Include information on treatment from a traditional healer as well as from the health service

27. KU TSHUNGURIWA KA MUFI (HLAMUSELA)
TREATMENT RECEIVED (SPECIFY)

Xana a tshunguriwile hi xilungu ke? Ina___ Ee___ AT___
Western treatment received?

Loko kuri ina, a nyikiwile mirhi yihi xana?
If yes, what medicine?

_____

_____

Xana a nyikiwile mirhi ya xintima ke? Ina___ Ee___ AT___
Traditional treatment received?

(Include EVERYTHING not western eg. ZCC tea; prayers etc)

Loko kuri ina a ku ri muhlovo wihi wa murhi?
If yes, what type?

_____

_____

Loko a tshunguriwile hi xilungu na xintima, xana hi wihi murhi lowu a nga sungula a kuma wona?
If both used, which treatment was sought first?

_____

****

28. LOKO URI NA SWI N'WANA SWO ENGETELA
OTHER REMARKS

_____

_____

_____

****

ASSESSMENT TWO

CAUSE OF DEATH DIAGNOSIS

Probable main cause: _____

Probable immediate cause: _____

Probable contributing cause(s): _____

NAME MEDICAL DOCTOR: _____

ASSESSMENT ONE

CAUSE OF DEATH DIAGNOSIS

Probable main cause: _____

Probable immediate cause: _____

Probable contributing cause(s): _____

NAME MEDICAL DOCTOR: _____

Author Tollman S M
Name of thesis Life And Death Without Trace: Examining Population Dynamics And Trends In Mortality In Rural South Africa Tollman S M

PUBLISHER:
University of the Witwatersrand, Johannesburg
©2013

LEGAL NOTICES:

Copyright Notice: All materials on the University of the Witwatersrand, Johannesburg Library website are protected by South African copyright law and may not be distributed, transmitted, displayed, or otherwise published in any format, without the prior written permission of the copyright owner.

Disclaimer and Terms of Use: Provided that you maintain all copyright and other notices contained therein, you may download material (one machine readable copy and one print copy per page) for your personal and/or educational non-commercial use only.

The University of the Witwatersrand, Johannesburg, is not responsible for any errors or omissions and excludes any and all liability for any errors in or omissions from the information on the Library website.