Annex I

A WHO report on inequities in Maternal and Child health in Mozambique

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Executive Summary

In August 2006, the Honourable Minister of Health of Mozambique, Dr. Paulo Ivo Garrido met with WHO officials from the Department of Equity, Poverty and Social Determinants of Health (EQH) in Maputo. The Minister identified maternal and child health as pressing but relatively neglected issues in Mozambique, especially given the recent focus on HIV/AIDS. He proposed that it would be most useful if EQH could help identify and provide suggestions for actions related to reducing maternal mortality and child malnutrition in the country with an emphasis on tackling inequities across socioeconomic groups.

Given the focus identified by the Minister of Health, this report is divided into two main sections: (1) maternal health, and (2) child malnutrition. Each section consists of an introduction to the specific problem, an analysis of the current situation and trends, a more in-depth analysis on factors associated with the particular health outcome, and recommendations on actions to reduce inequities in maternal health and child malnutrition.

In terms of maternal health, Mozambique has made significant progress since 1990 with the maternal mortality ratio falling from 1,600 per 100,000 live births in 1990 to 408 in 2003. Though WHO estimates, adjusted for underreporting and misclassifications, indicate that it could have been as high as 1,000 per 100,000 live births in 2000. Progress has been slower in child health where prevalence of malnutrition for children under three marginally worsened from 36% in 1997 to 37% in 2003.

Further, differences across population subgroups remain high such as those between urban and rural populations, richer and poorer groups etc. For example, prevalence of malnutrition in children under three is 41% in rural areas compared to 26% in urban areas; while it is 43% for children with mothers having no education compared to 12% for children with mothers having secondary or higher education. These indicate that there is an equally important need to address inequities existing across socioeconomic and geographically identified groups in addition to reducing the burden of the health problem on average in Mozambique.

Substantial constraints exist on the availability and quality of information to confidently describe the problems associated with maternal mortality, although we do know that most maternal deaths occur between the third trimester and the first week after the end of pregnancy indicating the importance of prenatal, perinatal and postnatal care. In this study, we have used the percentage of skilled birth attendance as a proxy for maternal mortality, as available information is more reliable.

A framework for maternal mortality developed by a joint WHO Project on Health Systems Research 1994 in Malawi was used to identify the determinants of skilled birth attendance. This framework emphasized the influence of the following aspects: (1)

physical/health condition of mother, (2) utilization of maternal health services, (3) quality of case management and availability of services, and (4) socio-economic factors.

Child malnutrition was analyzed using 'stunting' - low height-for-age - as it is considered to be a good long-term indicator of the nutritional status of a child population because it represents a chronic and sustained lack of food.

We used the conceptual framework for child nutritional status originally created by UNICEF and subsequently modified by USAID. The framework focuses on the following main factors: (1) immediate influences such as food intake and infectious diseases, (2) underlying biological and behavioural influences, (3) underlying social and economic influences, and (4) basic influences such as area of residence.

Based on the analysis the following actions were identified as important to address inequities in skilled birth attendance:

1. Focus on antenatal care by (1) training personnel, (2) improving quality, and (3) improving coverage.
2. Improve barriers to access especially with respect to distance to health services.
3. Target women who are (1) uneducated, (2) poor, and (3) working in agriculture

For reducing inequities in child malnutrition the following main actions were identified:

1. Focus on increase coverage of safe and improved quality of drinking water in particular to rural population.
2. Target mothers working in agriculture as a priority group to decrease malnutrition in Mozambique.
3. Increase MOH activities related to educating the public on food and sanitary conditions including hygienic disposal of child waste.

In conclusion, the analysis reveals that the health sector needs to adopt different approaches to tackle inequities in maternal and child health. In order to improve maternal health the focus must be primarily on improving coverage and quality of antenatal care by reducing barriers to accessing health services. Addressing child malnutrition requires a stronger multi-sectoral approach, in particular, a joint effort with the Ministry of Public Works and Housing.

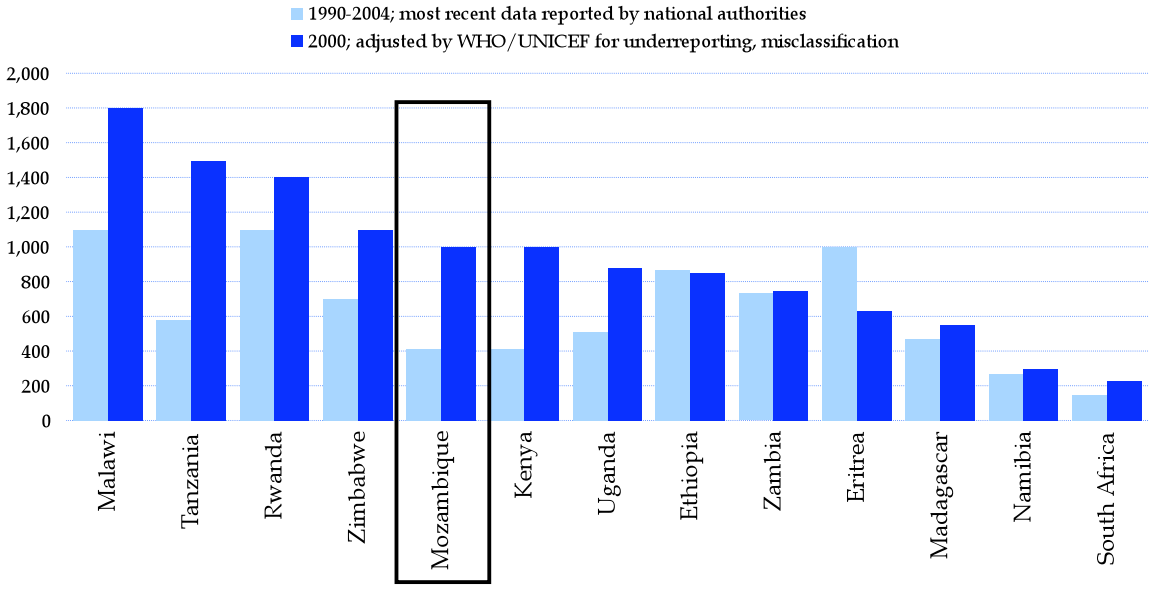
Maternal Health

A. Background

Mozambique has made significant progress in their maternal health indicators in the last 15 years since the end of civil unrest. According to the 2003 IDS, Graphic 5, the use of Modern Family Planning Methods increased in all of the country's provinces, with the exception of Niassa. The Contraceptive Prevalence Rate for the country increased from 6% in 1997 to 17% in 2003.

However, maternal mortality is still high, even when compared to other countries in east Africa (figure 1). According to WHO's adjusted numbers, that take into account underreporting and misclassifications, Mozambique's true maternal mortality ratio could be closer to 1,000 per 100,000 live births.

Figure 1 Comparing maternal mortality ratios for countries in the Eastern African region; *Source: UNDP HDR 2006*



In addition, substantial inequities exist in the attainment of these outcomes between population subgroups e.g. between richer and poorer women; urban and rural women. There is cause for concern on some other indicators of maternal health such as a high stillbirth rate of 256 per 1,000 deliveries and only around 50% of deliveries attended by skilled health personnel. AIDS is an increasingly serious public health problem with HIV prevalence rate increasing to 14.9% in 2004 among the 15-49 years age group.

B. Objective

The general objective of this section is to explore factors associated with and to identify actions related to reducing maternal mortality in Mozambique.

However, substantial constraints exist on the availability and quality of information to confidently describe the problems associated with maternal mortality. We do know that most maternal deaths occur between the third trimester and the first week after the end of pregnancy and that mortality can be extremely high on the first and second days after birth. These indicate that prenatal care, skilled care during delivery and postpartum care could be important factors for reducing maternal mortality.

Therefore, in this study, we have used percentage of skilled birth attendance as a proxy for maternal mortality, as available information is more reliable.

C. Framework of analysis

In a systematic review of studies of maternal mortality by WHO, severe bleeding, hypertensive diseases and infections were identified as dominant causes. In Sub-Saharan Africa, the combined maternal mortality ratio for these three causes are staggering at almost 500 deaths per 100,000 live births compared with around 300 and 100 deaths in South Asia and Latin America, respectively.

Whether or not a woman dies from complications during or after childbirth depends largely on access to timely and competent obstetric care. Therefore, although it is important to know which complications arise during pregnancy/delivery and what the main clinical causes of maternal mortality are, it is equally important to find out the main predisposing factors. Figure 2 illustrates a framework to explain pathways to maternal deaths.

The framework distinguishes four direct factors that influence maternal mortality:

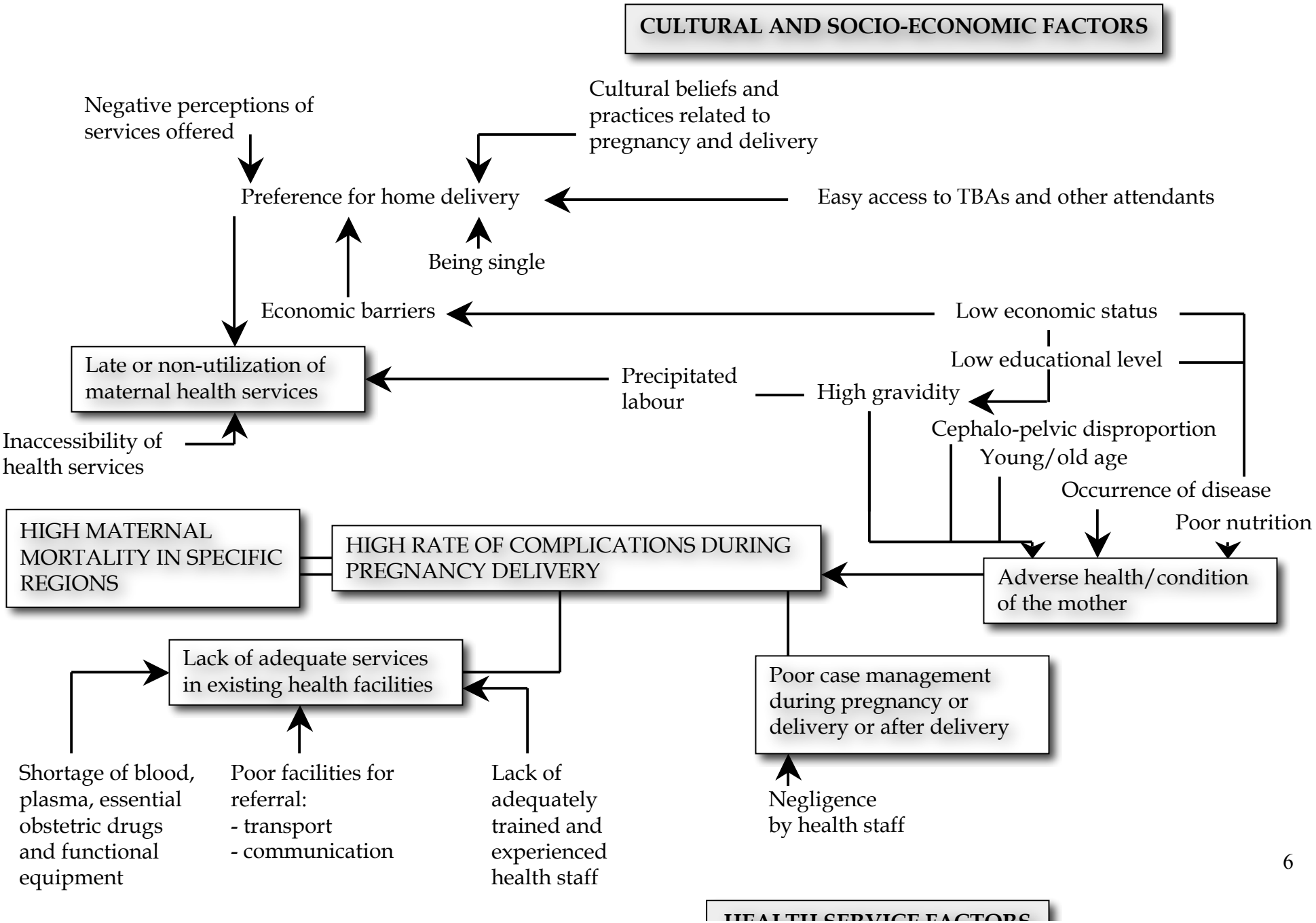
1. Late or non-utilization of available maternal health services,
2. Lack of trained staff and adequate equipment,
3. Poor case management during pregnancy, during delivery or after delivery by professional health workers, and
4. Adverse physical/health condition of the mother

It also identifies three main categories of indirect factors:

1. Cultural and socio-economic e.g. low education, negative perception of health services,
2. Physical factors e.g. young or old age, nutritional status, and
3. Health service factors e.g. geographical inaccessibility, economic barriers

In annex 1 we identify the specific variables related to each one of these factors that are available from the Demographic and Health Surveys data in Mozambique.

Figure 2 Problem analysis diagram; *Source*: *Factors associated with maternal mortality, Joint WHO/RTI/DGIS Project on Health Systems Research 1994*



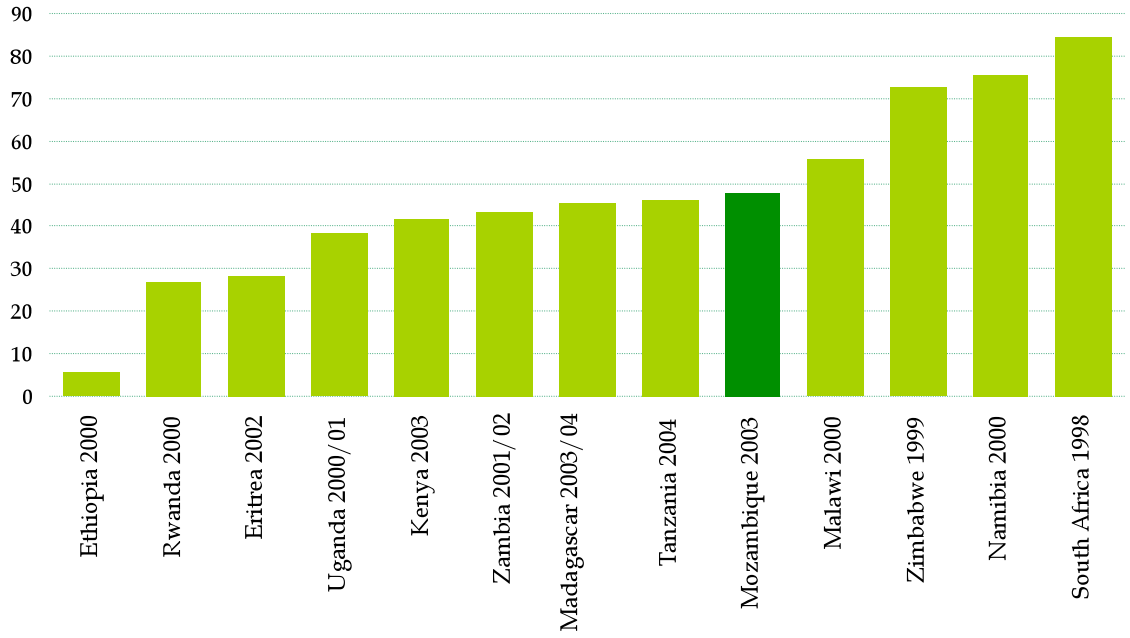
D. Results

In this section we present a brief overview of the current situation in Mozambique with respect to skilled birth attendance:

a. Comparative performance of Mozambique in the African region

From figure 3 we can see that Mozambique's ranks fifth of thirteen countries in Eastern Africa in attaining skilled birth attendance, of those who have conducted the Demographic and Health Surveys.

Figure 3 Percentage of births in the last five years that were attended by skilled personnel by country and year of survey in the Eastern African region; *Source: Demographic and Health Survey*



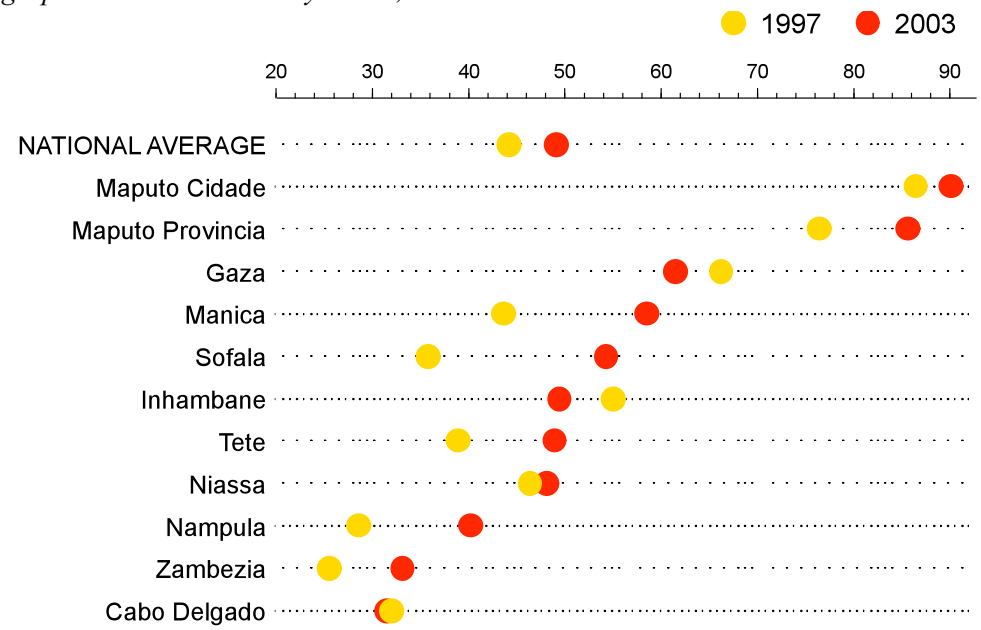
b. Trends in achievement

Skilled birth attendance increased in Mozambique, on average, at the national level as well as across all major population subgroups between 1997 and 2003. The national average increased from 44.2% in 1997 to 49.1% in 2003. Among women with no education the proportion increased from 28.1% in 1997 to 32.1% in 2003, while for women with primary education skilled attendance increased from 52.7% to 61.0%.

From figure 4 we can see that eight of the eleven provinces registered an increase in skilled birth attendance; most notably in Sofala (+18.5%) and Manica (+14.9%). However, three provinces showed a decrease in skilled birth attendance including Inhambane (-5.5%), Gaza (-4.8%) and Cabo Delgado (-0.5%). The decrease in Cabo

Delgado made it the worst performing province in 2003; below Nampula and Zambezia which were worse off in 1997.

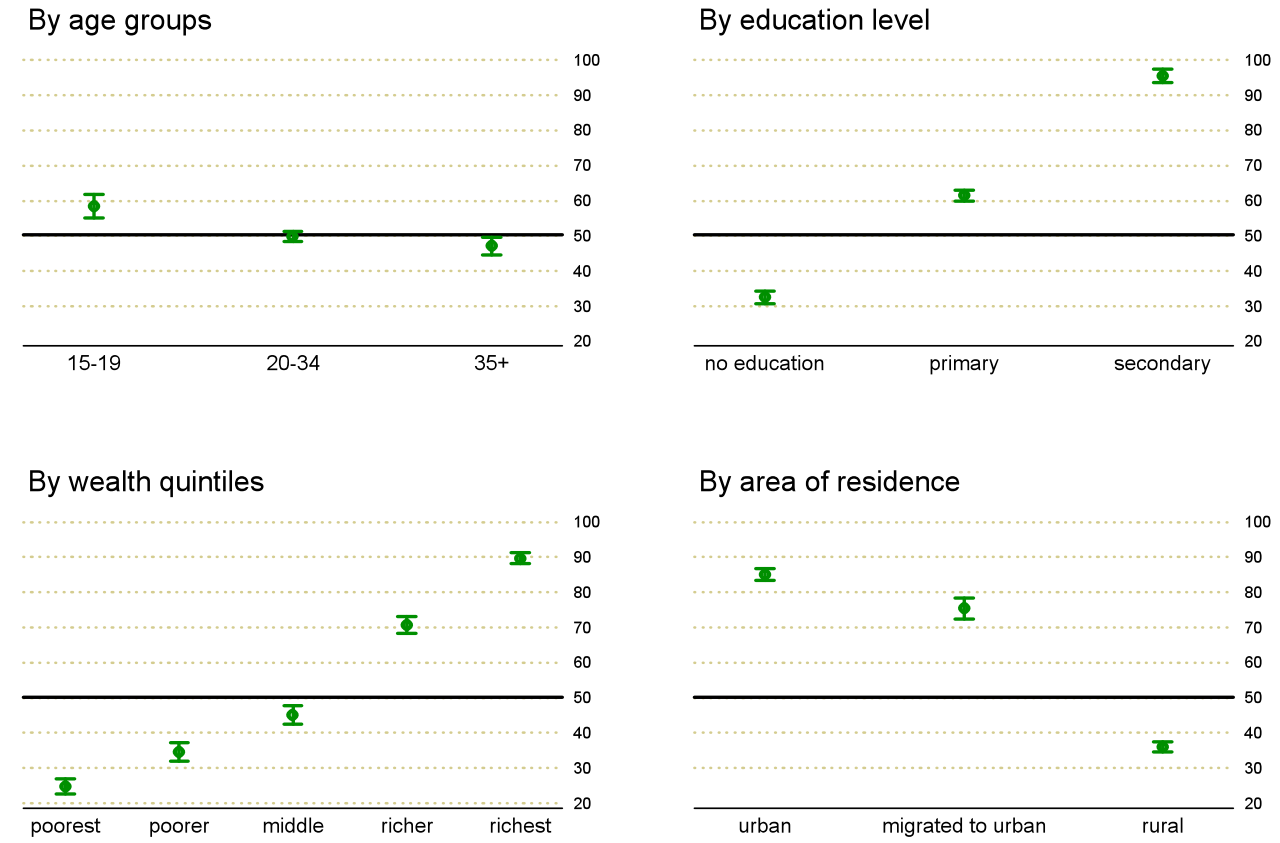
Figure 4 Percentage of skilled birth attendance by province in 1997 and 2003; *Source: Demographic and Health Surveys 1997, 2003*



c. Inequities in skilled birth attendance

From figure 5 we can see that there is a sharp gradient in attainment of skilled birth attendance across wealth and education levels. Differences between urban and rural areas are also highly significant. Older women are less likely to avail of services than younger women, on average, though differences are not very large.

Figure 5 Percentage of skilled birth attendance for last birth in the past five years by population subgroups in 2003 [95% confidence intervals]; *Source: Demographic and Health Survey 2003*



Black lines represent the NATIONAL AVERAGE value

d. Factors that influence inequities in skilled birth attendance

In this section we present results of the analysis that identify significant factors in determining the *risk of not having skilled birth attendance* based on the framework described in section C. There are four main categories of factors under which results are shown:

1. physical/health condition of mother
2. utilization of maternal health services
3. quality of case management
4. socio-economic factors

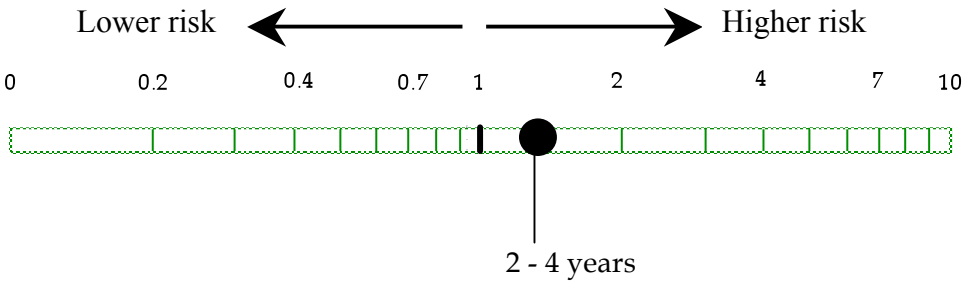
Odds ratios for factors that significantly affected risk are presented in graphs following the text in each subsection while the results of the analysis are presented in annex 2.

1. Physical/health condition of mother

Women with smaller birth intervals were at a higher risk of not receiving skilled birth attendance than those with a birth interval greater than 4 years. This result was significant for those having a birth interval of 2 - 4 years.

No significant differences in risk were elicited by all other physical/health factors considered. They included maternal age, mother's nutritional status, prior obstetrical history factors, existence of the following pregnancy complications: (a) blurred vision, (b) vaginal infection, (c) urinary tract infection, (d) bleeding, (e) problems with night vision, and (f) hypertension; and previous pregnancies that miscarried, aborted or ended in still birth.

Figure 6 Odds ratio for women with smaller birth intervals (control: > 4 years)



2. Utilization of maternal health services

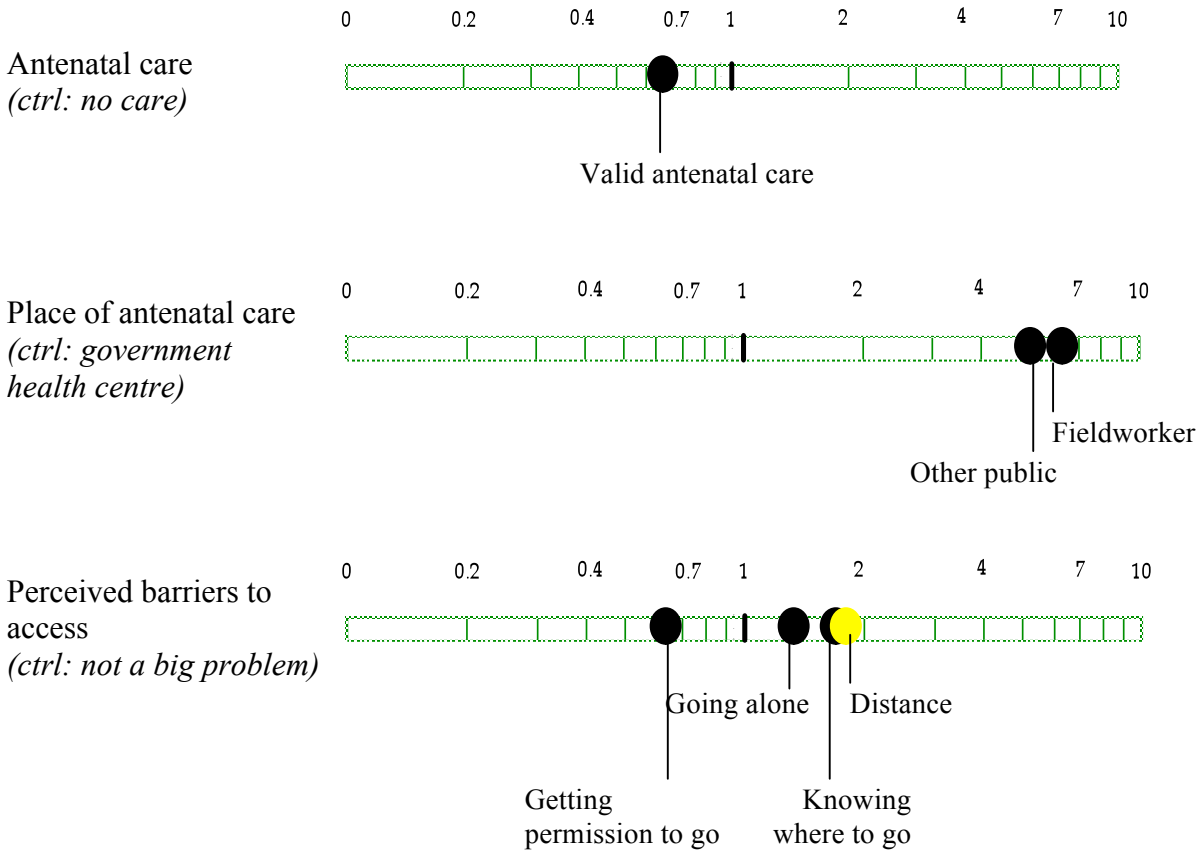
When examining the relationship between utilization patterns and receiving skilled care during delivery, we find that women who did not receive valid antenatal care (at least four visits to a health professional during pregnancy) were at a higher risk of also not getting professional care during delivery. The place where antenatal care was obtained and perceived barriers to access were also significant in predicting a higher risk of not getting skilled birth attendance.

Approximately 87% of antenatal care is provided by government health centres in Mozambique. Services are provided to small proportions of population by government hospitals, fieldworkers, other public centres and the private sector. Women who received antenatal care by fieldworkers were at higher risk of not receiving skilled birth attendance in comparison to women who went to government health centres for antenatal care.

Information on perceptions of the following barriers were recorded in the DHS 2003: (a) knowing where to go, (b) getting permission to go, (c) having money for treatment, (d) distance to facility, (e) availability of transport, (f) not wanting to go alone, and (g) lack of female provider.

Those who perceived distance to facility, knowing where to go, and going alone a big problem were at higher risk of not getting skilled birth attendance than those who did not perceive such risks.

Figure 7 Odds ratio for significant utilization factors determining skilled birth attendance

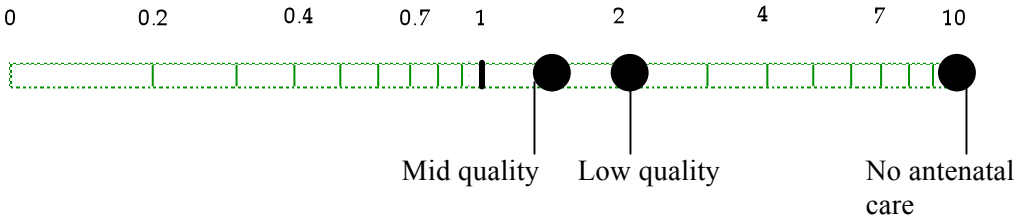


3. Quality of case management

Quality of antenatal care was used to approximate the quality of case management. It was defined by the variety of antenatal services women reported receiving. These services included: (a) measurement of weight, (b) measurement of height, (c) blood pressure assessment, (d) urine sample, (e) blood sample, (f) provision of referral for pregnancy complications, (g) provision of iron tablets, and (h) information on HIV/AIDS. Quality scores were constructed using principal components analysis for each woman using information on the above services. These scores were further divided into tertiles.

For the purpose of comparison, the highest group (tertile), defined as 'high quality' antenatal care, was used as the control group. In figure 8, we can see that women who received lower quality antenatal care had a higher risk, while those who received no antenatal care had an even higher risk of not receiving skilled birth attendance compared to women who received high quality antenatal care.

Figure 8 Odds ratios for women receiving varying qualities of antenatal care (ctrl: high quality antenatal care)



4. Socio-economic factors

A number of socio-economic factors such as education, wealth, occupation, access to information and area of residence were critical in determining the risk of not receiving skilled birth attendance. However, risks were not significantly different by marital status, responsibility for decision making on health care, relationship to household head, sex of household head, and mother's religion.

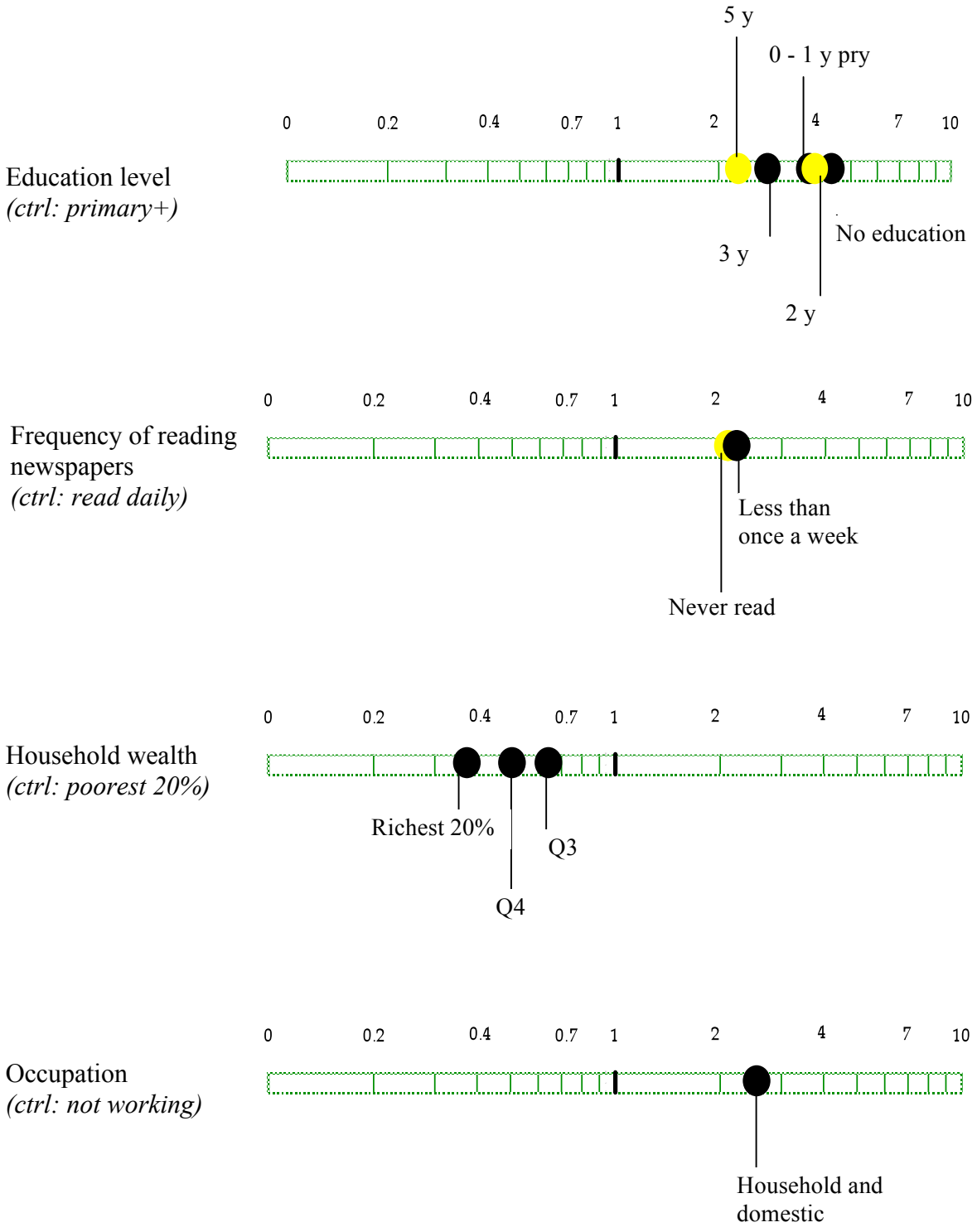
In terms of the mother's education level, women with 5 years and less education revealed a significantly higher risk of not receiving skilled birth attendance than those with complete primary and higher education. The risk diminished progressively with extra years of education.

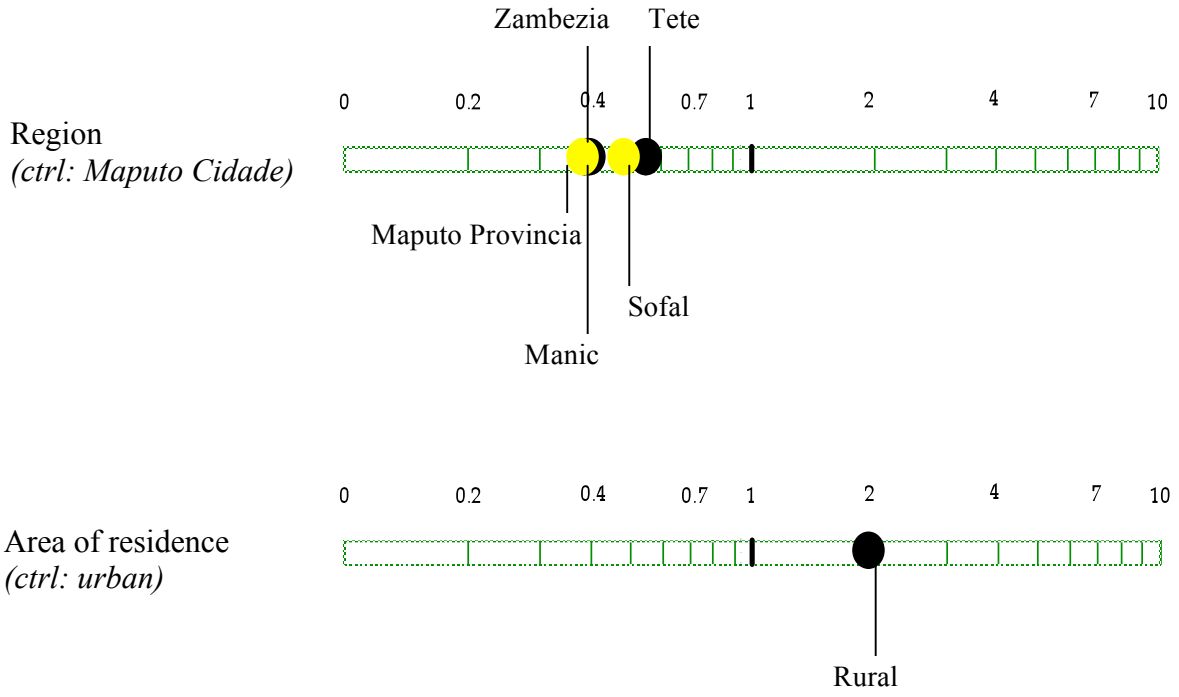
Household wealth was also critical in affecting risk of using services as women in the wealthiest 60% of households were at lower risk of not having skilled birth attendance than those in the poorest 20% households. Though, women in the poorest 20-40% group did not have a differential risk of accessing services. Women working in household and domestic services had a higher risk of not accessing services than those who were not working.

Although the skilled birth attendance rate in Maputo Cidade is the highest of all regions, women living in regions such as Maputo Provincia and Manica has a lower risk of not receiving skilled birth attendance. In addition, women in rural areas were, as expected, at higher risk of not receiving skilled birth attendance than those living in urban areas.

Accessing information regularly can also lead to lower risk of not getting care. Women who never or less frequently read newspapers were at higher risk of not having skilled birth attendance than those who frequently read newspapers.

Figure 9 Odds ratios for women with differing socio-economic status





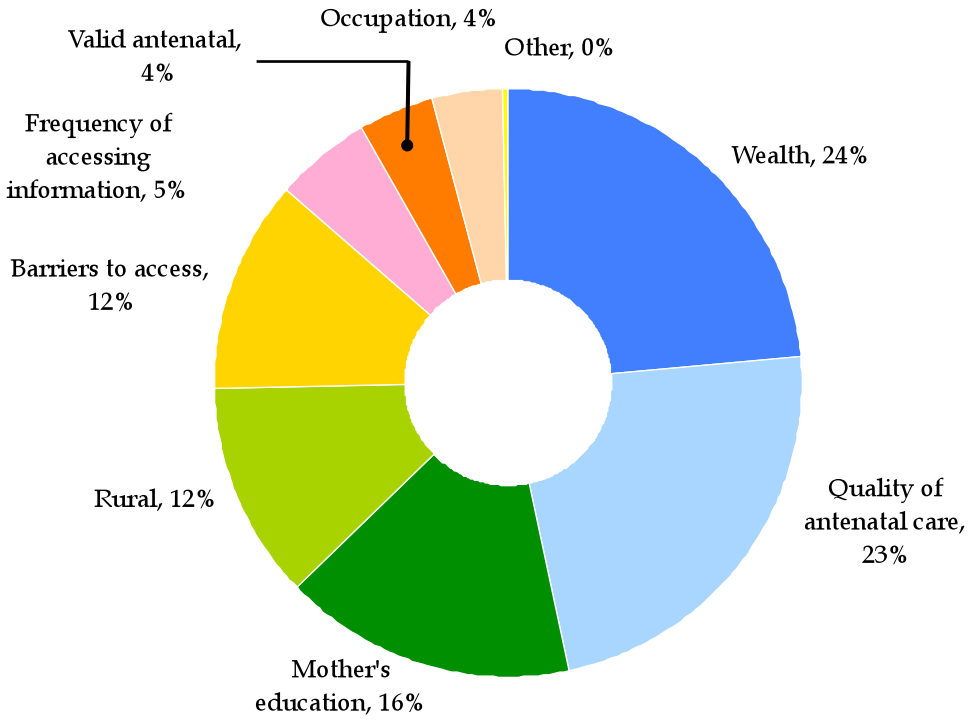
E. Main determinants of inequality in skilled birth attendance

In addition to the analysis conducted to determine factors that are significant in influencing the risk of not receiving skilled birth attendance, we decomposed the relative contributions of these factors to inequalities in skilled birth attendance across wealth groups.

Differences in socio-economic aspects accounted for 61% of inequalities in skilled birth attendance. The three main socio-economic contributors to inequalities were: household wealth (24%), mother's education (16%) and living in rural areas (12%). Other important socio-economic contributors included frequency of accessing information (5%) and mother's occupation (4%).

Quality of case management, approximated by antenatal care quality, contributed to another 23% of inequalities in obtaining skilled birth attendance. While most of the remaining influences on inequalities were due to factors associated with utilization of maternal health services (16%). Of this, 12% of inequalities could be attributed to perceived barriers to access especially distance to facility, while another 4% was attributed to receiving valid antenatal care,

Figure 10 Factors contributing to inequalities in attaining skilled birth attendance



F. Conclusions and implications

Differences in socio-economic aspects accounted for 61% of inequalities in skilled birth attendance. The three main socio-economic contributors to inequalities were: household wealth, mother's education and living in rural areas. Therefore, much can be achieved by focusing on working intersectorially to target rural, uneducated and poor girls to increase accessibility to education, social services and subsidies. The focus should also be on targeting the three provinces that have recently showed a decrease in skilled birth attendance including Inhambane (-5.5%), Gaza (-4.8%) and Cabo Delgado (-0.5%) which is the worst performing province.

When examining the relationship between utilization patterns and receiving skilled care during delivery, we find that women who did not receive valid antenatal care (at least four visits to a health professional during pregnancy) were at a higher risk of also not getting professional care during delivery. The place where antenatal care was obtained and perceived barriers to access were also significant in predicting a higher risk of not getting skilled birth attendance.

Perceived quality of antenatal care, contributed to 23% of inequalities in obtaining skilled birth attendance. This is important because it implies that a critical prerrequisite to increase skilled birth attendance is to improve prenatal coverage and quality of care. Much can be achieved by focusing on improving demand, accessibility and acceptability of maternal health services and increasing the proportion of antenatal care services delivered in government health centres instead of antenatal care provided by fieldworkers which is associated with at higher risk of not receiving skilled birth attendance.

Factors associated with utilization of maternal health services account for 16% percent of inequities in skilled birth attendance. Of this, 12% of inequalities could be attributed to perceived barriers to access especially distance to facility, which should be a focus for intersectoral intervention jointly with the Ministry of Public Works to improve roads and with the Ministry of Transportation to improve availability of transport in disadvantaged areas.

Approximately 87% of antenatal care is provided by government health centres in Mozambique. Services are provided to small proportions of population by government hospitals, fieldworkers, other public centres and the private sector. Women who received

One possible drawback of our analysis could have been the impossibility to incorporate availability of resources as a determinant. However, in Mozambique, the maternal bed occupancy rate is 37% indicating that the health system possesses the potential to meet a greater demand for institutional births.

In conclusion, the analysis reveals that the health sector needs to adopt different approaches to tackle inequities in maternal and child health. In order to improve maternal health the focus must be primarily on intersectoral action to reduce geographical and financial barriers to accessing health services, to improve coverage and quality of antenatal care. Poor, uneducated and rural girls should be targeted in terms of redressing structural determinants like education, income and social exclusion. .

Childhood Malnutrition

A. Background

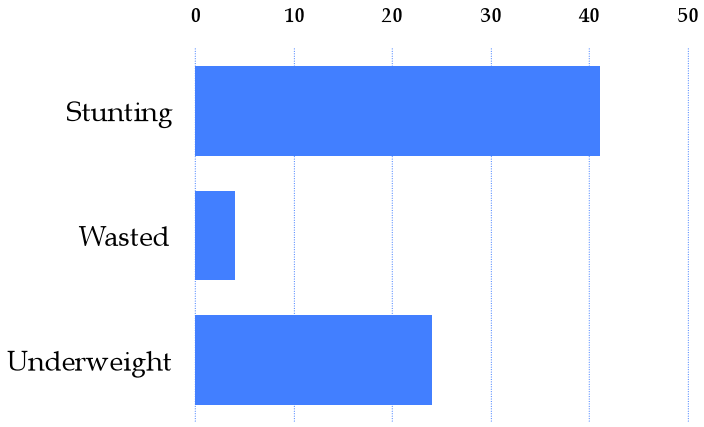
Childhood malnutrition* is a major public health and development concern, certainly in Sub-Saharan Africa with important health and socioeconomic consequences. In Sub-Saharan Africa, the prevalence of malnutrition among the group of under-fives is estimated at 41% (UNICEF 2000). It is the only region in the world where the number of child deaths is increasing and in which food insecurity and absolute poverty are expected to increase.

a. Malnutrition among Children under Five in Mozambique

41% of children ages 0-59 months are chronically malnourished. In other words, they are too short for their age, or stunted. The proportion of children who are stunted is almost 20 times the level expected in a healthy, well-nourished population.

Acute malnutrition, manifested by wasting, results in a child being too thin for his or her height. It affects 4% of children. 24% of children under five years are underweight for their age.

Figure 11: Percentage of malnutrition among children under five in Mozambique

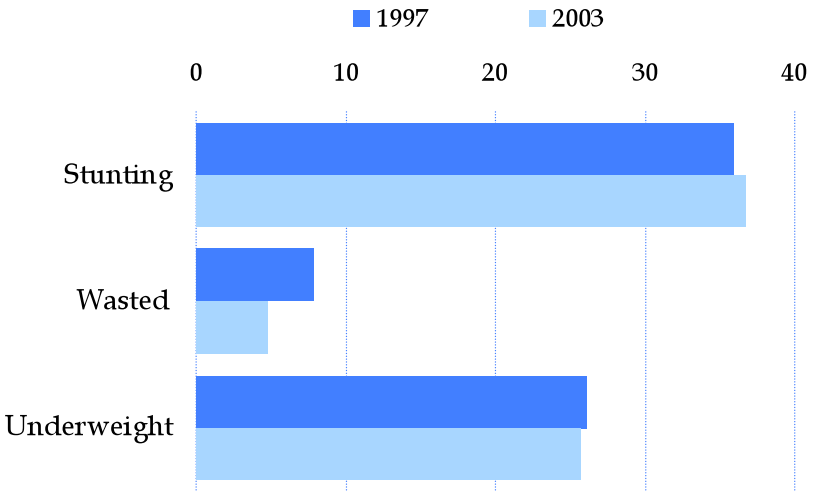


* A stunted child has a height-for-age Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. Chronic malnutrition is the result of an inadequate intake of food over a long period and may be exacerbated by chronic illness.
A wasted child has a weight-for-height Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. Acute malnutrition is the result of a recent failure to receive adequate nutrition and may be affected by acute illness, especially diarrhea.
An underweight child has a weight-for-age Z-score that is below -2 SD based on the NCHS/CDC/WHO reference population. This condition can result from either chronic or acute malnutrition or a combination of both.

b. Time trend in malnutrition among children under 3 years old

The findings of the 2003 Mozambique DHS suggest that the nutritional status of children in Mozambique has not changed much since 1997 (DHS).

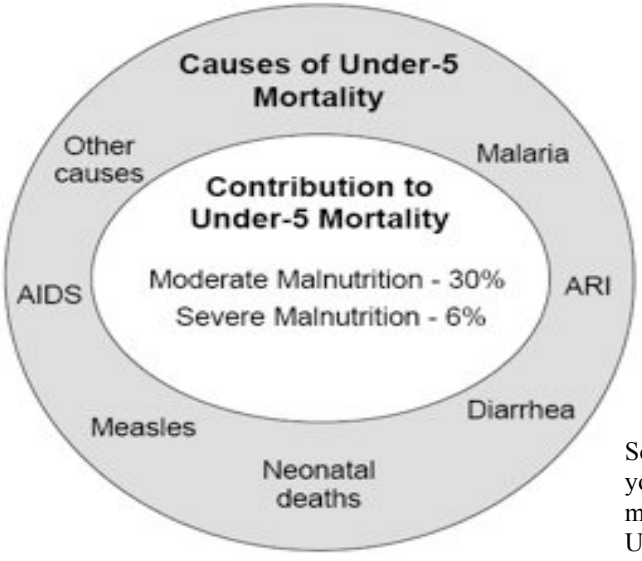
Figure 12: Trend in percentage of children under 3 who are malnourished



c. Contribution of malnutrition to U5MR in Mozambique

Malnutrition is one of the most important health and welfare problems among infants and young children in Mozambique. 36% of all deaths in Mozambique that occur before age five are related to malnutrition. Because of its extensive prevalence, moderate malnutrition (30%) contributes to more deaths than severe malnutrition (6%).

Figure 13: Contribution of malnutrition to U5MR in Mozambique



Source: Nutrition of young children and mothers in Mozambique, USAID 2006

B. Objective

Previous reports like the Mozambique DHS report and the chart book entitled "Nutrition of young children and mothers in Mozambique" have illustrated associations between malnutrition and various social and economic determinants.

This assessment identifies factors that are relatively more important in reducing malnutrition and the main contributors to *inequities* in childhood malnutrition.

C. Framework for analysis

Child stunting was assessed using Mozambique Demographic and Health Survey (DHS) 2003. We used the conceptual framework for child nutritional status originally created by UNICEF and modified by USAID and tried to capture all the available variables using Mozambique Demographic and Health Survey (DHS) 2003. (See annexes 3 and 4 for the list of variables used and for the analysis)

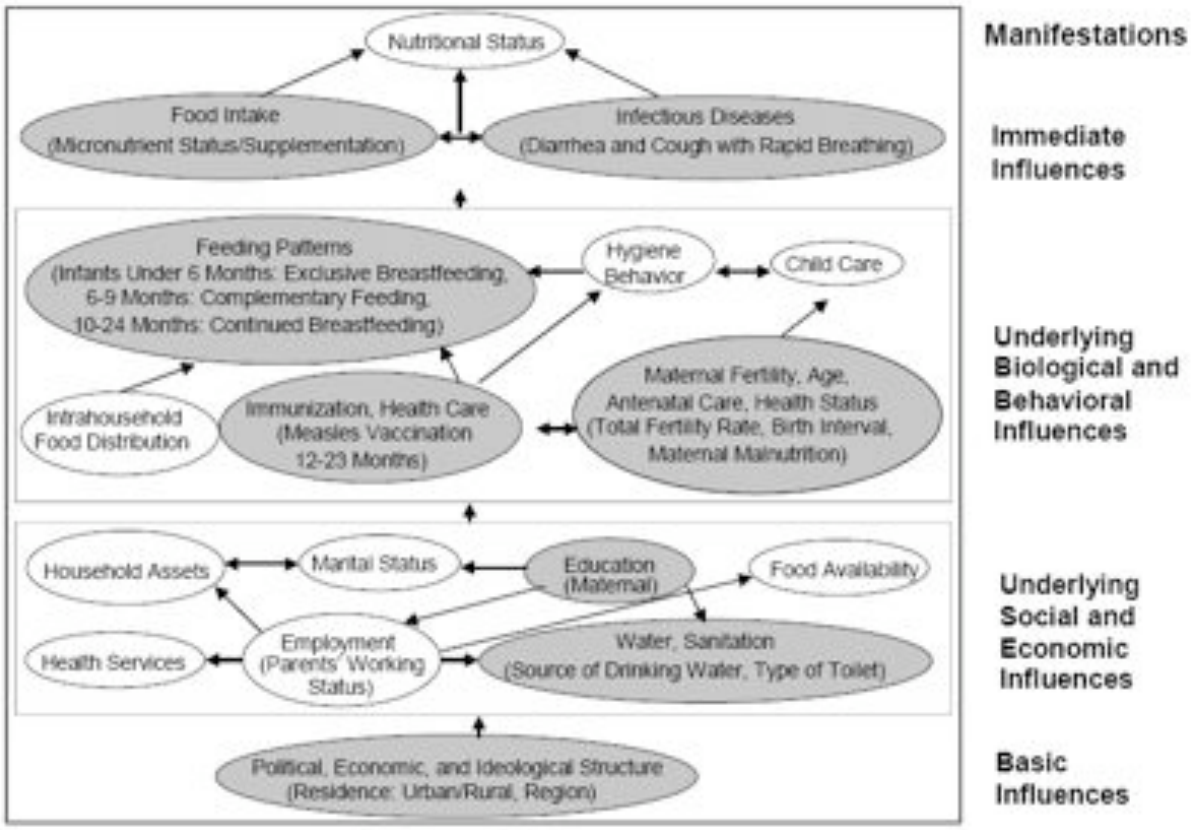
The framework illustrates malnutrition as a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food available at the household level, improper feeding practices, or both. Improper feeding practices include both the quality and quantity of foods offered to young children as well as the timing of their introduction. Poor sanitation puts young children at increased risk of illness, in particular diarrheal disease, which adversely affects their nutritional status. Both inadequate food intake and poor environmental sanitation reflect underlying social and economic conditions.

Figure 14 reflects relationships among factors and their influences on children's nutritional status.

These factors are:

- Immediate influences, such as food intake (micronutrient status and supplementation) and infectious diseases (diarrhea and respiratory infections)
- Underlying biological and behavioral influences, such as maternal fertility, measles vaccination, and feeding patterns of children under two years
- Underlying social and economic influences, such as maternal education, drinking water, and sanitation
- Basic influences, such as area of residence.

Figure 14: The conceptual framework for nutritional status

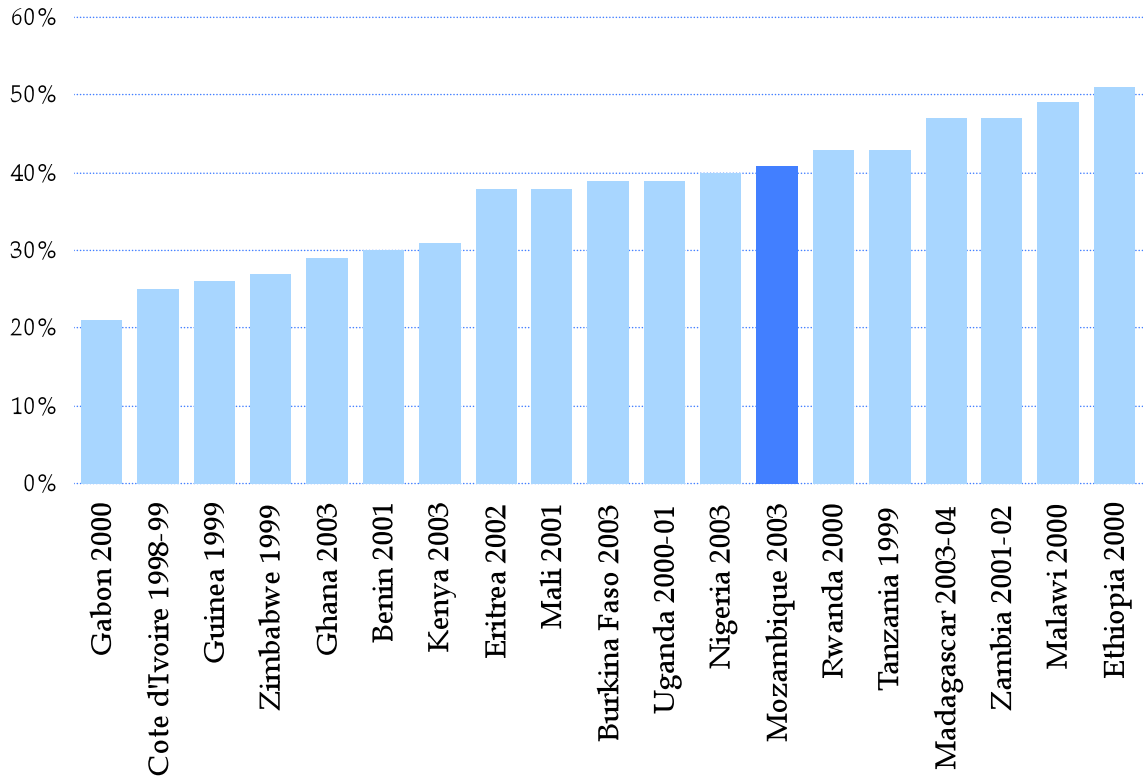


D. Results

a. Comparative performance in the region

Among the Sub-Saharan countries surveyed, the percentage of children under five who are stunted ranges from 21-51%. With 41% of children under five years of age who are stunted, Mozambique has the seventh highest rate among 19 of the Sub-Saharan countries surveyed.

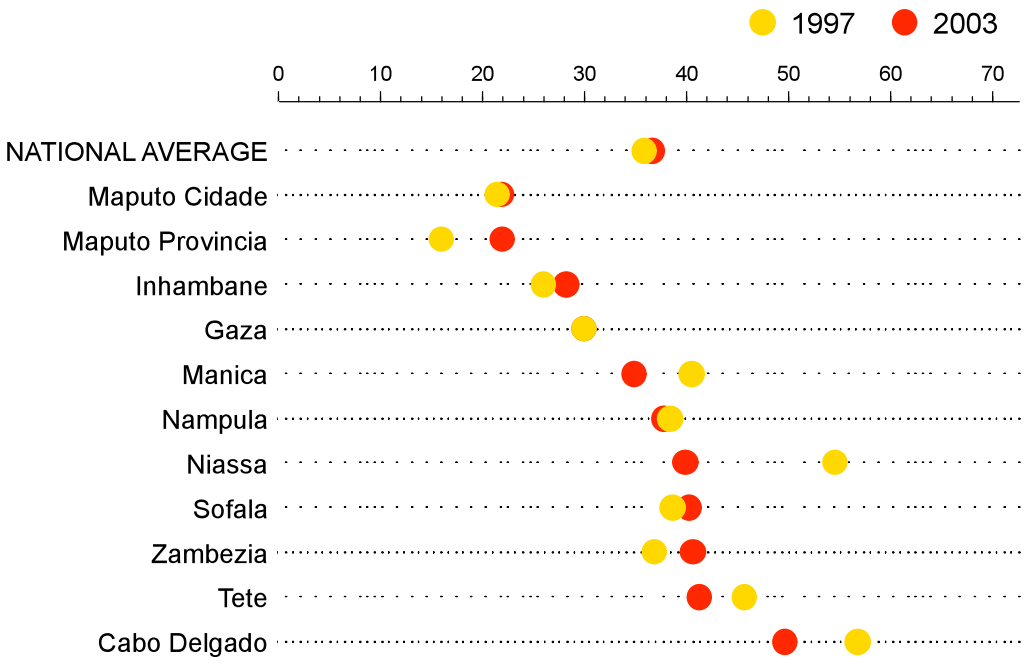
Figure 15: Stunting among children under five, Mozambique compared with other Sub-Saharan countries



b. Trends in achievement

As mentioned earlier the national average of child stunting remained unchanged between 1997 and 2003. From figure 16, we can see that for most provinces, stunting in children did not differ between 1997 and 2003 (Sofala, Nampula, Gaza, Inhambane and Maputo Cidade). However, some provinces like Niassa, Cabo Delgado, and Manica showed a decrease in stunting. On the other hand, there was a small increase in child stunting in Maputo Provincia.

Figure 16 Trends in percentage of stunted children, by province, Mozambique, 1997 and 2003

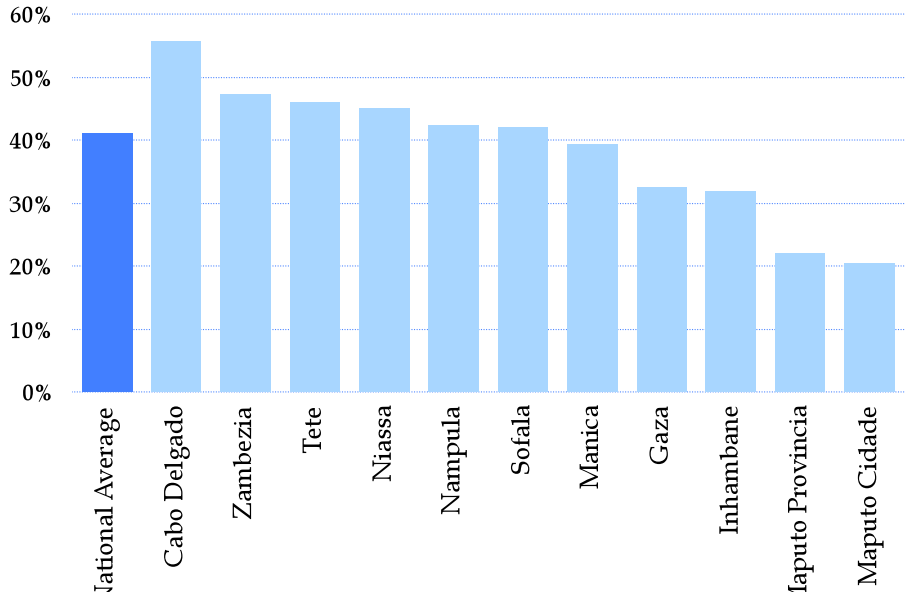


c. Disparities in child malnutrition

Below are some simple associations of different determinants with malnutrition.

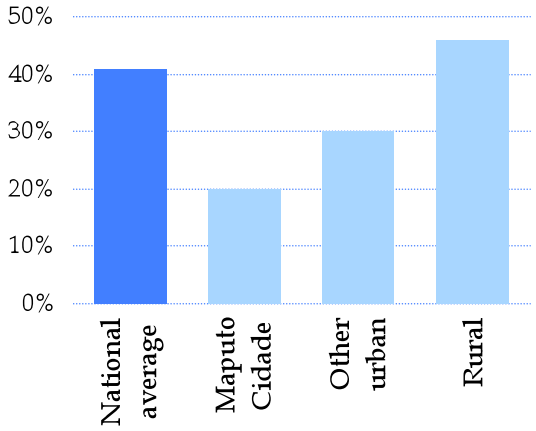
Stunting ranges from 20-56% among children in the 11 regions. Stunting rates are lowest in Maputo City (20%) and highest in the Cabo Delgado province (56%).

Figure 17: Percentage of stunted children, by province, Mozambique 1999-2003



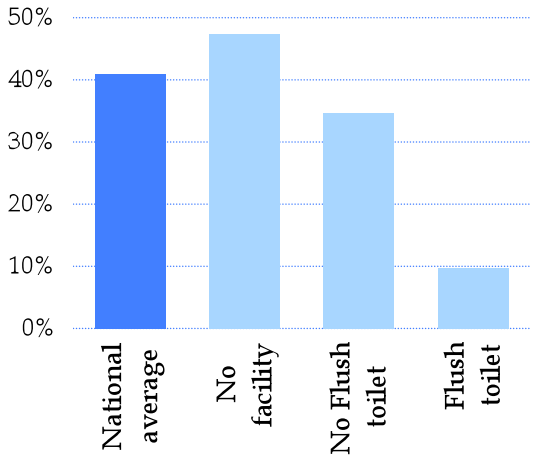
The rate of stunting is 28 % in urban areas and 46 % in rural areas.

Figure 18: Percentage of stunted children, by rural/urban, Mozambique 1999-2003



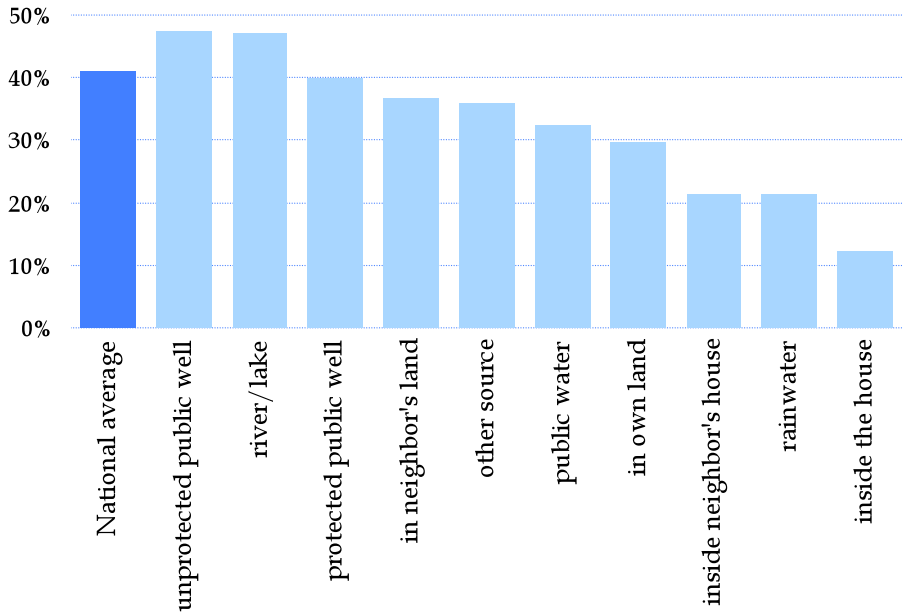
Infants and children from households that do not have access to a flush toilet are at greater risk of being malnourished than children from households with this amenity. In Mozambique, 47% of households surveyed with at least one child under five years have access to a latrine, 51% have no facilities, and only 2% of surveyed households have access to a flush toilet.

Figure 19: Percentage of stunted children, by type of toilet facility, Mozambique 1999-2003



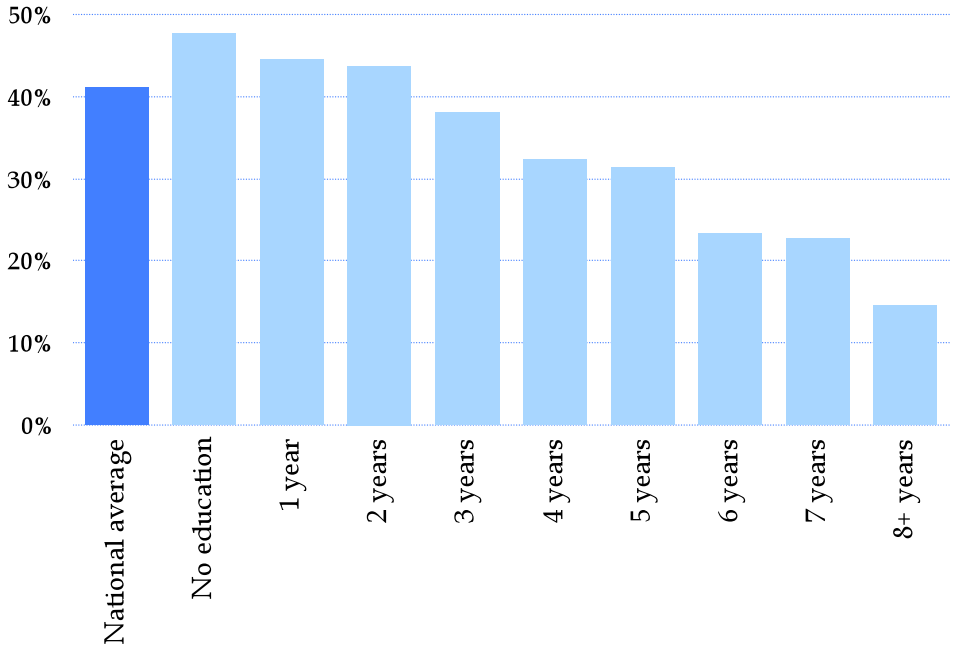
Infants and children from households that do not have a private tap are at greater risk of being malnourished than those from households with this amenity. Among the households surveyed with children under five years old, only about 5% have piped water inside the house. On the other hand, most of the households obtain their drinking water from either an unprotected well or surface water.

Figure 20: Percentage of stunted children, by source of drinking water, Mozambique 1999-2003



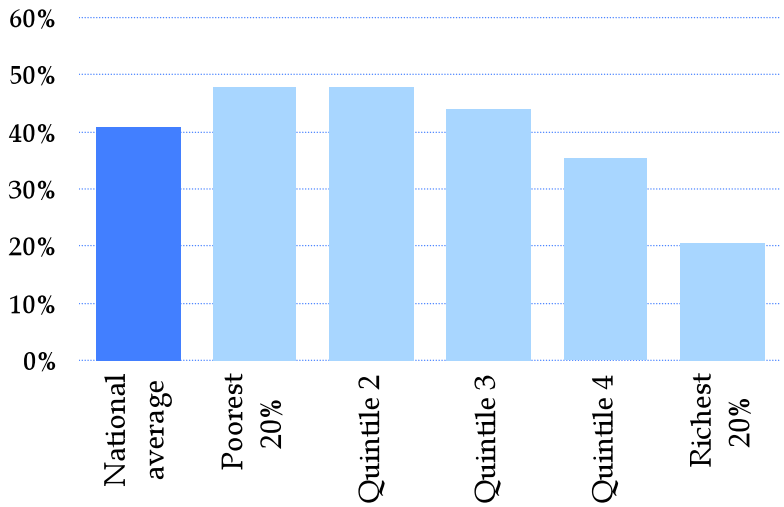
In Mozambique, child malnutrition is associated with mother's education. Child malnutrition decreases with increasing level of mother's education.

Figure 21: Percentage of stunted children, by mother's education, Mozambique 1999-2003



In addition, household's wealth is inversely related to the prevalence of stunting in children. (See annex 4 for information about the construction of the household wealth index)

Figure 22: Percentage of stunted children, by household wealth, Mozambique 1999-2003



d. Factors that influence child malnutrition

In order to determine the 'true' effect of any single factor on child malnutrition we need to simultaneously control for all other factors when determining the influence of one particular factor. In this section, we show the results of such an analysis and identify the factors that are significantly likely to influence child malnutrition.

There are four main categories of factors based on the framework described in section 3 plus the category related to child characteristics:

1. Basic influences
2. Underlying social and economic influences
3. Underlying biological and behavioural influences (at mother's level)
4. Immediate influences
5. Child characteristics

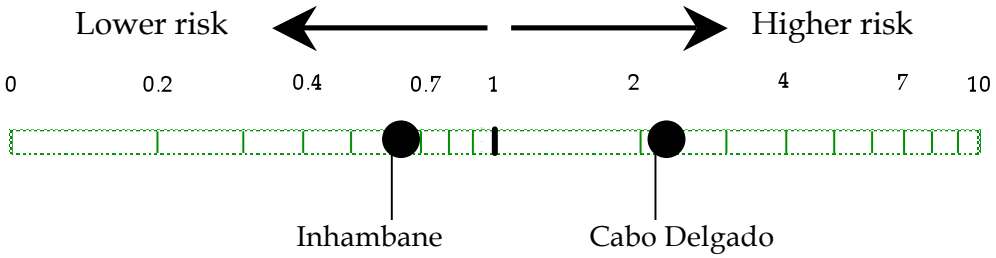
Odds ratios for factors that significantly affected risk are presented in graphs following the text in each subsection while the results of the analysis are presented in annex 5.

1. Basic influences: provinces, rural/urban areas and religion. *(See annex 3 for the description of the variables in detail)*

Malnutrition is higher in province Cabo Delgado compared to the other *provinces* after controlling for other factors (figure 23). Though there was no difference between rural and urban areas after controlling for other factors. This lack of difference appeared *after* controlling for just the source of drinking water and type of toilet. The latter implies that the effect of the area of residence on malnutrition can mainly be explained through water and sanitation.

Although the level of child malnutrition was lower among Zionists than in other *religions*, there was no significant difference between the various religions after controlling for regions and area of residence. The difference could, therefore, be due to the geographical concentration of people from the same religion.

Figure 23 Odds ratios for stunted children by region in Mozambique (ctrl: Maputo city)



2. Social and economic factors: Water and sanitation, household wealth, mother's and father's education and occupation, mother's concept about availability and accessibility to health care facilities, mother's relation with household head and her marital status. *(See the annex 3 for the description of the variables in detail)*

Child malnutrition was lower among households who had *piped water* inside the house in comparison with households who used other water sources including public water, land-located source, unprotected and protected public well and river/lake except for rainwater.

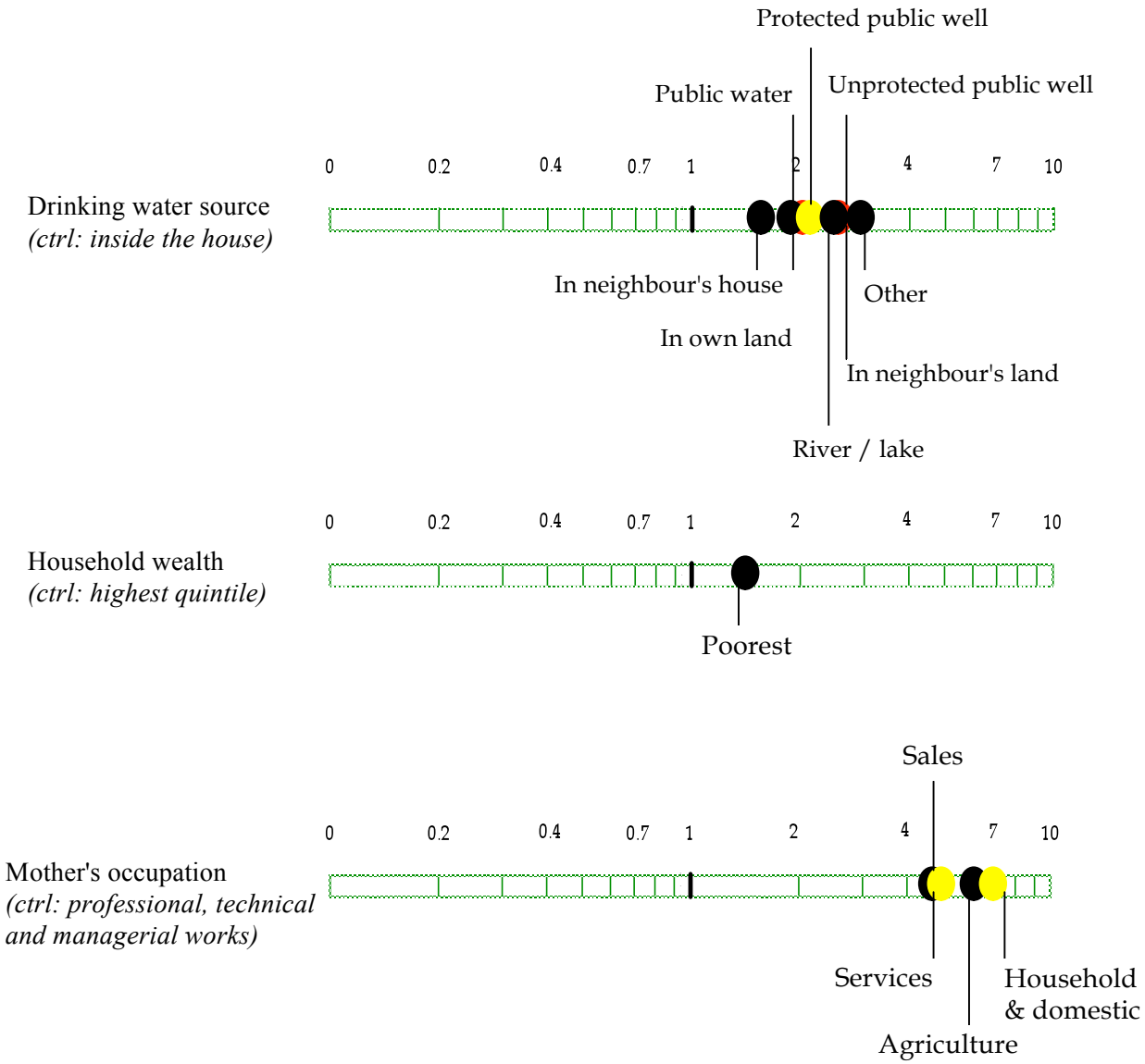
Although malnutrition was lower among households with flush *toilets* compared to those without a toilet facility or other kinds of toilets, the differences ceased to exist after controlling for other factors.

Child malnutrition was higher in the lowest *household wealth quintile* compared to highest quintile after controlling for the other factors. Mother's education didn't have an important role in child malnutrition after controlling for the other factors, but child malnutrition rate differed by mother's occupation. Children whose mothers were in the following professions were less likely to be stunted: professional, technical and managerial.

Mother's marital status, being the household head and father's education and occupation didn't have a significant role in child malnutrition after controlling for the other factors.

Figure 24 summarizes the factors -in this subsection- which had an effect on child malnutrition after considering the effects of the other factors at the same time.

Figure 24 Odds ratios for stunted children by sources of drinking water, wealth quintiles & mother's occupation



3. Biological and behavioural factors: mother's age, parity, nutritional status, birth interval, utilization of and quality of perinatal health services, measles vaccination of child, duration of child breastfeeding, disposal of the child waste, person who takes care of child, decision making on seeking health care for the child and frequency of reading newspaper, listening to radio and watching TV. *(See annex 3 for the description of the variables in detail and the previous chapter for the definition and construction of quality of perinatal health services).*

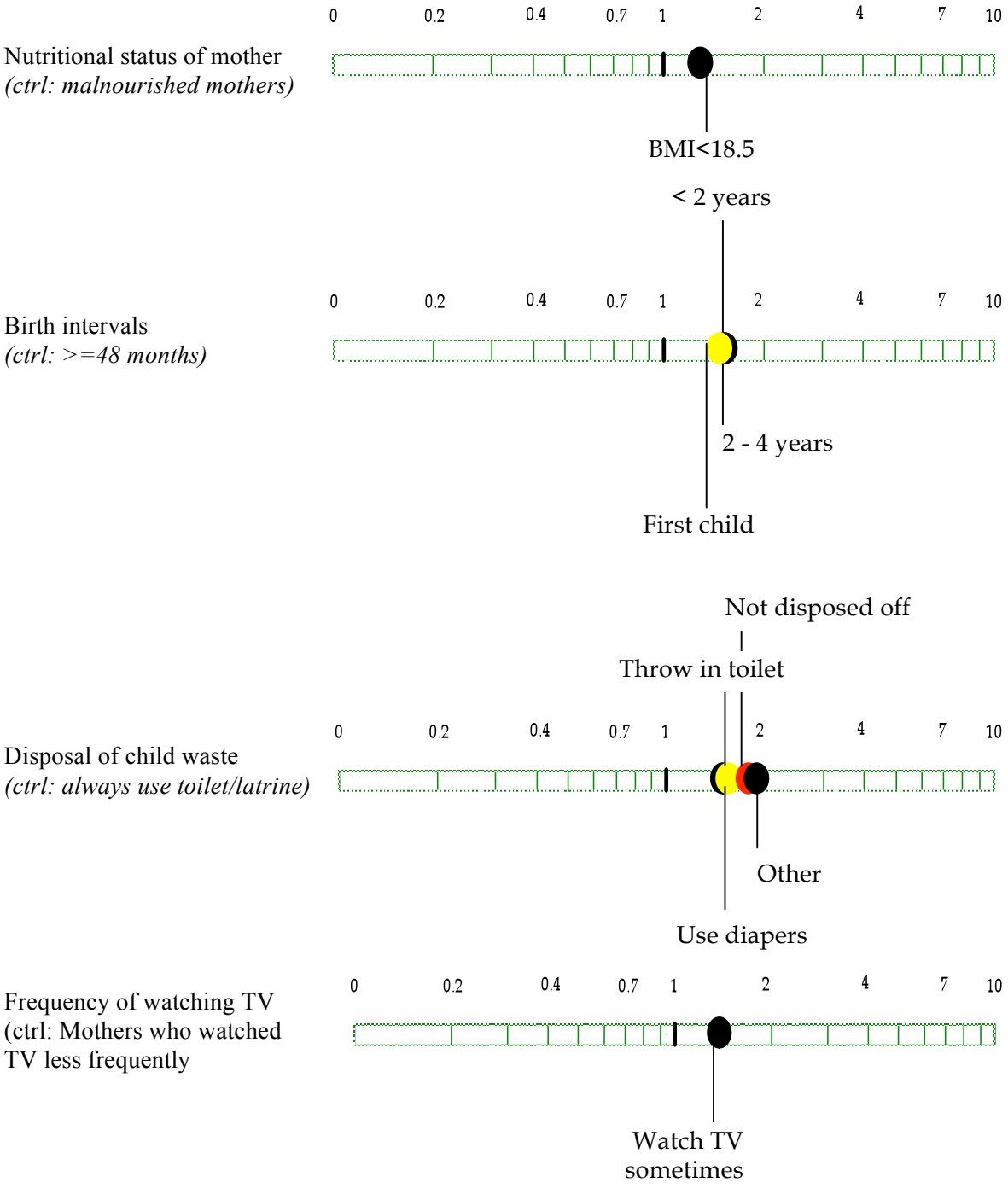
Mother's nutritional status (BMI < 18.5) and risky birth interval (<24 months) were significant determinants of child malnutrition. Other significant determinants of child malnutrition included lack of hygienic disposal of child waste and low access to information such as watching television.

However, mother's age, parity and duration of breastfeeding were not significant factors. Differences in child malnutrition did not exist when decisions about seeking health care for child was made by the mother or the partner or jointly.

Utilization of and quality of perinatal health services weren't important factors in determining child malnutrition after controlling for the other factors. Utilization of perinatal health services includes receiving valid antenatal care, place of antenatal care, tetanus injection, and skilled birth attendance.

Figure 25 summarizes the factors -in this subsection- which had an effect on child malnutrition after considering the effects of the other factors at the same time.

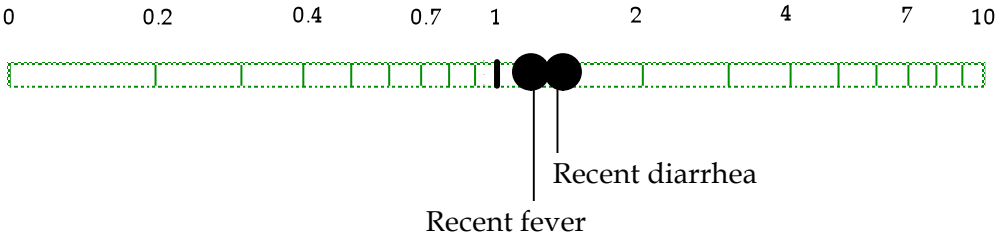
Figure 25 Odds ratio for stunted children by nutritional status of mother, birth intervals, way of child waste disposal and frequency of watching TV



4. Immediate influences

Malnutrition was higher among children with recent history of fever and diarrhea after controlling for the other factors.

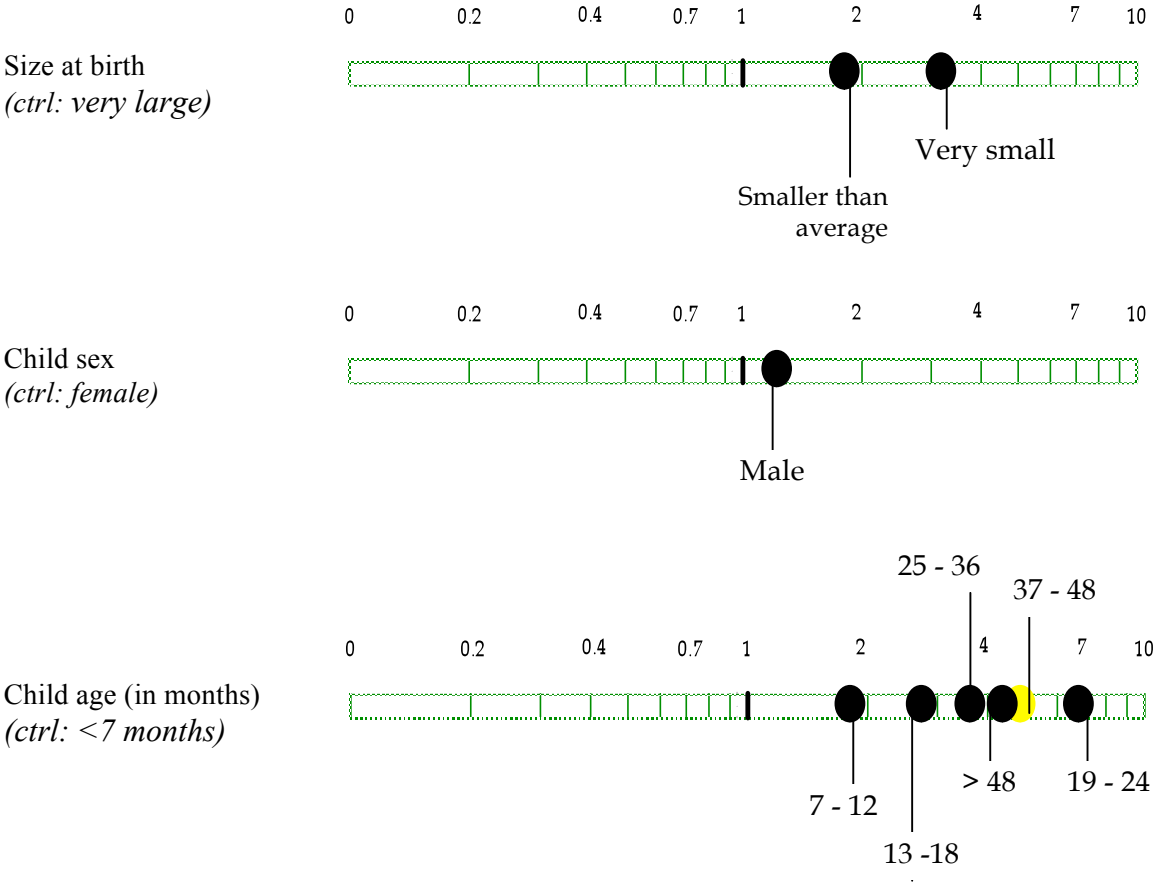
Figure 26 Odds ratios for stunted children with history of recent diarrhea or fever



5. Child characteristics

Malnutrition was higher among males, older children and those with lower size at birth.

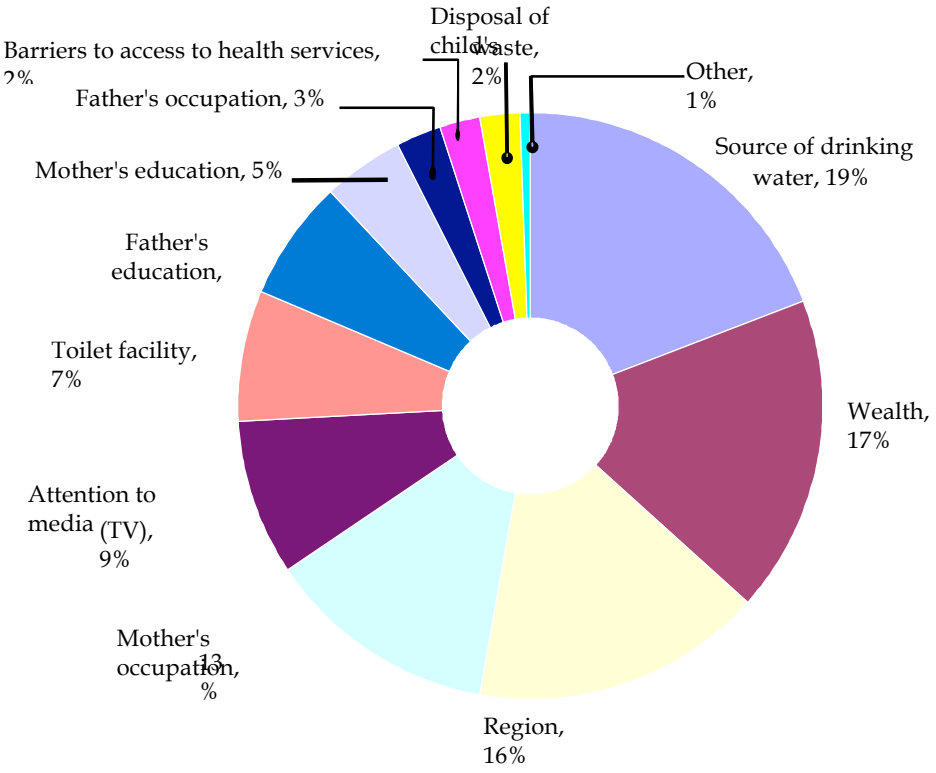
Figure 27 Odds ratios for stunted children by size at birth, child sex and age



E. Main determinants of inequality in child malnutrition

The analysis illustrates that underlying social and economic influences by themselves contribute to 70% of existing inequality in childhood malnutrition. The source of drinking water (18%), the household wealth (17%) and mother's occupation (13%) are the biggest three contributors in this category. Contribution of basic influences comes only through the regional differences (16%). Underlying biological and behavioural influences at mother's level consists nearly the rest of the contribution. Attention to media especially TV is the only big contributor (9%) in this category.

Figure 28: Contribution of determinants of childhood stunting to its economic inequality, Mozambique 1999-2003



F. Conclusions and Implications

As our analysis shows economic inequality in child malnutrition is related to factors beyond the scope of health authorities and the health care delivery system. In fact the health system related factors like access to, utilization of and quality of health services didn't have significant contribution to inequity in malnutrition. On the significant factors access to safe water is the most important contributor to inequities in malnutrition. The second most important factor is maternal occupation. Mothers who work in agriculture have a rather large contribution to the inequality in malnutrition.

As a conclusion, our assessment illustrates that intersectoral collaborations are essential to achieve a reduction in the prevalence of malnutrition and also its inequality:

1. Investment in safe water could be considered as the first priority to decrease child malnutrition, as it is the most contributor to inequality in malnutrition and also an important factor for decreasing the prevalence of child malnutrition.

Specifically we propose:

- To generate concrete mechanisms to integrate the day-to day work of both Ministries of Health and Public works to improve water supply coverage and quality in particular in the rural areas. Currently 70% of the Mozambican population lives in slums where there is no minimum of basic sanitation services with most of activities related to water supply and sanitation funded by donors, especially for rural areas.

- To abolish payments for the maintenance of the water supply system in rural areas

2. Improving the conditions of female agricultural workers should be the immediate next priority.

3. The health sector could play a vital role in the health education of mothers and in implementing a good follow-up and monitoring of low birth weight children given their significantly higher propensity to being malnourished.

References

- Factors associated with maternal mortality. Joint WHO/RTI/DGIS Project on Health Systems Research, 1994.
- Mozambique Progress on Maternal and Perinatal Mortality Reduction, Government of Mozambique, 2006
- Human Resources for Health: A Key Priority for the Ministry of Health, WHO Mozambique, 2006.
- AbouZahr C, Wardlaw T. Maternal mortality at the end of a decade: signs of progress? Bulletin of the World Health Organization 2001: 79 (6) 561-573.
- Jamisse L. et al. Reducing maternal mortality in Mozambique: challenges, failures, successes and lessons learned. International Journal of Gynecology and Obstetrics 2004: 85 203-212.
- Ronsmans C et al. Maternal mortality: who, when, where and why. Lancet 2006; 368: 1189-200.
- Mozambique Demographic and Health Surveys: Final Report 1997 and 2003
- Mozambique Demographic and Health Survey dataset, 2003. http://www.measuredhs.com/
- Africa nutrition chartbooks: Nutrition of young children and mothers in Mozambique. USAID, 2006.
- The State of the World's Children. UNICEF 1998.
- Filmer D, Pritchett L. Estimating wealth effects without expenditure data - or tears: An application to educational enrolments in states of India. Demography 2001;38:115-32.
- Wagstaff A, van Doorslaer E, Watanabe N. On decomposing the causes of health sector inequalities with an application to malnutrition inequalities in Vietnam. Journal of Econometrics 2003;112:207-23.

Annex 1 - Identifying variables for the determinants of maternal mortality

Factors (from diagram)	Proposed indicators	Available or proximate indicators from DHS 2003
A. Physical/health condition of mother	• Age (years or categories) • Nutrition status • Occurrence of complications/disease before or during pregnancy • Number of pregnancies • Outcome of and complications during previous pregnancies	• Age of mother in years categorized according to risk groups • Mother's malnutrition status • During pregnancy did the following complications arise: - swelling in the feet - blurred vision - migraines - collapses - vaginal infection - pain/burning while urinating - bleeding - problems with night vision • Total number of children ever born • Number of previous pregnancies that miscarried, aborted or ended in stillbirth
B. Utilization of maternal health services	• Gestational age at time of first antenatal visit • Frequency of antenatal care attendance • Type of health facility for delivery (public / private) • Condition of mother upon arrival at health facility *Preference for non-institutional delivery* • Reason(s) for mother to prefer delivering at home • Distance between home and nearest facility • Mode of transport to reach health facility	• Number of months pregnant when first received antenatal care for last pregnancy (*categorized by trimesters*) • Number of times received antenatal care during pregnancy (*categorized according to WHO definition of valid antenatal care*) • Type of health care provider seen for ANC (*doctor, nurse/midwife and auxiliary midwife counting as skilled*) • Type of health facility where ANC was

Factors (from diagram)	Proposed indicators	Available or proximate indicators from DHS 2003
		received (*home, public, private*) • Reasons for not delivering in a health facility: - costs too much - facility not open /no transport - poor quality service - no female provider - family did not allow - not necessary, not customary, other • Distance to nearest health facility
C. Quality of case management and availability of services	• Appropriateness of actions taken during pregnancy at ANC site • Complications during labour • Appropriateness of actions taken given the complications *Variables for availability of services are recommended; which are not recorded in the DHS. These include:* • Number of staff for maternal services at health facility and their qualifications and experience • Number of antenatal visits and number of deliveries per month for past 12 months • Availability of functional and non-functional transport facilities for referral • Availability of essential obstetric drugs • Availability of blood or plasma for transfusion	• Were the following done during pregnancy at least once (*WHO rec.*): - were you weighed? - blood pressure measured? - urine sample taken? - blood sample taken? • Referral for pregnancy complications • Drugs taken for malaria prevention • Number of days taken iron tablets or syrup • Offered HIV/AIDS test as part of antenatal care

Factors (from diagram)	Proposed indicators	Available or proximate indicators from DHS 2003
D. Socio-economic variables	• Marital status of the mother • Composition of household • Education level of the mother • Economic status • Occupation • Area of residence	• Marital status of mother • Person making decision on health care for the mother • Relationship to household head • Sex of household head • Education of mother in years (*categorized appropriately*) • Frequency of reading newspaper / magazine • Frequency of listening to radio • Frequency of watching television • Religion of mother • Wealth quintiles using principal components analysis • Mother's occupational status • Region of residence • Area of residence

Annex 2 - Results of multivariate logistic regression of skilled birth attendance, Mozambique 1999-2003

Determinants of skilled birth attendance		Odds ratio	p-value
1. Physical/health condition of mother			
1.1 Age group	(*control: 20 - 34 years*)		
	15 - 19 years	0.933	0.644
	>= 35 years	0.959	0.707
1.2 Mother's nutrition status	(*control: BMI>=18.5*)		
	Malnutrition status (BMI<18.5)	1.076	0.596
1.3 Pregnancy complications	(*control: No pregnancy complication*)		
	Low hypertension	0.960	0.762
	Mid hypertension	1.176	0.300
	Severe hypertension	1.205	0.110
	Blurred vision	0.755	0.037
	Vaginal infection	1.145	0.274
	Urinary infection	0.897	0.421
	Bleeding	1.013	0.950
	Night vision	1.034	0.873
1.4 Total number of children	(*control: 0 - 3 children*)		
	4-5 children	1.013	0.901
	6-9 children	1.074	0.536
	>=10 children	1.219	0.414
1.5 History of terminated pregnancies	(*control: No history of terminated pregnancy*)		
	Terminated pregnancy	0.886	0.292
1.6 Birth interval	(*control: Greater than 48 months*)		
	<2 y	1.245	0.123

Determinants of skilled birth attendance		Odds ratio	p-value
	2 - 4 y	1.304	0.014
	first child	1.031	0.849
2. Utilization of maternal health services			
2.1 Valid antenatal care	(*control: Not valid antenatal care*)		
	Valid antenatal	0.653	0.000
2.2 Place of antenatal care	(*control: Government health centre*)		
	Government hospital	1.021	0.899
	Fieldworker	6.306	0.000
	Other public	5.222	0.044
	Private/other	0.676	0.392
2.3 Perceived barriers to access a big problem	(*control: Barrier is a small problem*)		
	Knowing where to go	1.684	0.004
	Getting permission to go	0.627	0.015
	Having money for treatment	1.146	0.119
	Distance	1.770	0.000
	Transport	1.011	0.924
	Not wanting go alone	1.308	0.045
	No female provider	0.894	0.503
3. Quality of case management			
3.1 Quality of antenatal care	(*control: Low quality antenatal care*)		
	Mid quality antenatal care	0.686	0.008
	High quality antenatal care	0.494	0.000
	No antenatal care	6.600	0.000
4. Socio-economic factors			
4.1 Marital status	(*control: Currently married*)		

Determinants of skilled birth attendance		Odds ratio	p-value
	Never married	1.068	0.736
	Formerly married	1.049	0.709
4.2 Person making decision on health care	(*control: Self only*)		
	Self and partner/other	0.942	0.600
	Other only	1.129	0.267
4.3 Relationship to household head	(*control: Self or wife of head*)		
	Other person head	0.788	0.054
4.4 Sex of household head	(*control: Female head*)		
	Male head	1.094	0.456
4.5 Mother's education	(*control: Completed primary and higher*)		
	No education	4.300	0.000
	0-1 primary	3.686	0.001
	2 primary	3.838	0.000
	3 primary	2.760	0.008
	4 primary	2.091	0.060
	5 primary	2.253	0.030
	6 primary	1.320	0.480
	7 primary	1.361	0.486
4.6 Frequency of accessing information	(*control: Activity at least once a week*)		
	Never read	2.081	0.057
	Once a week	2.207	0.055
	Never listen	0.921	0.561
	Once a week	1.047	0.596
	Never watch	1.220	0.313
	Once a week	0.859	0.475
4.7 Religion	(*control: Catholic*)		

Determinants of skilled birth attendance		Odds ratio	p-value
	Moslem	0.813	0.254
	Zionist	1.144	0.411
	Protestant	0.827	0.112
	Other	0.790	0.720
4.8 Household wealth	(*control: Poorest 20%*)		
	Q2	0.852	0.135
	Q3	0.637	0.000
	Q4	0.500	0.000
	Q5	0.370	0.000
4.9 Mother's occupational status	(*control: Not employed*)		
	Professional	1.047	0.941
	Clerical	1.688	0.494
	Sales	0.905	0.576
	Agriculture	1.260	0.137
	Household and domestic	2.538	0.003
	Services	0.681	0.633
	Manual	0.733	0.414
	Other		
4.10 Region	(*control: Maputo Cidade*)		
	Niassa	0.528	0.076
	Cabo Delgado	1.855	0.073
	Nampula	0.866	0.647
	Zambezia	0.383	0.003
	Tete	0.542	0.047
	Manica	0.396	0.010
	Sofala	0.477	0.014

Determinants of skilled birth attendance		Odds ratio	p-value
	Inhambane	0.671	0.188
	Gaza	0.634	0.170
	Maputo Provincia	0.380	0.008
4.11 Area of residence	(*control: Urban*)		
	Migrated to urban	1.111	0.566
	Rural	1.909	0.000

Annex 3 - Variables used in the study of child malnutrition

Variables	Categories
Basic influences	
Region	(ctrl: Maputo city)
	Niassa
	Cabo Delgado
	Nampula
	Zambezia
	Tete
	Manica
	Sofala
	Inhambane
	Gaza
	Maputo province
Area of residence	(ctrl: Urban)
	Rural
Religion	(ctrl: Zionist)
	Catholic
	Moslems
	Protestant /evangelic
Underlying social and economic influences	
Toilet facility	(ctrl: Flush toilet)
	No facility
	No Flush toilet
Source of drinking water	(ctrl: inside the house)
	inside neighbour's house
	public water
	in own land
	in neighbour's land
	unprotected public well
	protected public well
	river/lake
	rainwater
	other
Household wealth	(ctrl: 5th quintile)
	1st wealth quintile
	2nd wealth quintile
	3rd wealth quintile
	4th wealth quintile

Variables	Categories
Relationship to household head	Head
	Wife
	Others
Mother's age	(ctrl: 20-34
	<20
	35-49
Mother's marital status	(ctrl: currently married)
	formerly married
	never married
Mother's education	(ctrl: 8+)
	No education
	1
	2
	3
	4
	5
	6
	7
Mother's occupation	(ctrl: professional, technical, managerial)
	not working
	clerical
	sales
	agriculture
	household & domestic
	services
	manual
Father's education	(ctrl: 13+)
	No education
	1-5
	6-7
	8-12
Father's occupation	(ctrl: professional, technical, managerial)
	not working
	clerical
	sales
	agriculture
	household & domestic
	services
	manual

Variables	Categories
	others
Decision on healthcare	(ctrl: herself)
	herself and someone else jointly
	someone else
Mother's perception about difficulty in access to health services	
Where to go	(ctrl: yes)
Permission to go	(ctrl: yes)
Money for treatment	(ctrl: yes)
Distance	(ctrl: yes)
Transport	(ctrl: yes)
Not go alone	(ctrl: yes)
No female provider	(ctrl: yes)
Underlying biological and behavioral influences (mother's level)	
Parity	(ctrl: <4)
	4-5
	6-9
	>10
Mother's nutritional status	(ctrl: BMI>=18.5)
	Malnourished
Tetanus injection	(ctrl: at least 2 doses)
	No or one dose
Valid antenatal care	(ctrl: at least 4 visit by skilled personnel)
	<4
Skilled Birth Attendance	(ctrl: yes)
Place of antenatal care	(ctrl: health facilities
	Government hospital
	Fieldworker/other public
	Private/other
Quality of health care	(ctrl: high)
	low
	Medium
Birth interval	(ctrl: >=48 months)
	<24
	24-47
	1st order
Measles vaccination	(ctrl: yes)
Disposal of child waste	(ctrl: always use toilet/ latrine)
	throw in toilet/latrine

Variables	Categories
	throw outside the yard/not disposed of
	bury in the yard
	throw in the trash
	use diapers
	bury/throw in the bush
	other
Person taking care of child	(ctrl: mother)
	Oldest sister/brother or mother's partner
	others
Decision on seeking child health care	(ctrl: by mother)
Breastfeeding	(ctrl: 0 month)
	1-6
	7-12
	13-24
	>24
Immediate influences	
Recent fever	(ctrl: no)
Recent cough	(ctrl: no)
Recent diarrhea	(ctrl: no)
Child characteristics	
Child size at birth time	(ctrl: very large)
	Larger than average
	Average
	Smaller than average
	Very small
Child sex	(ctrl: female)
	Male
Child age	(ctrl: <7months)
	7-12
	13-18
	19-24
	25-36
	37-48
	>48
Reading newspapers	(ctrl: At least once a week)
	Less than once a week
	not at all
Listening to radio	(ctrl: At least once a week)
	Less than once a week

Variables	Categories
	not at all
Watching TV	(ctrl: At least once a week)
	Less than once a week
	not at all

Annex 4 - Explanatory notes on the household wealth index, the concentration index and decomposition analysis

The DHS has not collected data on self-reported income or expenditure, but provides information on ownership of asset variables. Principal components analysis (PCA) is a statistical method that enables us to develop an index of the household wealth based on the asset variables. In fact, PCA is a technique for extracting from a large number of variables those few orthogonal linear combinations of the variables that best capture the common information. Intuitively, the first principal component is the linear index of all the variables that captures the largest amount of information that is common to all of the variables.

The result of principal components is an asset index for each household (A_j) based on the formula:

$$A_j = \sum_{i=1}^{N} f_i * \left(a_{ji} - a_i\right) / s_i$$

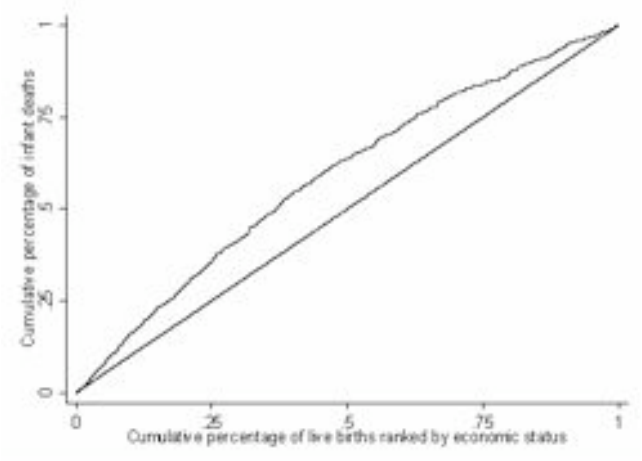
where f_i is the "scoring factor" for i_{th} asset as determined by the procedure, a_{ji} is the j_{th} household's value for the i_{th} asset and a_i and s_i are the mean and standard deviation of i_{th} asset variable over all households.

The crucial assumption - and it is just an assumption - is that household long-run wealth is what causes the most common variation in asset variables. Scoring factor is the "weight' assigned to each variable (normalized by its mean and standard deviation) in the linear combination of the variables that constitute the first principal component.

The concentration index and curve have provide a means of assessing the degree of socioeconomic inequality in the distribution of a health variable. For example, they could be used to assess whether infant/child mortality is more unequally distributed to the disadvantage of children in households with a lower socioeconomic status in one country/province than another.

There two variables underlying the concentration curve: the health variable, the distribution of which is the subject of interest; and a variable of socioeconomic status, against which the distribution is to be assessed. As shown in Figure A1, the concentration curve plots the cumulative proportions of a health variable (y-axis) against the cumulative percentage of the sample, ranked by their socioeconomic status, beginning with the most disadvantaged, and ending with the least disadvantaged (x-axis).

Figure A1 The concentration curve



If the health variable is equally distributed among socioeconomic status, the concentration curve will be a 45° line. This is known as the line of equality. If, by contrast, the health variable takes higher (lower) values among people with lower socioeconomic status, the concentration curve will lie above (below) the line of equality. The further the curve lies from the line of equality, the greater the degree of inequality in health.

The concentration index is defined with reference to the concentration curve. The health concentration index, denoted by C, is defined as twice the area between the concentration curve and the line of equality. So, in the case where there is no socioeconomic inequality, the concentration index is zero. The value of the concentration index can vary between –1 and +1. Its negative values imply that a variable is concentrated among disadvantaged people while the opposite is true for its positive values. When there is no equality, the concentration index will be zero. If the health variable is "bad", such as infant death, a negative value of the concentration index means it is higher among the most disadvantaged.

The concentration index can be computed as twice the (weighted) covariance of the health variable and a person's relative rank in terms of economic status, divided by the variable mean, according to equation (1).

$$C = \frac{2}{\mu}\mathrm{cov}_w(y_i, R_i) \qquad (1)$$

where y_i and R_i are the health status of the ith individual and the fractional rank of the ith individual (for weighted data) in terms of household economic status, respectively, μ is the (weighted) mean of the health of the sample and cov_w denotes the weighted covariance.

The method proposed by Wagstaff, Van Doorslaer, and Watanabe was used to decompose socioeconomic inequality in infant mortality into its determinants. A decomposition analysis allows one to estimate how determinants proportionally

contribute to inequality (e.g., the gap between poor and rich) in a health variable. They showed that for any linear regression model linking the health variable of interest, y; to a set of K health determinants, x_k:

$$y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i \qquad (2)$$

where ε is an error term. Given the relationship between y_i and x_{ki} in equation (2), the concentration index for y (C) can be written as:

$$C = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu} \right) C_k + \frac{GC_\varepsilon}{\mu} = C_{\hat{y}} + \frac{GC_\varepsilon}{\mu} \qquad (3)$$

where μ is the mean of y, $\bar{x}_k$ is the mean of x_k, C_k is the concentration index for x_k (defined analogously to C). In the last term (which can be computed as a residual), GC_ε is the generalized concentration index for ε_i.

Equation (3) shows that C can be thought of as being made up of two components. The first is the deterministic, or "explained", component. This is equal to a weighted sum of the concentration indices of the regressors, where the weights are simply the elasticities[†] $(\beta_k \bar{x}_k / \mu)$ of y with respect to each x_k. The second is a residual, or "unexplained", component. This reflects the inequality in health that cannot be explained by systematic variation in the x_k across socioeconomic groups.

The method allows to establish which factors contribute to greater inequality and how, i.e. through the more unequal distribution of the determinant or through the greater effect on mortality. In other words, this method enables us to quantify the pure contribution of each determinant of a health variable - controlled for the other determinants - to socioeconomic inequality in that health variable. However, as the concentration index of a health variable can only be decomposed into the concentration indices of its determinants additively, the usefulness of the method is limited to linear models.

[†] An elasticity is a unit-free measure of (partial) association, i.e. the % change in the dependent variable (health or infant mortality in this case) associated with a % change in the explanatory variable.

Annex 5 - Results of multivariate logistic regression of childhood stunting, Mozambique 1999-2003

Determinants of childhood malnutrition		Odds Ratio	p-value
Basic influences			
Region	(ctrl: Maputo city)		
	Niassa	1.32	0.239
	Cabo Delgado	2.23	0.000
	Nampula	1.07	0.761
	Zambezia	1.29	0.254
	Tete	1.26	0.308
	Manica	1.08	0.688
	Sofala	1.21	0.400
	Inhambane	0.63	0.019
	Gaza	0.77	0.205
	Maputo province	0.82	0.302
Area of residence	(ctrl: Urban)		
	Rural	0.95	0.661
Religion	(ctrl: Zionist)		
	Catholic	0.98	0.863
	Moslems	0.97	0.877
	Protestant /evangelic	1.03	0.787
Underlying social and economic influences			
Toilet facility	(ctrl: Flush toilet)		
	No facility	1.38	0.516
	No Flush toilet	1.17	0.752
Source of drink. water	(ctrl: inside the house)		
	inside neighbour's house	1.54	0.053
	public water	2.00	0.001
	in own land	1.85	0.053
	in neighbor's land	2.51	0.001
	unprotected public well	2.50	0.000
	protected public well	2.08	0.001
	river/lake	2.43	0.000
	rainwater	1.49	0.388
	other	2.88	0.007
Household wealth	(ctrl: 5th quintile)		
	1st wealth quintile	1.39	0.037

Determinants of childhood malnutrition		Odds Ratio	p-value
	2nd wealth quintile	1.29	0.137
	3rd wealth quintile	1.18	0.275
	4th wealth quintile	1.05	0.711
Relationship to household head	(ctrl: head)		
	Wife	0.95	0.680
	Others	1.01	0.964
Mother's marital status	(ctrl: currently married)		
	formerly married	1.44	0.427
	never married	1.20	0.187
Mother's education	(ctrl: 8+)		
	No education	1.10	0.715
	1	0.92	0.759
	2	1.05	0.864
	3	0.99	0.977
	4	0.81	0.440
	5	1.03	0.902
	6	0.83	0.500
	7	0.88	0.671
Mother's occupation	(ctrl: professional, technical, managerial)		
	not working	3.74	0.081
	clerical	8.85	0.061
	sales	4.64	0.016
	agriculture	6.03	0.004
	household & domestic	6.87	0.007
	services	4.93	0.031
	manual	2.66	0.180
Father's education	(ctrl: 13+)		
	No education	1.43	0.400
	1-5	1.41	0.405
	6-7	1.37	0.458
	8-12	1.07	0.878
Father's occupation	(ctrl: professional, technical, managerial)		
	not working	1.03	0.948
	clerical	0.93	0.818
	sales	0.94	0.747

Determinants of childhood malnutrition		Odds Ratio	p-value
	agriculture	1.03	0.874
	household & domestic	1.52	0.293
	services	0.87	0.497
	manual	0.96	0.826
	others	2.40	0.062
Decision on healthcare	(ctrl: herself)		
	herself and someone else jointly	1.02	0.823
	someone else	1.14	0.107
Mother's concept about difficulty in access to health services			
Where to go	(ctrl: yes)		
	No	1.26	0.143
Permission to go	(ctrl: yes)		
	No	1.23	0.231
Money for treatment	(ctrl: yes)		
	No	1.12	0.128
Distance	(ctrl: yes)		
	No	1.24	0.027
Transport	(ctrl: yes)		
	No	0.76	0.008
Not go alone	(ctrl: yes)		
	No	1.04	0.763
No female provider	(ctrl: yes)		
	No	0.85	0.296
Underlying biological and behavioral influences (mother's level)			
Mother's age	(ctrl: 20-34)		
	<20	1.17	0.252
	35-49	1.09	0.380
Parity	(ctrl: <4)		
	4-5	0.96	0.637
	6-9	0.93	0.499
	>10	1.24	0.302
Mother's nutritional status	(ctrl: BMI>=18.5)		
	Malnourished	1.28	0.038
Tetanus injection	(ctrl: at least 2 doses)		
	No or one dose	0.81	0.019

Determinants of childhood malnutrition		Odds Ratio	p-value
Valid antenatal care	(ctrl: at least 4 visit by skilled personnel)		
	<4	0.92	0.370
Skilled Birth Attendance	(ctrl: yes)		
	No	1.10	0.265
Place of antenatal care	(ctrl: health facilities)		
	Government hospital	1.13	0.431
	Fieldworker/other public	1.50	0.131
	Private/other	0.93	0.870
Quality of health care	(ctrl: high)		
	low	1.20	0.212
	Medium	1.09	0.436
Reading newspapers	(ctrl: At least once a week		
	Less than once a week	1.39	0.278
	not at all	1.24	0.500
Listening to radio	(ctrl: At least once a week		
	Less than once a week	0.91	0.462
	not at all	0.97	0.749
Watching TV	(ctrl: At least once a week		
	Less than once a week	1.37	0.051
	not at all	1.19	0.277
Birth interval	(ctrl: >=48 months)		
	<24	1.50	0.000
	24-47	1.51	0.000
	1st order	1.45	0.002
Measles vaccination	(ctrl: yes		
	No	0.81	0.037
Disposal of child waste	(ctrl: always use toilet/latrine)		
	throw in toilet/latrine	1.46	0.022
	throw outside the yard/not disposed of	1.52	0.038
	bury in the yard	1.31	0.142
	throw in the trash	0.92	0.782
	use diapers	1.75	0.005
	bury/throw in the bush	1.21	0.382
	other	1.86	0.020
Person taking care of child	(ctrl: mother)		

Determinants of childhood malnutrition		Odds Ratio	p-value
	Oldest sister/ brother or mother's partner	1.03	0.776
	others	0.79	0.045
Decision on seeking child health care	(ctrl: by mother)		
	No	0.96	0.663
Breastfeeding	(ctrl: 0 month)		
	1-6	0.88	0.673
	7-12	1.58	0.124
	13-24	1.74	0.074
	>24	1.30	0.509
Immediate influences			
Recent fever	(ctrl: no)		
	Yes	1.16	0.042
Recent cough	(ctrl: no)		
	Yes	1.10	0.285
Recent diarrhea	(ctrl: no)		
	Yes	1.35	0.001
Child characteristics			
Child size at birth time	(ctrl: very large)		
	Larger than average	1.06	0.704
	Average	1.40	0.066
	Smaller than average	1.79	0.001
	Very small	3.13	0.001
Child sex	(ctrl: female)		
	Male	1.20	0.004
Child age	(ctrl: <7months)		
	7-12	1.79	0.013
	13-18	2.71	0.000
	19-24	6.77	0.000
	25-36	3.60	0.000
	37-48	4.80	0.000
	>48	4.32	0.000

Annex 6 - Map of Mozambique by Province

Annex 7 - Health and Demographic Indicators in Mozambique

(World Health Statistics 2006)

Indicator	Value (year)
Life expectancy at birth (years) males (?)	44.0 (2004)
Life expectancy at birth (years) females (?)	46.0 (2004)
Healthy life expectancy (HALE) at birth (years) males (?)	36.3 (2002)
Healthy life expectancy (HALE) at birth (years) females (?)	37.5 (2002)
Probability of dying (per 1 000 population) between 15 and 60 years (adult mortality rate) males (?)	627 (2004)
Probability of dying (per 1 000 population) between 15 and 60 years (adult mortality rate) females (?)	549 (2004)
Probability of dying (per 1 000 population) under five years of age (under-5 mortality rate) males (?)	154 (2004)
Probability of dying (per 1 000 population) under five years of age (under-5 mortality rate) females (?)	150 (2004)
Infant mortality rate (per 1 000 live births) (?)	102.0 (2004)
Neonatal mortality rate (per 1 000 live births) (?)	48 (2000)
Maternal mortality ratio (per 100 000 live births) (?)	1,000 (2000)
Deaths due to HIV/AIDS (per 100 000 population per year) (?)	110,000 (2003)
Deaths due to tuberculosis among HIV-negative people (per 100 000 population) (?)	62 (2004)
Deaths due to tuberculosis among HIV-positive people (per 100 000 population) (?)	67 (2004)
Age-standardized mortality rate for non-communicable diseases (per 100 000 population) (?)	720.0 (2002)
Age-standardized mortality rate for cardiovascular diseases (per 100 000 population) (?)	370.6 (2002)
Age-standardized mortality rate for cancer (per 100 000 population) (?)	124.5 (2002)
Age-standardized mortality rate for injuries (per 100 000 population) (?)	66.0 (2002)
Years of life lost to communicable diseases (%) (?)	91.1 (2002)
Years of life lost to non-communicable diseases (%) (?)	6.6 (2002)
Years of life lost to injuries (%) (?)	2.3 (2002)
Deaths among children under five years of age due to neonatal causes (%) (?)	29.0 (2000)
Deaths among children under five years of age due to HIV/AIDS (%) (?)	12.9 (2000)
Deaths among children under five years of age due to diarrhoeal diseases (%) (?)	16.5 (2000)
Deaths among children under five years of age due to measles (%) (?)	0.3 (2000)
Deaths among children under five years of age due to malaria (%) (?)	18.9 (2000)
Deaths among children under five years of age due to pneumonia (%) (?)	21.2 (2000)
Deaths among children under five years of age due to injuries (%) (?)	1.0 (2000)
Deaths among children under five years of age due to other causes (%) (?)	0.1 (2000)
Neonatal deaths due to tetanus (%) (?)	10.1 (2000)
Neonatal deaths due to infection (%) (?)	37.8 (2000)
Neonatal deaths due to asphyxia (%) (?)	18.8 (2000)
Neonatal deaths due to diarrhoea (%) (?)	3.9 (2000)
Neonatal deaths due to congenital causes (%) (?)	5.0 (2000)
Neonatal deaths due to preterm (%) (?)	19.1 (2000)
Neonatal deaths due to other causes (%) (?)	5.4 (2000)
HIV prevalence among adults aged 15-49 years (%) (?)	12.2 (2003)
Incidence of tuberculosis (per 100 000 population per year) (?)	460.2 (2004)
Prevalence of tuberculosis (per 100 000 population) (?)	635.1 (2004)

Indicator	Value (year)
One-year-olds immunized with one dose of measles (%) (?)	77 (2004)
One-year-olds immunized with three doses of diphtheria tetanus toxoid and pertussis (DTP3) (%) (?)	72 (2004)
One-year-olds immunized with three doses of Hepatitis B (HepB3) (%) (?)	72 (2004)
Antenatal care coverage - at least one visit (%) (?)	71 (1997)
Antenatal care coverage - at least four visits (%) (?)	41 (1997)
Births attended by skilled health personnel (%) (?)	47.7 (2003)
Contraceptive prevalence rate (%) (?)	16.5 (2003)
People with advanced HIV infection receiving antiretroviral (ARV) combination therapy (%) (?)	9 (2005)
Tuberculosis: DOTS case detection rate (%) (?)	46 (2004)
Tuberculosis: DOTS treatment success (%) (?)	76 (2003)
Children under five years with acute respiratory infection and fever (ARI) taken to facility (%) (?)	55.4 (2003)
Children under five years of age with diarrhoea who received oral rehydration therapy (ORT) (%) (?)	46.7 (2003)
Births by Caesarean section (%) (?)	3 (1997)
Children under five years of age stunted for age (%) (?)	41.0 (2003)
Children under five years of age underweight for age (%) (?)	23.7 (2003)
Children under five years of age overweight for age (%) (?)	3.0 (2003)
Newborns with low birth weight (%) (?)	14 (2002)
Prevalence of adults (15 years and older) who are obese (%) females (?)	3.8 (2003)
Population with sustainable access to an improved water source (%) urban (?)	76 (2002)
Population with sustainable access to an improved water source (%) rural (?)	24 (2002)
Population with sustainable access to an improved water source (%) total (?)	42 (2002)
Population with sustainable access to improved sanitation (%) urban (?)	51 (2002)
Population with sustainable access to improved sanitation (%) rural (?)	14 (2002)
Population with sustainable access to improved sanitation (%) total (?)	27 (2002)
Population using solid fuels (%) total (?)	80 (2004)
Condom use at higher risk sex in young people aged 15-24 years (%) males (?)	33 (2003)
Condom use at higher risk sex in young people aged 15-24 years (%) females (?)	29 (2003)
Physicians (number) (?)	514 (2004)
Physicians (density per 1 000 population) (?)	0.03 (2004)
Nurses (number) (?)	3,954 (2004)
Nurses (density per 1 000 population) (?)	0.21 (2004)
Midwives (number) (?)	2,229 (2004)
Midwives (density per 1 000 population) (?)	0.12 (2004)
Dentists (number) (?)	159 (2004)
Dentists (density per 1 000 population) (?)	0.01 (2004)
Pharmacists (number) (?)	618 (2004)
Pharmacists (density per 1 000 population) (?)	0.03 (2004)
Public and environmental health workers (number) (?)	564 (2004)
Public and environmental health workers (density per 1 000 population) (?)	0.03 (2004)
Lab technicians (number) (?)	941 (2004)
Lab technicians (density per 1 000 population) (?)	0.05 (2004)
Other health workers (number) (?)	1,633 (2004)
Other health workers (density per 1 000 population) (?)	0.09 (2004)

Indicator	Value (year)
Health management and support workers (number) (?)	9,517 (2004)
Health management and support workers (density per 1 000 population) (?)	0.50 (2004)
Total expenditure on health as percentage of gross domestic product (?)	4.7 (2003)
General government expenditure on health as percentage of total expenditure on health (?)	61.7 (2003)
Private expenditure on health as percentage of total expenditure on health (?)	38.3 (2003)
General government expenditure on health as percentage of total government expenditure (?)	10.9 (2003)
External resources for health as percentage of total expenditure on health (?)	40.8 (2003)
Social security expenditure on health as percentage of general government expenditure on health (?)	0.0 (2003)
Out-of-pocket expenditure as percentage of private expenditure on health (?)	38.80 (2003)
Private prepaid plans as percentage of private expenditure on health (?)	0.5 (2003)
Per capita total expenditure on health at average exchange rate (US$) (?)	12 (2003)
Per capita total expenditure on health at international dollar rate (?)	45 (2003)
Per capita government expenditure on health at average exchange rate (US$) (?)	7 (2003)
Per capita government expenditure on health at international dollar rate (?)	28 (2003)
Coverage of vital registration of deaths (%) (?)	<25 (1997)
Under-5 mortality rate (per 1 000 live births) - rural (?)	192.0 (2003)
Under-5 mortality rate (per 1 000 live births) - urban (?)	143.2 (2003)
Under-5 mortality rate (per 1 000 live births) - rural to urban ratio (?)	1.3 (2003)
Under-5 mortality rate (per 1 000 live births) - lowest wealth quintile (?)	196.0 (2003)
Under-5 mortality rate (per 1 000 live births) - highest wealth quintile (?)	108.0 (2003)
Under-5 mortality rate (per 1 000 live births) - lowest to highest wealth quintile ratio (?)	1.8 (2003)
Under-5 mortality rate (per 1 000 live births) - mother with no education (?)	200.5 (2003)
Under-5 mortality rate (per 1 000 live births) - mother with higher education (?)	85.7 (2003)
Under-5 mortality rate (per 1 000 live births) - mother with no to higher education ratio (?)	2.3 (2003)
Children under five years stunted for age (%) - rural (?)	45.7 (2003)
Children under five years stunted for age (%) - urban (?)	28.5 (2003)
Children under five years stunted for age - rural to urban ratio (?)	1.6 (2003)
Children under five years stunted for age (%) - lowest wealth quintile (?)	49.3 (2003)
Children under five years stunted for age (%) - highest wealth quintile (?)	20.0 (2003)
Children under five years stunted for age - lowest to highest wealth quintile ratio (?)	2.5 (2003)
Children under five years stunted for age (%) - mother with no education (?)	47.7 (2003)
Children under five years stunted for age (%) - mother with higher education (?)	14.5 (2003)
Children under five years stunted for age - mother with no to higher education ratio (?)	3.3 (2003)
Births attended by skilled health personnel (%) - rural (?)	34.1 (2003)
Births attended by skilled health personnel (%) - urban (?)	80.7 (2003)
Births attended by skilled health personnel - urban to rural ratio (?)	2.4 (2003)
Births attended by skilled health personnel (%) - lowest wealth quintile (?)	24.8 (2003)
Births attended by skilled health personnel (%) - highest wealth quintile (?)	88.6 (2003)
Births attended by skilled health personnel - lowest to highest wealth quintile ratio (?)	3.6 (2003)
Births attended by skilled health personnel (%) - mother with no education (?)	31.4 (2003)
Births attended by skilled health personnel (%) - mother with higher education (?)	94.8 (2003)
Births attended by skilled health personnel - mother with no to higher education ratio (?)	3.0 (2003)
Measles immunization coverage among one-year-olds (%) - rural (?)	70.8 (2003)
Measles immunization coverage among one-year-olds (%) - urban (?)	90.8 (2003)
Measles immunization coverage among one-year-olds - urban to rural ratio (?)	1.3 (2003)

Indicator	Value (year)
Measles immunization coverage among one-year-olds (%) - lowest wealth quintile (?)	60.8 (2003)
Measles immunization coverage among one-year-olds (%) - highest wealth quintile (?)	96.4 (2003)
Measles immunization coverage among one-year-olds - lowest to highest wealth quintile ratio (?)	1.6 (2003)
Measles immunization coverage among one-year-olds (%) - mother with no education (?)	65.6 (2003)
Measles immunization coverage among one-year-olds (%) - mother with higher education (?)	99.1 (2003)
Measles immunization coverage among one-year-olds - mother with no to higher education ratio (?)	1.5 (2003)
Population (in thousands) males (?)	9,580 (2005)
Population (in thousands) females (?)	10,212 (2005)
Population (in thousands) total (?)	19,792 (2005)
Annual population growth rate (%) (?)	2.1 (2004)
Population in urban areas (%) (?)	38.0 (2005)
Total fertility rate (per women) (?)	5.4 (2004)
Adolescent fertility proportion (%) (?)	16.2 (2002)
Adult literacy rate (%) (?)	46.5 (2004)
Net primary school enrolment ratio (%) males (?)	58.0 (2003)
Net primary school enrolment ratio (%) females (?)	53.0 (2003)
Gross national income per capita (international $) (?)	250 (2004)
Population below the poverty line (% of the population living on less than $1 a day) (?)	37.9 (1996)
Per capita GDP in international dollars (?)	1,053 (2004)