Policy Implications of
Adult Morbidity and Mortality

End of Phase 1 Report Summary

This summary has been prepared by the Adult Morbidity and Mortality Project (AMMP) Team. AMMP is a bilateral development assistance project of the governments of Tanzania and the United Kingdom, implemented by the Tanzanian Ministry of Health, and supported by the UK Department for International Development (DFID). Technical support and management is provided by the University of Newcastle upon Tyne, and administrative assistance by the British Council.
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Copies of Policy Implications of Adult Morbidity and Mortality - End of Phase 1 Report, from which this summary is drawn, may be obtained by contacting the AMMP Team, PO Box 65243, Dar es Salaam, Tanzania (email: ammp.dar@twiga.com) or UK Department for International Development, British Development Division in East Africa, PO Box 30465, Upper Hill Road, Nairobi, Kenya.
Dedicated to the late Professor Donald McLarty
Executive Summary

Cause-specific morbidity and mortality data are considered essential for planning and policy making. Ministries of health in Africa, however, have had to act in the absence of such information about their own populations. The Ministry of Health of the United Republic of Tanzania (MOH) has access to statistics from several sources, but these do not provide sufficient data for essential health planning and policy making. The Adult Morbidity and Mortality Project (AMMP), in conjunction with the MOH, saw the necessity for producing such information, and recognised its value in the planning and evaluation of health services and interventions. AMMP, a policy-orientated intervention and research project, has been designed specifically to address this need.

Phase 1 of the project (AMMP-1) has, for the first time in Africa, followed the demographic fate, at a household level, of more than 300,000 individuals from urban, affluent rural, and poor rural settings. For more than 3½ years, AMMP has documented prospectively the broad causes of death for all ages within a sample that represents over one per cent of the entire Tanzanian population.

Mortality in Africa, particularly among adults, remains poorly understood. With yearly expenditures of less than $0.25 per capita,

<table>
<thead>
<tr>
<th>AMMP-1’s Accomplishments</th>
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<tbody>
<tr>
<td>Direct estimates of cause-specific and all cause mortality among adults;</td>
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<tr>
<td>Direct population-based estimates of burden of disease at the district level;</td>
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<tr>
<td>A determination of the relative burden of major causes of death for three large populations in mainland Tanzania;</td>
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<td>Statistics on health service usage before death.</td>
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AMMP has addressed this information gap by producing direct, population-based estimates of the burden of disability and premature death in our project areas.

The AMMP approach offers the potential for the sustainable collection of data integral to Tanzania’s programme of district-based Health Sector Reform. We have provided an estimate of the overall burden of disease, and produced information on specific health issues such as chronic non-communicable diseases and HIV/AIDS, and health service and facility usage.

The Policy Implications of Adult Morbidity and Mortality - End of Phase 1 Report, upon which this summary is based, contains findings from the monitoring of more than 14,000 deaths in the city of Dar es Salaam, and in Hai and Morogoro Rural Districts. Deaths were recorded through an active reporting system, and cause of death determined by ‘verbal autopsy.’ The final report also includes the results of several intervention studies.

The ultimate policy implications of AMMP-1 will be determined by the MOH, major non-governmental health sector initiatives, and community-level stakeholders. These parties will be in a position to employ AMMP-1 findings in setting priorities for improving health in the project areas.
SOME OF AMMP-1’S MOST SIGNIFICANT FINDINGS

- HIV/AIDS is the leading cause of death among adults 15-59 in project areas;
- The incidence of pulmonary tuberculosis has increased dramatically since 1984, corresponding to the occurrence and spread of HIV infection;
- Infectious diseases, many avoidable, account for most premature death;
- There are significant differences in the burden of disease among the three sites, and among women compared to men;
- Men die at higher rates than women across nearly all age groups;
- Perinatal death and acute febrile illnesses are the major killers of children under 14;
- One third to one half of all deaths within the populations under surveillance occur among adults in the productive years of life, between 15-54;
- One third to one half of 15 year old boys in all areas will die before their 60th birthday;
- Maternal mortality remains high, yet nine of ten reproductive aged women who die, die of causes other than those related to childbirth;
- Injuries (accidental and intentional) are a major cause of death among adults 15-59 in project areas;
- Non-infectious diseases account for 15-27% of all deaths in the project areas;
- Stroke kills those aged 15-59 at rates several times higher than in the United Kingdom;
- Many adults in the study areas die at home, without any contact with the formal health care sector in the month prior to death.
Policy Implications of AMMP-1

The overriding goal of AMMP has been to contribute to the alleviation of suffering due to ill health in Tanzania through the provision of accurate data to planners and policy makers. The results outlined in this summary have provided information on the health of over 1% of the Tanzanian population.

While everyone must die, it is clear that many adults as well as children are dying prematurely and unnecessarily. AMMP has also confirmed the observation that large variations in the burden of disease exist at a district level, a fact hidden by national statistics.

For a yearly cost less than that of purchasing and maintaining a four-wheel drive vehicle, AMMP has provided a firm foundation for the implementation and evaluation of Tanzania’s National Health Policy and District Health Planning Guidelines (part of the programme of Health Sector Reform) in the three project districts.

It is the fervent wish of the AMMP Team that our findings reach all organisations engaged in health promotion, service provision, and programme evaluation in Tanzania, from the community-based to the regional and international. We hope that the report will act as a stimulus to greater co-operation between groups who share the goals of advancing health and reducing avoidable and premature death. Those involved in vertical health programmes may wish to use the data as a tool in the evaluation of the effectiveness of their programmes in the project areas.

Our findings should be viewed in the context of the stark fiscal and institutional realities of Tanzania’s economy and health care system. Structural adjustment has had dire consequences for the provision of all social services in Tanzania, including health care. The government has had to reconsider the role of the state in the overall provision of social welfare and how to accomplish this redefinition ‘with a human face.’
A new plan for the organisation of public and private-practice health care is being introduced in Tanzania. Under this plan, information-based policy formation and the ability to assess the cost-effectiveness of interventions through measuring changes in the burden of disease will feature prominently.

It is widely recognised that communities must have a voice in the setting of health priorities and evaluation of progress. Our findings indicate clearly how the populace that has born the brunt of structural adjustment, economic decline and AIDS has suffered. Furthermore, diversity in the burden of disease in the 3 study sites and between the sexes is one of the project’s findings emphasised in the final report.

We believe that evidence-based health policy formulation and service planning, combined with meaningful community input, is a promising approach to meeting enormous health needs with limited resources. We hope that this report will encourage similar studies in other districts. It is also our hope that future reports will be able to record significant declines in mortality and morbidity following effective interventions.

On the following pages we list some of the policy implications from the AMMP Phase 1 data.
AIDS IS THE LEADING CAUSE OF DEATH AMONG ADULTS IN THE THREE PROJECT AREAS.

Policy Implications

1. Emphasis should be placed on cost-effective measures for the prevention of HIV and mitigation of the epidemic;
2. STD treatment and control should be a high priority;
3. A focus on youth and education about sexuality and family life is needed;
4. Social and economic policies that reduce the need for long term family separation should be considered;
5. Ways of keeping people with HIV well as long as possible should be explored.

MORTALITY RATES ARE GENERALLY HIGHER IN MEN THAN IN WOMEN.

Policy Implications

1. Maternal mortality as a cause of adult death has rightly been emphasised, but effects of paternal mortality must now be considered;
2. Prevention of risk factors for male mortality must be considered;
3. Social and cultural aspects of male gender that render men more vulnerable to premature death must be explored.
4. Accidents and injuries as a cause of death and risk-taking among men should receive special attention.
Mortality rates vary between project areas.

Policy Implications

1. District based data are needed to provide information on adult as well as childhood illness and death.
2. An expanded sentinel surveillance system should be considered.
3. Vulnerable population sub-groups should be identified;
4. Cost-effective interventions at district level should be assessed.

The percentage of deaths in the age-group 15 to 59 may exceed that in under-fives.

Policy Implications

1. Mortality in young adults may now be as serious as mortality among children and deserves increasing attention by policy makers;
2. Adult health interventions should be thought of as augmenting child health initiatives.

Infectious diseases are the main cause of death in adults in 2 of the 3 project areas.

Policy Implications

1. Correct diagnosis and treatment of infectious diseases is required;
2. Prevention of infectious diseases such as malaria, diarrhoeal diseases, STDs/AIDS is vital;
3. Social factors and cultural beliefs that delay contact with formal health services need to be examined.
Most women who die during child-bearing years (15-49 years) do not die from maternal causes.

Policy Implications

1. While maternal mortality is a major problem, more attention should be paid to non-maternal causes of death e.g. HIV, acute febrile illness (incl. malaria), injuries etc.

Non-communicable diseases (NCDs) account for a large proportion of deaths in the project areas.

Policy Implications

1. Cost-effective interventions for NCD prevention, management and treatment require consideration;

2. Need to recognise that NCDs are already a significant cause of death for certain Tanzanians, requiring health service planning;

3. Initiatives are needed for culturally appropriate NCD prevention materials for health education among both youth and adults;

4. Costs and benefits of basic food commodities that may have both positive and negative effects on the burden of disease need to be examined.

Most deaths occur at home.

Policy Implications

1. Need for health systems evaluation and assessment of ‘what goes wrong’ in cases where contact with medical services fails to prevent avoidable death;

2. Community views on health services in times of critical illness need to be considered.
AMMP-1 Background and Objectives

The overall objective of AMMP-1 was to contribute to the alleviation of suffering due to ill health in Tanzania through the provision of accurate data on the extent and causes of death and disease among adults. Cause-specific morbidity and mortality data are considered essential for planning and policy making in industrialised countries. Yet many concerned observers have noted the lack of any reliable figures for most African countries. The lack of such data across the continent raised some important questions. Upon what information do ministries of health in Africa base their policy decisions? Are decisions based upon national health statistics, pressure from donors or special-interest groups, health crises, economics, ideology or ‘common sense’?

The Tanzanian MOH has available health statistics generated by several sources (e.g. national censuses and demographic and health surveys, some hospitals, several targeted health programmes and campaigns, other government department datasets, and numerous non-governmental organisations). None of these sources, however, offers routine ascertainment of cause-specific mortality. AMMP saw both the necessity for developing knowledge in this area, and the planning and evaluation uses to which such knowledge could be put. In order to assist future health care planning and the evaluation of interventions, AMMP-1 set specific goals and objectives.

Although AMMP set ambitious goals, much has been accomplished in Phase 1.
AMMP-1 GOALS AND OBJECTIVES

1. To define the causes and rates of mortality in adults living in rural and urban communities in Tanzania;

2. To define causes, prevalence, and incidence of illness in adults;

3. To define biological, social, economic and environmental determinants of ill-health and death in order to identify vulnerable groups;

4. To assess the impact of the existing health care system on health problems faced by adults;

5. To assess the social and economic consequences of major illnesses in adults, by estimating their direct and indirect costs;

6. To test and implement cost-effective interventions;

7. To strengthen existing disease interventions in primary health care;

8. To provide data which may be used by the MOH in establishing and setting priorities for cost-effective methods of health care delivery;

9. To provide information which may assist officials concerned with the formulation of social policy.

Objective 1

While we are confident that the mortality rates determined for individuals aged 5 years and older are highly accurate and based on nearly complete ascertainment, we cannot say the same about deaths among the population under five. Complete enumeration of young child deaths, particularly during the first year of life, poses special challenges that has probably led us to under-report mortality in this age group in the Final Report.
Objective 2
The causes, prevalence and incidence of illness is a vast topic that AMMP-1 chose to approach through the implementation of a self-perceived morbidity survey in two project areas, followed by a validation study in Dar es Salaam focusing on specific conditions. A focused study among village cohorts in Hai and Morogoro Rural Districts on the prevalence of chronic non-infectious diseases and risk factors has provided another source of data on morbidity at the community level.

Objective 3
With the establishment of a general risk profile for premature death, the definition of biological, social, economic and environmental determinants of ill health and death has begun. However, further analysis of our data is needed.

Objective 4
We have assessed the usage of health facilities and the impact of medical services upon health problems of adults with data available on health service utilisation prior to death for every deceased person in the 3 project areas, and on the utilisation and cost of health care in Dar es Salaam. AMMP-1 has also pointed to the high maternal death rate in Dar es Salaam, a city apparently well served by medical facilities and personnel.

Objective 5
For major NCDs, this objective has been met through focused studies on diabetes mellitus and hypertension. Formal studies on important infectious conditions such as HIV/AIDS and malaria within the project populations have not been conducted due to personnel and financial constraints.

Objective 6
The testing and implementation of cost-effective interventions will be a major emphasis of AMMP-2. The inclusion of community members
in the setting of public health priorities for intervention will be a key element of meeting this objective.

Objectives 7 & 8
The main contribution of AMMP-1 to strengthening existing interventions and primary health care has been in the provision of reliable information on morbidity and mortality to decision makers for undertaking evidence-based planning for primary care initiatives. In addition, AMMP-1 has highlighted potentially high rates of treatment cessation among those with tuberculosis, and spotlighted the importance of intentional self-harm as a cause of death in Hai. AMMP-2 will go further in bolstering primary health care activities by carrying out operational and intervention research on culturally appropriate ways of conducting health education about chronic diseases including diabetes, hypertension, and asthma.

Objective 9
Finally, the findings of AMMP-1 have already begun to assist the MOH in establishing and setting priorities in population health. Several findings are of significance to broader social policy questions related to issues such as urbanisation, road traffic, education, and social services to a growing population undergoing both demographic and health transitions.

Why the focus was on adults in AMMP-1
Until recently, most attention in public health in developing countries has been focused on children, since childhood deaths account for a large proportion of all deaths in these areas of the world. It has also been known that a range of relatively inexpensive and effective interventions exist for the limited number of diseases that cause most deaths among children, whereas adults suffer from a broader range of conditions, many of which are much less amenable to low-cost intervention. Furthermore, it was widely held that if people survived the diseases of childhood their chances of living to old age were good. AMMP, however, has estimated that the proportion of all deaths
occurring to those between 15 and 60 years of age may equal or exceed that of deaths to children under 5.

The adverse consequences of maternal mortality to surviving children has been well documented. Increasingly, however, the international health community is focusing on the concept of the “household production of health.” In this context, the follow-on effects of death to economically productive adults, including increased risk of ill health or mortality to surviving family and household members, is becoming a more central problem. Thus, there was a clear need for a development project with a holistic approach to the topic of adult morbidity and mortality. The broader development aims of AMMP included: supporting the rational provision of services; influencing the policy environment; and supporting research into effective planning and intervention.
Design and setting
The bulk of AMMP-1’s activities consisted of monitoring all deaths and causes of death that occurred during 42 months of observation among adults and children in a population of 307,912. The project populations were made up of residents in 8 branches of the city of Dar es Salaam, 51 villages in Hai District, and 61 villages in Morogoro Rural District. In all, 73,272 households participated in the project. In addition, retrospective analysis was carried out of all deaths that occurred over an 8½ year period among a group of approximately 7,000 adults aged 15 years and above living in 4 villages in Hai and 3 villages in Morogoro Rural. These people participated in surveys to determine how many villagers had risk factors that might increase their chance of contracting diabetes, hypertension, anaemia or

**MAJOR AMMP-1 ACTIVITIES AND ASSOCIATED STUDIES**

- Prospective monitoring of all deaths among 300,000 Tanzanians residing in three districts;
- A village cohort study on non-communicable diseases in rural Tanzania;
- A self-rated health survey among Dar es Salaam residents;
- A self-perceived morbidity study in adults in Morogoro and Kilimanjaro regions;
- A prevalence study of stroke and other disabilities in Hai District;
- A study of results and costs of treatment of patients with hypertension;
- A study of effectiveness of treating tuberculosis in HIV infected adults;
- A study of prevalence of hepatitis B markers in Morogoro Rural and Hai Districts;
- A study of the prevalence of syphilis among Maternal and Child Health clinic attendees in Dar es Salaam, Hai, Morogoro Rural, and Dodoma.
cardiovascular disease. Additional information about deaths was collected from major hospitals used by the project populations.

Regular censuses were undertaken to maintain accurate denominators for estimation of age, sex and cause specific death rates. The censuses also collected demographic, and socio-economic data to which the mortality experience of each individual and household can be related. Using these techniques, AMMP generated mortality data never before available in sub-Saharan Africa. In addition to the censuses and verbal autopsies, several focused studies were carried out within the AMMP-1 framework.

**Characteristics of the study populations**

The large size of the populations studied in AMMP-1 was deemed necessary for the accurate determination of age, sex, and cause-specific mortality rates. The Dar es Salaam sites were chosen to represent a range of urban living conditions such as variations in socio-economic status and population density. Morogoro Rural District, located in Morogoro Region, approximately 180 km west of

<table>
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<tr>
<th>Demographic characteristics of study populations, 1992-1995</th>
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<tr>
<td><strong>Age group</strong></td>
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<td>0-4</td>
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<tr>
<td><strong>Dar es Salaam</strong></td>
</tr>
<tr>
<td>14.1% 22.2% 61.2% 2.4%</td>
</tr>
<tr>
<td><strong>Hai District</strong></td>
</tr>
<tr>
<td>14.9% 27.6% 49.1% 8.4%</td>
</tr>
<tr>
<td><strong>Morogoro Rural District</strong></td>
</tr>
<tr>
<td>14.4% 27.2% 50.6% 7.7%</td>
</tr>
<tr>
<td><strong>Tanzania</strong>¹</td>
</tr>
<tr>
<td>17.6% 29.2% 47.1% 6.1%</td>
</tr>
</tbody>
</table>

DAR es Salaam, has a low population density and mixed topography that includes mountains and plains. Most of the population are farmers. Hai District is located on the slopes of Mount Kilimanjaro, in Kilimanjaro Region in north-eastern Tanzania. Hai has distinct productive zones, from hot and arid plains and lowlands to seasonally and permanently cultivated mountain slopes. While the majority of the population are farmers growing cash crops such as coffee, the Hai population is very mobile and many people depend upon non-agricultural economic activities for their livelihood. Hai is generally regarded to have a higher standard of living than most rural districts in Tanzania.

**Mortality in project areas**

Between June 1992 and December 1995, a total of 14,261 deaths were recorded in the three project areas. There were 2,940 deaths in Dar es Salaam, 5,024 deaths in Hai, and 6,297 in Morogoro Rural District. Death rates were highest in Morogoro Rural, followed by Dar es Salaam, and then Hai. Mortality was higher in men than in women except in the 15 to 39 year age group in Dar es Salaam and the 20 to 34 year age group in Morogoro Rural District.

A large proportion of deaths occur among adults. Among males, adults accounted for nearly a third of all deaths, even in the relatively low-mortality Hai population. In the comparatively high-mortality Morogoro Rural population, however, just over half of all deaths among females were to adults. If the crude death rates do not change, half of all 15 year old boys in Dar es Salaam and Morogoro Rural, and

| Mortality rates per 1,000 population per year in project areas, 1992-1995 (all ages) |
|----------------------------------|----------------|
| Men | Women |
| Dar es Salaam | 13.3 | 12.2 |
| Hai | 11.3 | 9.0 |
| Morogoro Rural | 19.4 | 16.7 |
more than a third of 15 years old boys in Hai will die before their 60th birthday. The sisters of these boys face odds nearly as bleak: nearly half of 15 year old girls in Dar es Salaam and Morogoro, and more than one quarter of 15 year old girls in Hai, will die before age 60. Finding that such a high proportion of deaths occur in adults, and the fact that most adult deaths are due to preventable causes, raises the question of whether policies and services for young adults, both male and female, should receive a higher profile than in the past.

**Causes of death in project areas**

**Contribution of infectious and non-infectious causes of mortality in adults**

The ability of AMMP to determine with precision the relative contribution of infectious and non-infectious causes of death to the overall adult mortality picture is one of the most significant findings of the first phase of the project. Infectious diseases accounted for just under one half to over two thirds of deaths among men aged 15 to 59, and from just over half to over two thirds of deaths among women. While it is clear that infectious diseases remain the top cause of premature adult death overall, AMMP-1 has also identified several important trends with regard to non-infectious diseases, accidents and injuries.
Causes of Death in AMMP areas
Percentage of deaths attributed to broad causes for all age groups

**0-4 years**

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<thead>
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**5-14 years**

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**15-59 years**

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**60+ years**

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**KEY:**
- Dar es Salaam
- Hai District
- Morogoro Rural District
ADDITIONAL FINDINGS REGARDING CAUSES OF DEATH

- Non-infectious causes account for a slight majority of deaths among adult men in Hai;
- Men are three to five times more likely than women to die from injury or accidents;
- Large differentials exist in the burden of infectious versus non-infectious diseases across the three study populations;
- Infectious diseases are a greater burden in Dar es Salaam than among rural residents.

Adult men: HIV/AIDS (with or without tuberculosis) has become the single most common cause of death among adult men in Dar es Salaam and Hai, and the second most common cause in Morogoro (after acute febrile illness). Unfortunately, given that HIV incidence is still on the rise in much of Tanzania, the proportion of deaths due to AIDS can be expected to increase into the next millennium. Again, there are large differences in the relative contribution of specific causes to adult mortality among the project areas. For example,

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<tbody>
<tr>
<td>1. HIV/AIDS</td>
<td>35.5</td>
<td>24.1</td>
<td>14.2</td>
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<tr>
<td>2. Pulmonary tuberculosis</td>
<td>12.5</td>
<td>20</td>
<td>14.1</td>
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<tr>
<td>3. Injuries</td>
<td>11.5</td>
<td>8.1</td>
<td>13.9</td>
</tr>
<tr>
<td>4. Acute febrile illness (incl. malaria)</td>
<td>6.8</td>
<td>6.7</td>
<td>10.1</td>
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<tr>
<td>5. Acute diarrhoeal disease</td>
<td>3.4</td>
<td>6.1</td>
<td>9.8</td>
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* Percentage of all deaths attributable to cause
tuberculosis was the second most common cause of death in Dar es Salaam, but ranked eighth in Hai, behind stroke. Injuries, both accidental and intentional, were the second leading cause of death among men in the two rural sites, and ranked third in Dar es Salaam.

**Adult women:** HIV/AIDS was the leading cause of death among adult women in all three project areas. In each site, for every woman who died of non-HIV-related maternal causes, five more died of AIDS. Taken together, causes of death related to reproduction and sexual health account for more than half of all deaths to women in Dar es Salaam, 39% of female deaths in Morogoro, and 40% in Hai. As among men, there were significant differences in causes of death among the project areas, with Hai once again showing the most marked divergence. For example, cancers were the second leading cause of death among Hai women, yet they ranked as the sixth and seventh most common cause in Dar es Salaam and Morogoro respectively.

**Infants and children:** Among infants and children under the age of 5, perinatal causes and acute febrile illnesses (frequently associated with seizures and mostly thought to be malaria) were the leading causes of death in all areas. While perinatal causes dominated in Dar es Salaam

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<th>Five leading causes of death among women aged 15-59, 1992-1995</th>
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* Percentage of all deaths attributable to cause
and Hai, in Morogoro Rural more than twice as many children died from acute febrile illnesses as from perinatal causes. In children aged 5 to 14, injuries emerged as a major cause of death, alongside acute febrile illness, malnutrition, and other infections such as meningitis and diarrhoeal diseases.

The elderly: The health transition taking place in Tanzania can be seen clearly from the mortality figures among the elderly: in Dar es Salaam and Hai, acute febrile illnesses and pneumonia ranked below stroke, and were joined by cancers and chronic heart failure in causing the majority of deaths to those aged 60 and above. The relative significance of conditions among the elderly will become increasingly important as the country’s population structure ages during the next century. Given this emerging picture, a high number of single-person households found among the elderly in Morogoro may be of particular concern.

**Maternal Mortality**

In view of continued concern about the well-being of women in their childbearing years and women from pregnancy until after childbirth, AMMP analysed causes of death in women aged 15 to 49. Although maternal causes accounted for between 8.1 and 10% of all deaths to women in this age range, the maternal mortality death rates varied dramatically among the three study areas, with Morogoro Rural District experiencing over two and a half times the maternal mortality rate of Hai. There were also marked differences regarding the causes of maternal death. In Hai, nearly a third of maternal deaths were

<table>
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<th>Maternal mortality ratio per 100,000 live births, 1992-1995</th>
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<td>Morogoro Rural</td>
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related to induced or unsafe abortions—three and a half times the rate in Dar es Salaam or Morogoro. Most maternal deaths in the three areas occurred at home. Overall, AMMP found that maternal mortality ratios per 100,000 live births in the project areas were considerably higher than official Tanzanian government estimates.

**Mortality and Specific Health Problems**

The project team examined a number of specific health problems and generated age-specific mortality rates for twelve conditions for people living in all three project areas. Mortality rates due to HIV/AIDS were nearly three times higher for Dar es Salaam residents than for residents of Hai or Morogoro. Related to the high HIV burden in Dar es Salaam, deaths due to tuberculosis showed an increasing trend there, but not elsewhere.

Infectious conditions generally caused more deaths in Morogoro than Dar es Salaam or Hai. Among females in Morogoro, mortality rates due to both acute febrile illness and diarrhoeal disease were more than twice as high as among girls and women living elsewhere, and nearly three times as high among boys and men from the other study populations. Deaths due to respiratory conditions such as pneumonia and asthma, however, were more similar in the two rural areas. Hai had the highest mortality rates due to stroke of all areas. Among men in Hai and Morogoro, diabetes caused nearly twice as many deaths per 100,000 population as among women; sex differences in Dar es Salaam were much smaller. The pattern for deaths due to liver disease was similar to that for respiratory conditions and stroke; overall rates in the two rural populations were markedly higher than in Dar es Salaam and rates were roughly twice as high among males as among females.

Deaths rates due to epilepsy and injuries were also much higher among men than women, but without the large variations among the study districts. Epilepsy caused over twice as many deaths among males as among females, while injury death rates were roughly three
times as high. Although the crude rates of epilepsy deaths varied little among the three areas, the age-specific death rate profile of each study population was unique. The death rates due to cancer present a mixed picture. In Dar es Salaam and Morogoro, rates were higher among females. Hai had the highest cancer death rates for both sexes, with a male death rate higher than that for females, and more than three times that of the male rate for the two other populations.

**Burden of Disease and Cause Specific Mortality: Comparing Figures**

Through its ability to calculate age- and cause-specific death rates, and a version of the disability-adjusted life years measure (DALYs) based upon premature mortality, AMMP-1 has helped place Tanzania firmly in the global trend toward evidence-based health planning. The DALY measures and communicates the burden of disease within a population, and combines years of life lost as a result of premature mortality and years lived with a disability. DALY's have been generated by the World Bank,* and by Murray and Lopez** for broad geographic regions, including sub-Saharan Africa.

AMMP found that, when compared to 1993 World Bank estimates, DALY's lost in Hai were 24% higher than the world average, but over 40% lower than the estimate for all of sub-Saharan Africa, placing Hai slightly lower than India in terms of burden of disease. DALY's lost in Dar es Salaam and Morogoro Rural District were much closer to the figure for Africa as a whole, with the urban population suffering a 13% lower, and the poor rural population a 13% higher, burden of

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disease compared with the average taken from the rest of the continent. The ratio of premature years of life lost (YLL) to men versus women in all three AMMP study areas was 1.3 comparable to that of Latin America and the Caribbean and OAI.

AMMP also estimated cause-specific mortality rates for a number of diseases and conditions. Compared with rates in the United Kingdom mortality rates from stroke in men 15 to 59 years old in the project areas were 4 to 6 times higher. In women 15 to 59 years of age, stroke mortality rates were 2 to 7 times as high as for women of comparable age in the United Kingdom. The probability that a 15 year old boy will die from injuries before reaching an age 60 years was 3 to 4.5 times higher for all project areas than for England. For women, the probability was 1.7 to 2.4 times higher than for England.
Determinants of mortality
The following factors were found to be associated with a significantly increased relative risk (RR) of mortality in the cohort studies in Morogoro and Kilimanjaro Regions:

**RISK PROFILE FOR PREMATURE DEATH IN TANZANIA**
- increasing age (as expected)
- male sex
- body mass index of less than 17.6
- increased levels of blood pressure
- anaemia
- impaired glucose tolerance
- diabetes (in Morogoro Region)
- smoking (in Kilimanjaro Region)
- drinking of alcohol

**Causes of death in hospitals, facility use, and place of death**

**Adult deaths in hospitals**
An analysis of deaths in hospitals in Dar es Salaam and at Morogoro Regional Hospital indicate that among inpatients, HIV disease and tuberculosis were the leading causes of death among adult men and women. In the hospital nearest the Hai site, HIV/AIDS ranked sixth as a cause of death. The hospital confirmed the community-based finding that acute febrile illness and diarrhoeal diseases were also significant killers of adults.

Because patients are, to a certain degree, ‘self-selected,’ hospital data often do not reflect the mortality picture from a population
In the context of adult mortality perspective. For example, men may be more likely than women to die in hospital, as the ratio of male to female deaths was higher in hospitals than in the community. In addition, the data from the Dar es Salaam hospitals appeared to underestimate the importance of injuries, while overestimating the role of anaemia and heart disease.

**Place of death and health facilities used before death among adults**

Most of those who died during the study died at home. The greatest number of home deaths was in Morogoro Rural (84% of all deaths), followed by Dar es Salaam (56%) and Hai (52%). In all three areas, the elderly were more likely than others to die at home. In cases of critical illness among children, the high density of services in the urban areas may partially explain the observation that 60% of child deaths in Dar es Salaam took place in hospitals, but only 20% of children who died in Morogoro died in hospital.

### Additional Findings Related to Place of Death and Facility Use

- Even though government services were the most commonly used health outlets in all areas, a significant proportion of men and women have never made use of them;
- In Hai, level of education was strongly related to use of the formal sector;
- One in four residents of Morogoro Rural preferred traditional medicine as a treatment of first choice.
Non-Communicable Diseases in Tanzania:

The Village Cohort Study
AMMP conducted surveys among residents over the age of 15 living in several villages in Morogoro and Kilimanjaro regions. The surveys sought to identify the overall prevalence of factors associated with risk of death from chronic diseases such as diabetes, cardiovascular disease, and hypertension.

Compared with Tanzanian government officials and business executives, and with other populations around the world, rural Tanzanians had, for the most part, relatively low rates of smoking, hypertension, diabetes mellitus, obesity, and high cholesterol. In the Seychelles, for example, one in four persons had two or more major risk factors for chronic heart disease. The percentage in Kilimanjaro was half this figure, and in Morogoro it was roughly one quarter.

Additional Findings Related to Chronic Illness in Tanzania

- Non-communicable diseases account for 15-28% of male adult (15-59 years) deaths in the project areas and 14 to 27% in female adults;
- Asthma is a common chronic health problem and rates may be comparable to those in Europe and the USA;
- 65 to 85% of men and women in the Morogoro villages had borderline or anaemic haemoglobin levels;

was half this figure, and in Morogoro it was roughly one quarter.
Morbidity and Self-rated Health Status

Many developed countries now include data on self-perceived health status in assessing overall well-being among their populations. The AMMP team has begun to apply this idea to population health in Tanzania through translating into Swahili and administering one of the better known survey instruments for gauging self-rated health status, the SF-36 questionnaire. This was the first time that the SF-36 had been implemented in an African country. If it can be validated for use cross-culturally in Tanzania, intra-country and international comparisons of self-rated health status can be generated and will become another tool for health policy making and planning. Men in Dar es Salaam, like their male counterparts elsewhere in the world, may be down-playing their self-reported ailments; they scored slightly higher than women on measures of overall ‘healthiness’ despite having higher overall mortality.

OTHER FINDINGS OF AMMP MORBIDITY STUDIES

- One in four adults reported being ill during the 2 weeks prior to the survey;
- Women were more likely than men to report a perceived chronic illness and disability;
- Problems with vision and back problems were the most commonly cited disabilities;
- A census of severe disability in Hai District revealed that 32% of the seriously disabled have suffered since birth;
- Blood samples from Hai and Morogoro showed high levels of markers for hepatitis B;
- 4.6% of female MCH clinic attendees aged 15 to 20 in Dar es Salaam, Hai, Morogoro Rural and Dodoma had antibodies to syphilis.
Interventions

After determining that HIV/AIDS, with or without tuberculosis, was the biggest killer of adults in study areas, AMMP-1 launched an intervention trial of tuberculosis treatment among HIV-positive adults. After 8 months treatment, quality of life and functional status in surviving HIV-negative patients with pulmonary tuberculosis was comparable to that of seronegative Tanzanians. Even in patients with AIDS, the quality of life and functional status of survivors indicates that anti-tuberculosis treatment is worthwhile.

AMMP also undertook a study of results and costs of treating hypertension using relatively cheap and available drugs. Although within the 6 month study period 63% of participants reached a state in which their hypertension was controlled, the cost of supplying the medications to the estimated 240,000 Tanzanian hypertensives would represent an expenditure equivalent to more than one third of the 1995/96 MOH budget. If those with hypertension are to be treated over the long term and on a wider scale, ways for patients and the government health services to share the costs of drugs will probably need to be explored.

The implementation and evaluation of interventions will form a major component of the second phase of AMMP (AMMP-2). Through a series of information dissemination activities, District Health Management Teams and representatives of community units down to the ward-level will be provided with AMMP-1 data on causes of mortality and morbidity affecting their areas. Based on these data, these actors will then undertake the collaborative selection of interventions, which AMMP-2 shall assist in implementing and evaluating.
Acknowledgements

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