

VIEWPOINT

Shed some light on darkness: will Tanzania reach the millennium development goals?

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Abstract

The overall picture of health in sub-Saharan Africa can easily be painted in dark colours. The aim of this viewpoint is to discuss epidemiological data from Tanzania on overall health indicators and the burden of malaria and HIV. Is the situation in Tanzania improving or deteriorating? Are the health-related millennium development goals (MDG) on reducing under-five mortality, reducing maternal mortality and halting HIV and malaria within reach?

Conclusion: Child mortality and infant mortality rates are decreasing quite dramatically. Malaria prevention strategies and new effective treatment are being launched. The MDG 4 on child mortality is clearly within reach, and the same optimism may apply to MDG 6 on combating malaria.

The African continent encompasses the six countries where life expectancy at birth is 40 years or less, and all countries (with the exception of Afghanistan) that is around 30, where life expectancy at birth is below 55 years (1). Although the continent hosts countries as different from one another as South Africa and Egypt or Sudan and Malawi, the overall picture of health in Africa can easily be painted in dark colours. The demographic burden of the HIV-epidemic is yet to add its full weight to the picture.

Many African countries have been struck by war and political instability, which makes the judgement of the performances of the health systems even more difficult. Tanzania is an interesting country to observe, as it has had a peaceful development following independence in 1961. Also, it has been subject to decades of aid projects attempting to improve health on various levels.

The country is currently undergoing a transition from a one-party-state with a socialist economy to a multiparty democratic system with a market economy. Tanzania reported an annual growth rate of 6.7% (2) in 2004, which exceeds that of most Western countries. The growth is however taking place from a level just a little over a hundredth of the GNP-levels of the rich European countries, with 58% of Tanzanians living below the poverty line, with an income

of less than 1 USD a day (3). Fertility rates in Tanzania have seen just a slight decline (4) and are still very high, with 5.7 children born to each woman (5). Since independence, the population of Tanzania has quadrupled (Table 1) (6,7) (Table 1).

INDICATORS ON CHILD MORTALITY CLEARLY BETTER

Mortality rates and causes of death are far from reliable in many sub-Saharan countries, and WHO has judged only four African countries to produce useable data (9). Statistics may be lacking totally or be marred by great imperfections on all levels; in describing populations, in registration of deaths outside facilities, in correct diagnosis of deaths and in handling of data once registered.

To make up for the lack of high-quality national registers of vital events, such as births and deaths, other approaches are used. These various sources of information aid organizations like the World Health Organization (WHO) and the World Bank in modelling the national estimations that will determine for example a nation's success or failure in fulfilling the millennium development goals (MDG).

Sentinel surveillance is an approach where carefully selected sites are monitored, for example to get an estimate of the burden of disease, such as the prevalence of HIV-positive

women in a certain antenatal clinic. To pool data from sentinel sites to produce national estimates may or may not be relevant. Longitudinal surveys or *demographic surveillance*, where vital events in a certain area are prospectively recorded and explored during a period of time, will have advantages in accuracy but be limited to the area they cover. In *direct surveys* information about vital events is recorded retrospectively, usually by interviews. Here, the selection of respondents and their ability to correctly remember for example dates of birth and ages at death will be crucial for the quality of data.

In a large Demographic Surveillance Systems (DSS) in Tanzania three different geographical regions have been followed between 1992–1997 (AMMP-1) and 1999–2004 (AMMP-2). The great advantage of this study is that the researchers used a community-based approach covering 450 000 persons and more than 50 000 households with deaths were visited by enumerators performing verbal autopsies (10). This survey was a collaboration between the Tanzanian Ministry of Health and the University of Newcastle upon Tyne. It is likely to be one of the more reliable sources of information on causes of death available, together with the longitudinal surveys performed by the Ifakara Health Research and Development Centre (11).

In AMMP, the infant mortality rate in 1994–1999 ranged from 74/1000 live born children to 131/1000 in the three regions investigated. In 1999–2002 the infant mortality rate had dropped to a range of 65/1000 in the best to 116/1000 in the worst of the three regions. A decrease in under-five mortality was also seen with the best of the three regions going from 103/1000 live born children in 1994–1999 to 88 in 1999–2002. In the region having the highest under-five mortality rate it dropped from 209/1000 to 185/1000 in the same period.

The 2004–2005 Tanzania Demographic and Health Survey (THDS) by the Tanzanian National Bureau of Statistics

and Macro International was designed to produce national estimates on health-related issues (5). A representative sample of 10 312 households was selected and all women aged 15–49 in these households were interviewed, as was a sub sample of men. This survey is the sixth in a series of national sample surveys and considered reliable.

The 2004–2005 THDS found a further decrease in recent years to 68/1000 for infant mortality rate and 112/1000 for under-five mortality rate (5).

A striking geographic variation in under-five mortality, also when comparing very rural regions, was demonstrated. In this survey weight and height in children were recorded and poor nutritional status had a strong correlation with the risk of child death. The fit was surprisingly poor between childhood death and general poverty in the region (12). Recently, a study from the southern parts of Tanzania, where the mortality rates are by far the highest, has explored the local attitudes, recognition and perception of sick children. It seems reasonable to assume that local practices and attitudes to severe disease influence mortality to a great extent (13).

Regardless of source, all statistics on child death represent improvements (Table 1) and the MDG may be within reach for the indicator childhood mortality (Table 2). For this to happen, a focus on reducing infant mortality that contributes more than half of the under-five mortality is needed. Neonatal mortality, in turn, constitutes almost half of the infant mortality; with 32 children out of 1000 live born dying within the first month. Neonatal mortality is of course connected to maternal mortality, and it is important to stress that neonatal mortality has remained unchanged, whereas infant mortality has decreased at a similar pace, or slightly faster, than under-five mortality during the last decade.

Clearly, more focus on neonatal and infant survival is needed. To reduce the risk of maternal anaemia and malaria, pregnant women are currently treated for malaria twice in

Table 1 A comparison on statistics for Sweden and Tanzania. In Tanzania, the public expenditure on health is 2.4% of the GNP (7), or 7.6 USD per person and year. With the addition of external resources from donors it is estimated that a total of 10 USD per year is spent on all health care for each person (7,8)

	Population 1961 (millions) (5)	Population 2005 (millions) (6)	Income per capita 2004 (USD) (6)	Public health expenditure (per cent of GDP) (6)	Under-five mortality (per 1000 live born) 2004	Maternal mortality 2000 (per 100 000 live births)
Tanzania	10	38	320	2.4	112 (5)	578 (5)
Sweden	7,5	9	35 480	8	4 (6)	2 (6)
Ratio Tanzania to Sweden	1.3	4.2	0.01	0.3	28	290

Table 2 Millennium Development Goals on child and maternal mortality rates. Wrestling with clearly disparate data on maternal deaths, the MDG-evaluators in 2015 will have a hard time trying to determine if Tanzania has been able to reduce maternal mortality by 75% from the level in 1990. Ironically, it seems that the most ambitious MDG on maternal deaths currently must face statistics that are not clearly improving at all. The child mortality goal is clearly within reach but a focus on neonatal and infant mortality is needed

Millennium Development Goal	Tanzania in 1990 (3)	2000 (3)	2004 (5)	Goal for 2015 (3)
Goal 4 reduce under-five mortality by 66% (deaths before 5 years/1000 live born)	161	141	112	54
Goal 5 reduce maternal mortality rate by 75% (Maternal deaths/100.000 live births)	770	1500	578	192

the pregnancy and this treatment currently reaches just over half of all pregnant women. Eight in ten pregnant women have at least one tetanus-vaccination. In Tanzania, less than half of all women, 46%, have a skilled person assisting when giving birth, 53% of women deliver at home and over 80% of them do not come for a postnatal check-up. Half of all children are not weighed at birth. Vaccination coverage is unchanged over the last years with 71% of children receiving all recommended vaccination. Knowledge about oral rehydration salt (ORS) is high but only half of children with diarrhoea received ORS-packages (5). All of these aspects, and many more, need to be addressed to reduce neonatal and infant mortality further.

MATERNAL MORTALITY SUCCESSFULLY ADDRESSED IN KIGOMA

Maternal mortality ratios are generally believed to be more powerful tools in evaluating the performance of the health sector. To prevent a maternal death puts higher demands on structures such as screening and integrated referral systems, whereas child mortality at a high level can be reduced with relatively simple means such as immunizations.

But, in contrast to the child mortality rates, the official maternal mortality rate in Tanzania is increasing. In the WHO MDG-statistics, Tanzania shows a very alarming increase in maternal deaths, from 770 mothers per 100 000 live births in 1990 to 1100/100 000 live births in 1995 and 1500/100 000 in 2000 (Table 2) (3).

However, the same DSS as cited above shows maternal death rates that are lower, with maternal mortality in 2001 ranging from 570/100 000 in the second best region to 718/100 000 in the worst region which in this case is the capital (10). The data from the region with the lowest figure is not shown here, as it is marred by one area reporting no maternal deaths in the poorest quartile of the population.

A large study compared different methods for assessing maternal deaths in northwest Tanzania using three tools: a prospective community based survey; a sisterhood survey where respondents were asked about deaths among their



Figure 1 Child survival rates in Tanzania continue to improve and under-five mortality has fallen by one-third since 1990. 'Afya' means health in Swahili.



Figure 2 Malaria is contributing to a large share of deaths in infants and young children. The picture shows rapid testing for malaria with a direct dipstick method that requires neither electricity nor a laboratory technician.

adult sisters, and a hospital survey (14). This study, performed 1986–1991, came to the conclusion that hospital data tend to overestimate maternal deaths by a factor of three. Hospitals were reporting a maternal death rate of 845/100 000, whereas in the prospective study and sisterhood survey, the figures were 241 and 297, respectively.

In another and more recent study in northern Tanzania in 1995–1996, the reverse, a clear underestimation of deaths in pregnant women was shown with a majority of hospital deaths in pregnant women not being recorded properly. Nevertheless, this study estimated the overall maternal death rate to be 382/100 000 (15). A sisterhood survey showed a similar figure of 362 (16).

In the 2004–2005 THDS the maternal mortality rate was estimated to be 578/100 000 live births (5) (Table 2). This represents a non-significant change from the previous survey in 1996 and its estimate of 529.

Some of the most interesting studies of maternal mortality in Tanzania have been performed in the Kigoma region, a remote area bordering the Republic of Congo and Burundi. Following a retrospective study carried out in 1984–1986 a programme with 22 specific interventions was undertaken in 1987–1991. In this period the calculated maternal mortality ratio decreased from 933 to 186 per 100 000 live births, with the actual number of maternal deaths being 28 deaths in 1984 and eight deaths in 1991. This illustrates that a low-cost intervention programme can be very successful (17,18).

MALARIA, HIGH TIME TO ROLL BACK?

Man and malaria have walked hand-in-hand throughout evolution. The forceful genetic selection pressure of a disease that is most prone to kill infants and young people before reproductive age has had obvious effect on the global distribution of blood-groups and prevalence of diseases such as sickle-cell anaemia that make the individual less susceptible to malaria.

Malaria is becoming an increasingly important global health problem. The disease is causing more deaths in the world than before and is responsible for a larger fraction of deaths, mainly due to resistance to previously successful drugs (19,20). Although the contribution of acute or chronic malaria to deaths in HIV/AIDS-patients is likely to represent a growing problem, malaria alone probably remains Africa's number one child killer. The figure often cited is that malaria causes 1 million deaths per year in the world, or 3000 deaths a day. Ninety percent of these deaths occur in Africa, and almost all of the diseased are children (20).

The period of eradication of malaria with intensive use of insecticides for vector control that helped clear parts of the world from malaria is long gone, though some argue that insecticides such as DDT must be used again. The WHO issued guidelines in 2006 stating that DDT could be used in restricted conditions (21), and the Ugandan government announced recently that they would use the insecticide to fight malaria (22).

There are promising observations from the island of Zanzibar, part of the United Republic of Tanzania, that malaria incidence has decreased substantially during the last years. Modern vector control, primarily the use of impregnated bed nets and in-door spraying, efficient treatment with artemisinin-based compounds and community involvement has assisted in this work, and the village of Jambiani on Zanzibar is now becoming a model of malaria control (23).

The new artemisinin-based compounds used for treating malaria are efficient, both for the treated individual and by reducing the parasite gametocyte formation and thereby reducing transmission to others. In Zanzibar, artesunate taken together with amodiaquine has been first line drug since 2002. In mainland Tanzania artemisinin in the combination therapy artemether-lumefantrine (Coartem) was decided to be first line therapy from November 2006 (24), and the introduction has been quite efficient with Coartem now being available also in rural facilities (January 2007).

A major problem with the new drugs, currently the global hope for treating malaria parasites that have developed resistance to earlier drugs, is the high cost. One single treatment of an adult with Coartem bought over-the-counter in the capital is 10 000 Tanzanian shillings (7.5 USD), the full annual government spending on health care for one person, or the equivalent of 20 kg of maize flour used for cooking the staple food ugali.¹

In Tanzania, malaria is often diagnosed clinically. Treatments are often bought by the patient with little or no

involvement of trained health personnel. Also, means of correct diagnosis are quite limited at health facilities. In Tanzania, less than 5% of rural households have electricity, and the typical rural dispensary has no electricity. Sun-lit microscopes are an option though not widely used, and still demand trained technicians for slide reading. Even if available, the quality of the test can be questioned by the clinicians and results are not always considered (25,26). New rapid diagnostic tests that are based on antigen-reactions and require neither microscope nor electricity are very promising but expensive.

In the chloroquine-era, high incidence of malaria, poor means of diagnostics, risk of fatal outcome and efficient and cheap treatment were good arguments for treating most fevers as malaria, especially if the patient was a child. The Integrated Management of Childhood Disease (IMCI) guidelines still instructs that all fevers in under-fives in endemic areas are treated as malaria.

In adults, however, malaria is not always the explanation for fever, and previous experience and social acceptance of malaria as a cause of fever has contributed to extensive use of antimalarials. In a large and prospective study evaluating the size of this problem, overdiagnosis by two-fold was demonstrated for a district hospital setting and higher mortality was shown for patients that were false positive for malaria (25). Overdiagnosis of malaria is causing unnecessary costs, steering attention away from other important killer-diseases such as childhood pneumonia (27) and contributing to drug pressure and development of resistance towards antimalarial drugs. The overdiagnosis naturally also reflects on malaria mortality rates statistics, but it is not known to what extent. For example, in the SPP cited above, malaria is included in the term 'acute febrile illness'.

So, on one hand the global burden of malaria is clearly increasing, and on the other, its overdiagnosis is a big problem both for the health system and for the individual. These two pictures are both likely to be true, and not as contradictory as they may sound, even if the proportion of HIV/AIDS/TB now can be expected to account for a larger share of all fevers than before. Strategies to improve the ability to diagnose malaria correctly are seriously needed.

All in all, the combination of weapons; the impregnated bed-nets, indoor spraying, the new potent drugs, now also available for rectal administration in children unable to take drugs orally (13) and the better diagnostic possibilities, are likely to assist man in winning terrain and halt and reverse the malaria, thereby fulfilling part of the MDG 6.

HIV AND AIDS: BETTER THAN FEARED?

HIV/AIDS/tuberculosis is the leading cause of death in adults 15–59 years of both sexes in all three areas studied in the study cited above: Dar es Salaam, the rural areas around Morogoro and in the Hai district in Northern Tanzania. Among women living in the capital aged 15–59 years HIV/AIDS/TB accounted for 62% of the 203 deaths analyzed in this group (10). A big survey by Tanzania Commission for Aids in 2003–2004 showed that 7%, that is

¹ Market price at private pharmacy close to Muhimbili University Hospital in Dar es Salaam Oct 2006 and neighbouring grocery shop.

every twelfth adult 15–59 years, is infected by HIV, with big regional differences (28).

All reports on HIV-prevalence are marred by the low frequency of testing in the general population. In spite of the confusion surrounding the HIV situation, very interesting data on incidence of infection has been collected from the region west of lake Victoria. In three areas having contrasting initial exposure to the epidemic, individuals who were seronegative in the baseline survey 1987 have been followed with high response rates. The overall age-adjusted prevalence in the high-prevalence area of Bukoba decreased from 24.2% in 1987 to 13.3% in 1996, and the incidence in the same area declined from 47.5 to 9.1 per 1000 person years in the years between 1989 and 1996. That is, the risk has decreased from one person in twenty being infected each year to one person in a hundred. The figures are slightly better for women between the ages of 15–24 years, for whom a decreased incidence was also noted in areas with middle and low initial prevalence (29).

For treatment of AIDS, the introduction of antiretroviral therapy (ARV) is continuing in Tanzania, but ARVs are not yet distributed in the countryside on a large scale outside programmes run by non-governmental and faith-based organisations. The National AIDS Control Programme estimates that 49 315 Tanzanians were receiving ARVs in September 2006, and WHO claims that 315 000 need the drug. This coverage of 15% is quite a bit lower than in neighbouring Uganda (50%) and Kenya (25%) (30).

Basic drugs like antibiotics and antimalarials in Tanzania are distributed in the well-functioning Essential Drug Programme to reach the government first level health facility (village dispensary). The treatment of HIV-AIDS is still centralized, and diagnostics of HIV, eligibility for treatment by CD4 counts and the ARVs are usually available only at the tertiary level health facility (district hospital). Even if the drugs are provided for free, social aspects as understanding the need for treatment, risk of stigmatization and cost for travelling makes the cumbersome and life-long AIDS-treatment out of reach for many affected individuals in rural areas. There is a great fear that those enrolled in treatment will drop out once they feel better. In reality most HIV-infected patients in Tanzania have neither correct diagnosis nor access to treatment and to establish these systems with trained and educated staff is an enormous challenge for a weak health system. A special presidential initiative supported by donors to implement and decentralize treatment of AIDS continues.

Of the extremely successful strategies that prevent mother-to-child HIV-transmission in the developed world (caesarean section, no breast milk and ARVs) (31) only ARVs would be useful in the rural African context. The awareness in the general population of the possibility is however low, and in the study cited above only 15% of respondents know both that HIV can be transmitted to a child through breast-feeding and that there are special drugs that a pregnant mother can take to reduce the risk of transmission (28).

The health situation and the rate of economic growth in Tanzania are greatly affected by HIV. As has been pointed

out (32) the ability of women to use any of the components of the abc-strategy (abstain, be faithful, use a condom) to prevent AIDS is limited, and it has been demonstrated that married women are at high risk of transmission. However, the good news is that the situation may be better than feared. The Bukoba-study shows that the most significant decline in HIV-incidence is among women in the age group 15–24 years (29). If these figures are correct, and assuming the virus is as contagious and people as susceptible as before, this must reflect a change in sexual behaviour. People can understand and make good choices, and for poor people with little access to more sophisticated methods of prevention or treatment it is especially necessary that they do so.

NEED FOR FUTURE

Vaccines against malaria and HIV are being developed but are not likely to assist in reaching the MDGs for 2015.

In order to fulfil the MDGs, work to improve health further in Tanzania will need political and professional cooperation. Scarce resources must be spent wisely and where they will make a difference. It is easy to waste health care resources, more so than in many other fields targeted by development efforts, if 'bottle-necks' are allowed to clog the system, or if limiting factors such as lack of well-trained and highly motivated staff are not urgently addressed. All components of a functioning health care system need to be available for the system to perform well and the biggest problem in Tanzania is probably lack of skilled staff.

It is crucial that cheap and reliable surveillance systems are developed further, preferably community based and using modern communication techniques, such as satellite communications from the field sites. With unreliable data, it is hard to tell if the limited resources are spent well or should be used elsewhere.

We are yet to see if Tanzania will be able to fulfil the MDG by 2015 but one can be quite optimistic about reaching two of the health-related goals: to reduce under-five mortality by two thirds from the 1990-level, as well as halting and reversing the incidence of malaria.

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