# HEALTH AND ILLNESS

J. Ties Boerma & F. John Bennett

ABSTRACT

*Health and illness are decided by underlying factors such as the existing health infrastructure, fertility and family planning, maternal and child care practices, and nutritional conditions. The availability of hospital beds in coastal Kenya is below the national average; the distance to health services, including antenatal care and vaccination facilities, are generally satisfactory but pose difficulties for a minority of the population. Traditional medicine has a high rate of utilisation and nowadays incorporates African ethnic beliefs, Muslim elements and modern biomedical concepts. Knowledge of modern birth control methods is high but user rates are generally low and there are no indications of a decline in fertility. The utilisation of antenatal care is high but two-thirds of the women deliver at home. Childbirth complications are strongly associated with non-natural causes such as adultery and witchcraft. Vaccination coverage of children is high. Low birth weights are common and surveys in the past decades have shown that anthropometry of under-fives is below that of children elsewhere in Kenya. Altogether, children in coastal Kenya have higher risks of mortality than Kenyan children, on average. Since the 1950s, until very recently, Coast Province has shown little decline in child mortality. Still, life expectancy is close to the national figure and life expectancy at birth is now slightly over 50 years. The overall pattern of morbidity is dominated by communicable diseases notably respiratory infections, diarrhoea, intestinal parasites, malaria, schistosomiasis, anaemia, filariasis, STD and hepatitus.*

## INTRODUCTION

In the Swahili language the exchanges at greeting and words used for health bring out the concepts of health. *'Hujambo?'* – you have nothing the matter with you? *'Sijambo'* – I am well. *'Salama'* – peace, safety. *'Uzima'* – whole, sound, good health, fully grown. *'Siha, rai, nguvu'* – power, strength, health. *'Afya'* – good health; the Ministry is a Ministry of Good Health. The Swahili concept is a holistic one and can go further than the WHO definition of health by including wholeness, safety, strength. The healing processes for ill health include attention to social relationships, emotions and religious spirituality and conformity with tradition. The Swahili word *'Ugonjwa'* means sickness,

illness or disease.

Health and disease at the Kenya Coast are influenced by a number of factors associated with poverty and poor health infrastructure, and by the tropical environment. In addition, coastal Kenya is characterised by low levels of adult education and an adherence to local ways of defining and maintaining health which are not always beneficial. This review of health and illness at the Kenya Coast starts with reviewing the underlying health factors i.e. the existing health infrastructure, fertility and family planning, maternal and child care and nutritional conditions. A review of overall morbidity follows next; death is the ultimate outcome of acute and chronic assaults on the health status of an individual. The main part of the text consists of a review of morbidity levels of the major illnesses or groups of illnesses that afflict the population.

## HEALTH INFRASTRUCTURE

### *Modern health services*

Modern health services in Coast Province are provided by the government and by non-governmental organisations (NGOs). The Provincial hospital is located in Mombasa, including the Provincial Medical Officer and his/her team. Each district has a district hospital and a district health management team, led by the district medical officer. At the division level there is a health centre and at the location level a dispensary. NGOs in Coast Province include African Medical and Research Foundation (AMREF), Unicef, Aga Khan Health Services, and various church-related services. Most of these focus on community-based health services. Generally, the role of church organisations in the provision of in-patient and out-patient care is less prominent than in many other parts of Kenya.

In 1987 there were 14 government and four private hospitals in Coast Province (Kenya 1988). There were 24 health centres, 99 government dispensaries and 51 non-government dispensaries. On average there was one health facility for 9,153 persons, compared to the national figure of one facility for 12,088 people. Mobile clinics had become a rarity by 1987. Availability of hospital beds was below the national average: 123 and 158 beds per 100,000 population in Coast Province and Kenya respectively. Much of the resources is concentrated in Mombasa.

During the 1980s community-based health care was actively promoted and village health workers were trained. In coastal Kenya, Unicef supported the government in this programme while several NGOs (such as the Aga Khan Health Services and AMREF) were also active in community-based health care programmes. In recent years, the system of free health services has been under review and has led to new initiatives on community financing (called Bamako initiative) and health sector reform. A survey in Kwale District indicated that affordability hampers the use of health services for 10-30% of the population (McPake, Hanson & Mills 1993). For example, 32% of the respondents bought less drugs than prescribed because of lack of money.

*Traditional medicine*

Health services, just as educational services, have to consider the admixture of three strands of influence: traditional African, Islamic and western. Traditional medicine at the coast is working in parallel with and is being influenced by various African ethnic concepts, elements from Muslim beliefs and practices and now also incorporates of modern biomedical concepts. Traditional preventive measures such as charms and amulets with texts from the Koran are often found on children and nurses in the health services have to be taught not to interfere with them but to add additional preventive measures such as immunisation and health education on hygiene and water and sanitation.

The traditional healers use an extensive system of classifying illnesses according to signs and symptoms and suspected cause. Their system is dynamic and increasingly incorporates biomedical knowledge. For instance, *chirwa* refers to severe malnutrition and was described by Gerlach (1959) in the late 1950s. *Chirwa* is thought to be caused by breaking a sexual taboo and its treatment was exclusively the domain of traditional healers. More recently, however, an increasing number of healers distinguish different types of *chirwa*, and some of those can be treated by modern health services (Boerma & Baya 1990).

A very common condition in children is *nyuni*, which is also the leading cause of death. The major features of this illness are the symptoms of convulsions, even though convulsions do not need to be explicitly present to make the diagnosis. All biomedical diseases with fever or neurological symptoms can potentially be classified as *nyuni*. Healers distinguish many different types of *nyuni*, some of which appear to be close to their biomedical diseases. For instance, *nyuni wa kushikwa mbavu* refers to an illness with breathing problems and literally *kushikwa mbavu* can be translated into intercostal indrawings. Yet, this illness is not a specific indicator of childhood pneumonia, since it might be associated with many more conditions which lead to alterations in breathing pattern (e.g. high fever). Nowadays, most types of *nyuni* are considered to be treatable by both modern and traditional medicine (Boerma & Baya 1990).

Traditional healers play an important role in the provision of health services. A study in seven villages in Kwale District showed that 40% of the mothers had taken their child to a traditional healer during the last illness (Boerma & Baya 1990). Utilisation of traditional medical practitioners was higher if the mother had no formal education or was Muslim, and if the condition of the child was chronic. Combined use of modern and traditional medicine is common. Only a few diseases were considered exclusively for traditional medicine. Most illnesses can be treated by both modern and traditional medicine.

## FERTILITY AND FAMILY PLANNING

The total fertility rate in Coast Province was estimated at 5.3 children per woman for 1990-92 and 5.5 children for 1984-88 (NCPD 1994). Coastal Kenya is traditionally a low fertility area, in part because of higher levels of sterility compared to elsewhere in Kenya (Mosley, Werner & Becker 1982). Recent data, however, suggest that fertility is declining

in most of Kenya, but not in Coast Province (NCPD 1994).

Knowledge of modern family planning methods is high (95% of all women 15-49 years), and 86% know a source for a modern method (NCPD 1994). One in five women in Coast Province currently uses a method of family planning, including 17% who use a modern method. In all other provinces of Kenya at least 20% of women, aged 15-49, use a modern method of family planning. The 20% user rate for 1993 does, however, present a significant increase compared to the results of a survey in 1984 (Kenya 1986). At that time only 9% of the women were using a method of contraception. The median distance to a family planning service delivery point is 4.2 km in Coast Province (NCPD 1994). More than half of the women (52%) can reach a family planning clinic within half an hour and 61% within an hour. Women in most other provinces have to travel more or longer to reach family planning services.

Men in Coast Province also had high levels of knowledge: 99% of men knew at least one modern method, and the same percentage knew a source of such a method. Among married men 71% said that his wife (wives) and himself approved of family planning which is only slightly below the national figure (76%; NCPD 1994).

## MATERNAL AND CHILD CARE

### *Maternal health*

Anaemia and malaria are thought to be very common and serious problems for pregnant women but no data are available for Coast Province. Energy intake may also not be adequate. For instance, in 1993, 13% of women in Coast Province had a body mass index of less than 18.5, indicative of malnutrition, which was the highest proportion in Kenya (NCPD 1994). Low birth weight is a consequence of adverse intra-uterine conditions. The incidence of low birthweight in Coast Province is common (up to 20% of babies below 2,500 grams) and higher than in most other parts of Kenya (see below).

Utilisation of antenatal care is high in Coast Province, as it is elsewhere in Kenya. Only 8% of the women who gave birth in the period 1988-93 did not make an antenatal care visit. Notwithstanding the high proportion of women using antenatal care, the majority of women deliver at home: 68% of deliveries during 1988-93 occurred at home. In Kenya as a whole 55% of the babies were delivered at home. Traditional birth attendants in Coast Province assisted 25% of deliveries during 1988-93. Many deliveries were attended by relatives (34%), while 8% of the women delivered by themselves (NCPD 1994). A study in Kwale found many traditional birth attendants in rural villages, but most attended only a few deliveries per year (Boerma & Baya 1990). They generally do not provide antenatal care, and in case of a complicated delivery a traditional healer may be called in as well to address what are considered to be the social causes of the problem. Fifty-one percent of the women had antenatal care services within 5 km and 52% said they could reach antenatal services within half an hour (NCPD 1994). Regarding the availability of delivery care for 34% of women such services are available within 5 km. The median distance is 6.3 km. Delivery care can be reached within half an hour by 38% of women, within one hour by 56%, and within two hours by two-thirds of women. In

most other provinces, distances to delivery care services are longer.

Female genital mutilation (FGM) is a problem which has received increasing attention for the last fifteen years when WHO (1982) and Unicef became concerned with traditional practices affecting the health of women and children. The President of Kenya has spoken out against the practice on several occasions. Minority and Human Rights organisations have also provided advice for health education and social work professionals (Hedley & Dorkenoo 1992). Kiragu (1995) has reviewed FGM as a reproductive health concern. A Sheikh from Al Azar University, Cairo, summarised Islam's attitudes and stated that the Koran contains no special mention for female circumcision (Naggar 1985). FGM has been categorised by WHO into four main groups covering various degrees and forms of mutilation. This traditional custom affecting Somali women in the northern parts of Coast Province is infibulation which is the most severe form of genital mutilation of girls, usually between five and nine years of age. This operation has immediate effects of haemorrhage, shock, infection, sepsis, and urinary retention, and has late effects including delay in childbirth and infertility (Dirie & Lindmark 1992). No effect on the risk of HIV infection has been shown.

In the language of the Mijikenda tribes *nyongoo* refers to complications and illnesses associated with childbirth. According to the traditional healers, there are at least 50 types of *nyongoo* (Boerma & Baya 1990). These are classified according to description of symptoms, treatment or ascribed causes, such as transgression of sexual taboos or disrupted relationships with ancestral spirits. *Nyongoo* is considered to be caused by witchcraft. Nowadays, however, the healers also recognise natural components of *nyongoo*, such as lack of blood, which may or may not be associated with non-natural causes. The dynamic concept of the causation of *nyongoo* has important implications for treatment. In Kwale District, half of 64 traditional healers said that *nyongoo* treatment needs both traditional and modern medicine and 19% considered either services adequate. Only 31% of the healers said *nyongoo* could only be treated by traditional healers. This illustrates the dynamics of traditional medicine.

*Immunisation*

Currently, Kenyan children are immunised against measles, poliomyelitis, diphtheria, tetanus, whooping cough and tuberculosis. Even though measles-associated mortality has decreased considerably because of immunisation, it is still one of the leading causes of death in hospitals in Coast Province (see below). The immunisation programme may have reduced also the mortality due to whooping cough and chronic disability associated with poliomyelitis, but no data are available for the Kenya Coast.

Tuberculosis affects both children and adults. Protection by immunisation is limited. The vaccine BCG has its greatest effect against tuberculous meningitis and military tuberculosis, the severe killing forms of the disease in infants. Scar surveys amongst children in Kilifi and Kwale showed that coverage had dropped slightly from 60-65% in 1958-59 to 50-60% in 1986-90 (Kwamunga *et al.* 1993). With the present AIDS epidemic the public health significance of tuberculosis is likely to increase.

Tetanus infection may occur at all ages, but is only a leading cause of death during the neonatal period, when children are infected through the umbilical stump and most die after 3-20 days of life. Data from the 1977-78 Kenya Fertility Survey suggested high neonatal tetanus mortality in Coast and Western Provinces (Ewbank, Henin & Kekovole 1986). Population surveys in Tana River and Kwale Districts also found high neonatal tetanus mortality levels. In Tana River, neonatal tetanus mortality was 11 per 1,000 live births (Melgaard, Kimani & Mutie 1987; Melgaard, Mutie & Kimani 1988) and in Kwale 6.7 per 1,000 for the period 1982-87 (Unicef 1988). A survey in Kilifi District in 1989 reported a much lower neonatal tetanus mortality rate (3.1 per 1,000), which was attributed to maternal immunisation against tetanus (Bjerregaard *et al.* 1993).

Vaccination coverage is high in Kenya, including Coast Province (NCPD 1994). Among children of 12-23 months in Coast Province, 1993, 95% had received BCG, 86% three doses of DPT and polio vaccines and 88% measles vaccination. Generally, vaccination coverage appears to have improved gradually during the past decade. In 1993, more than half of the women in Coast Province had a vaccination facility available within half an hour travelling time and 60% within one hour (NCPD 1994). Yet, one in eight women had to travel more than two hours to reach a facility providing vaccination services.

## NUTRITION AND ANTHROPOMETRY

Anthropometric status in children is considered a good indicator of the health status of children and their risks of dying. Child nutrition surveys conducted by the Central Bureau of Statistics and other surveys have consistently found that children at the Kenya Coast have poorer anthropometric status than other children in Kenya (Kenya 1991, Haaga *et al.* 1986). For instance, in 1993 it was estimated that 41% of children under five years were stunted (low height-for-age), including 18% who were severely stunted (NCPD 1994). Stunting is considered a good indicator of chronic undernutrition. Wasting, a sign of acute malnutrition, was almost twice as common as elsewhere in Kenya: 11% of children in Coast Province were wasted, including 3% severely wasted (Table 1).

*Table 1*
Children under 5 years classified as undernourished according to four anthropometric indicators, 1993

| | | Coast Prov. (%) | Kenya (%) |
|---|---|---|---|
| Stunting | (< -2 sd)* | 41.3 | 32.7 |
| Severe stunting | (< -3 sd) | 17.5 | 12.2 |
| Wasting | (< - 2 sd) | 10.6 | 5.9 |
| Severe wasting | (< - 3 sd) | 3.6 | 1.2 |

* Two standard deviations (sd) or more below the median of the NCHS/CDC/WHO reference population.
*Source*: NCPD 1994

Low birthweight is also common. The mean birthweight of 17,920 births in all hospitals in Coast Province during 1987 was 3,001 grams, and 15.7% of babies born were less than 2,500 grams (Kenya 1988). In Kwale and Kilifi Districts about 20% of new-borns had a birthweight of less than 2,500 grams. This estimate of the incidence of low birthweight

only pertains to babies born in health facilities, which was 32% of all deliveries in Coast Province during 1987-92 (NCPD 1994).

Studies on adult road workers to evaluate the role of parasitic infections (Latham *et al.* 1983a) have reported that workers in Kwale were undernourished and anaemic. They had low wages, had to walk long distances to the workplace and had heavy duties. At the coast, the effect of malnutrition in adults in reducing working capacity is compounded by the effects of high temperatures, sunlight and high humidity. The road workers, however, had good teeth, no hypertension and no diabetes.

## MORTALITY

Data from several censuses and surveys have shown that children in coastal Kenya have higher risks of mortality than Kenyan children on average. Coast Province, together with Nyanza and Western Provinces, have considerably higher mortality than Rift Valley, Eastern and Central Provinces. During the 1980s, the probability of dying by age five in Coast Province was estimated at 181 per 1,000 live births (Brass & Jolly 1993). This was only a moderate decline compared to under-five mortality of 195 per 1,000 during the 1970s and 223 per 1,000 during the 1950s. Coast Province can indeed be singled out as having very little child mortality decline between the 1950s and 1980s while mortality decreased steadily in most other provinces (Blacker *et al.* 1987; Brass & Jolly 1993).

*Table 2* Age-specific mortality rates per 1,000 live births for 1984-93

| | | Coast Prov. | Kenya |
|---|---|---|---|
| Neonatal | (0 months) | 28.5 | 27.0 |
| Postneonatal | (1-11 m.) | 39.8 | 35.6 |
| Infant | (0-11 m.) | 68.3 | 62.5 |
| Child | (1-4 years)* | 43.4 | 32.7 |
| Under-five | (0-5 years) | 108.7 | 93.2 |

* Per 1,000 children aged 1.
*Source*: NCPD 1994

The Kenya Demographic and Health Survey of 1993 (NCPD 1994) shows a much lower level of under-five mortality in Coast Province than previously observed. Between the Demographic and Health Survey of 1988-89 (NCPD 1989) and that of 1993, child mortality levels in Kenya as a whole barely declined, but in Coast Province mortality declined by one-third. This may be a genuine decline during the second half of the eighties and early nineties, but such a large decline of mortality is unlikely given the short period of time between the two surveys. Apart from sampling error, under-reporting of deaths may be a problem in the survey of 1993. The latter was also considered a problem in the earlier survey and the under-five mortality estimate was adjusted upward by 20% (Brass & Jolly 1993). Keeping this limitation in mind, Table 2 presents age-specific mortality data for Coast Province for the period 1984-1993 and which is only 14% higher than the national figure. Almost two-thirds of under-five deaths in Coast Province occur in infancy, with an infant mortality and under-five mortality of 68 and 109 per 1,000 live

births, respectively.

Data from follow-up studies are often less affected by under-reporting of deaths than retrospective surveys such as the KDHS. Data from a small-scale longitudinal study in Kilifi District show relatively low levels of mortality. In this population with reasonably good access to health services, infant mortality was estimated at 58 per 1,000 live births and childhood mortality (1-4 years) was 12 per 1,000 children, implying an under-five mortality of 108 per 1,000 live births for the early nineties (Snow *et al.* 1994). On the other hand, longitudinal data of 1,200 children from seven villages in Kwale District in 1987-88 revealed an infant mortality of 115 per 1,000 live births, while the mortality probability during the second year of life was 36 per 1,000 children aged one year (Boerma, unpublished data).

Neonatal mortality, defined as mortality during the first month of life, was 28.5 per 1,000 live births which again is unexpectedly low (NCPD 1994). Analysis of the of the 1977-78 Kenya Fertility Survey had indicated that neonatal mortality in Coast Province was relatively high (76 per 1,000; Mott 1982). Longitudinal data from Kwale District in 1987-88 showed a perinatal mortality of 58 per 1,000 births (perinatal mortality includes stillbirths and first week deaths), and a neonatal mortality of 34 per 1,000 live births (Boerma, unpublished data).

There are mortality differences within Coast Province. Mombasa and Taita Taveta Districts have lower mortality than Kilifi, Kwale, Lamu and Tana River Districts (Ewbank *et al.* 1986; Brass & Jolly 1993; Muhuri & Rutstein 1994). Roughly, mortality is about 30-40% higher in the high mortality districts compared to Mombasa and Taita Taveta. Mombasa is of course largely urban and differs in many aspects from the other districts.

Information on cause of death is available from selected hospitals. In Kilifi, malnutrition was the leading cause (20% of all deaths on paediatric ward 1990-91, excluding neonates), followed by malaria (14%; Snow *et al.* 1993). Measles was diagnosed for 13% of all deaths, lower respiratory tract infection for 9%, gastro-enteritis and anaemia for 6% and 5% respectively. In Kwale, measles was the leading cause of death (20% of deaths), followed by malaria (16%), acute lower respiratory infection (13%), anaemia (12%), malnutrition (11%) and diarrhoea (9%). Caution, however, is needed when interpreting hospital data. For instance, diseases that can be fatal over a short period of time, such as malaria, are more likely to be found in the community than in the hospital. Snow *et al.* (1994) found through a prospective demographic and hospital-based surveillance study that those who died without admission to hospital lived further from the bus stage and used traditional healers more often, but that there was no influence of mother's education or economic status.

As elsewhere in sub-Saharan Africa, information on adult mortality is limited. All estimates must be considered with great care because of the difficulties associated with collecting reliable information. The 1969 and 1979 censuses included questions on survivorship of parents. From these data life expectancy at age 15 is 53.9 years in Coast Province, which is very close to the national figure (52.9 years) (Brass & Jolly 1993). Life expectancy at birth, combining child and adult mortality, was estimated at 48.7 years

for 1965 and 51.8 years for 1979 (Ewbank *et al.* 1986). Maternal mortality data can be derived from health facility statistics. In 1987, maternal mortality was 1.6 per 1,000 births in Mombasa hospitals and 3.1 in the rural districts of Coast Province (Kenya 1988). Hospital statistics, however, are considered an underestimate. Maternal mortality was 6.6 per 1,000 births in a detailed study of seven villages in Kwale District (Boerma & Mati 1989).

## MORBIDITY

The following information on various illnesses is derived from the literature and also from reports, observations and personal communications. For descriptive purposes the variables of person, place and time are used. Causal factors, physical, biological and socio-cultural including economic and political have been described in the scientific literature but the latter factor has often received insufficient attention.[1] Similarly, the consequences of a condition to an individual, a family, a community and the economy are not always studied. Also, research has been evolving in phases – in the 1960s there was great interest in tropical parasitic diseases, in the seventies and eighties attention focused more on nutrition, diarrhoea and immunisable diseases under the influence of international organisations, while in the nineties the AIDS epidemic and sexually transmitted diseases are a focus of much research.

The overall pattern of morbidity is dominated by communicable diseases (especially tropical parasitic diseases), nutritional disorders and interactions between the two, especially in childhood. The leading diagnoses for patients admitted to hospitals in Coast Province in 1987 were, in descending order, malaria, anaemia, pneumonia, gastro-intestinal infections, abortions, accidents, measles, tuberculosis and malnutrition (Kenya 1988). Among outpatients malaria, acute respiratory infections, skin conditions, diarrhoea and intestinal worms were the leading diagnoses.

Children suffer from many illnesses, mostly infectious diseases. For instance, during four rounds of follow-up of 1200 children under two years in seven villages in Kwale District, a large proportion of children reportedly had symptoms of common illnesses during the two weeks preceding the interview, such as fever (on average 58% of children), cough (44%), running nose (39%), diarrhoea (27%) and skin problems (20%) (Boerma, unpublished data).

1 Some occupations pose specific hazards at the coast such as truck drivers (STD, HIV, road accidents) and road workers (hookworm, malnutrition). Sugar cane workers in Kwale have been found to have a seroprevalence of 24% for leptospirosis (Geus, Kranendonk & Bohlander 1969). Commercial sex workers have high rates of STD and HIV prevalence with ultimate development of AIDS and tuberculosis. Dock workers, as elsewhere, have high rates of trauma. Fishermen, of which there are many, have the hazard of drowning. Coconut palm wine tappers have falls and paraplegia as a specific occupational risk. Farmers who stay in the field to stop birds, thieves and wildlife from sharing the crops are liable to malaria and filariasis.

*Respiratory infections*

Acute respiratory infections are one of the leading causes of outpatient morbidity. While many of these cases may be upper respiratory illnesses (common cold, throat infections etc.), lower respiratory infections, notably pneumonia are also important. In the two weeks prior to the survey, 15% of the children under five had cough with rapid breathing according to their mothers (NCPD 1994). Of these children, 73% had been taken to a health facility, 23% had received an oral antibiotic and 27% an injection.

More severe respiratory infections are also common. In 1987 pneumonia was the third most common diagnosis for inpatients in Coast Province hospitals, after malaria and anaemia. Acute respiratory infection was the fourth most common cause of post-neonatal death among children admitted to Kilifi hospital, following malnutrition, malaria and measles (Snow *et al.* 1992).

Tuberculosis ranked as the eighth most common diagnosis for inpatients in Coast Province hospital in 1987 (Kenya 1988). During the past decade the number of tuberculosis cases has increased considerably, due to the AIDS epidemic. In Kenya, by 1989/90, about 30% of tuberculosis patients were HIV-infected (Narain, Raviglioni & Kochi 1992). Others have estimated that tuberculosis incidence will double as the prevalence of HIV infection reached 13 per 100 adults (Bermejo, Veeken & Berra 1992). Also, different types of tuberculosis will now be more common, notably extra-pulmonary tuberculosis.

*Diarrhoea*

Diarrhoeal diseases and other intestinal infections are an important cause of morbidity and mortality. Surveys focusing on mother's recall of diarrhoea in children under five years have shown that diarrhoea is common in Coast Province: 15% of under-fives reportedly had diarrhoea during the two weeks preceding the survey (NCPD 1994). This is very similar to overall diarrhoea prevalence in Kenya, although it has been suggested that diarrhoea is more common in Coast, Nyanza and Western Provinces (Unicef 1989).

Breast-feeding is an important intervention against diarrhoea and other illnesses, reducing both incidence and severity. In Coast Province, 96% of children are breastfed, but introduction of supplements is early. More than half of the mothers have added plain water within half a year and other supplements follow soon before the recommended 4-6 months of age. This puts the child at an additional risk of gastro-intestinal infections. In addition, lack of safe water, lack of toilet facilities and poor health education are important factors. A survey in Kwale showed that only a very small proportion of households had usable latrines (Omambia, Njogu & Oduol 1985).

Prevention and treatment of severe dehydration through the use of oral rehydration therapy is well known among mothers in Coast Province. Eighty-seven percent of women knew about oral rehydration salts (ORS packets) and 69% had ever used it, which was slightly higher than the national average (NCPD 1994). Simply increasing fluids is important during diarrhoea, whether ORS packets are used or not. Only 37% of mothers of a child with diarrhoea in the last two weeks had done so. A high proportion of these children with diarrhoea had been taken to a health facility (56%).

The aetiology of diarrhoeal disease in children has been studied. Makino *et al.* (1983) found rotavirus prevalent all year, with the highest prevalence among infants under six months with gastro-enteritis in July. Infections with bacteria (*E. coli*) producing stable toxins have also been found in about a fifth of children with diarrhoea (Waiyaki, Sang & Ngugi 1986). Cholera has affected the coastal region in several epidemic years (most recently in 1997), but is now controlled by a diarrhoeal disease programme with emphasis on early diagnosis and readily available rehydration (oral even more than intravenous). The economic effects of a cholera epidemic can be especially great on the tourist industry.

*Intestinal parasites*

A review of intestinal helminthic infections in Kenya since 1900 indicated that helminths should be considered an important public health problem (Chunge, Kamunvi & Kinoti 1985). Intestinal helminths are generally as prevalent as they were 60 years ago, despite various (limited) attempts at control. The common worms that are soil transmitted are hookworm (*Ankyloma duodenale* is most prevalent and leads to more blood loss than *Nector Americanus*), *Ascaris* (roundworm), *Trichuris* and *Strongyloides*. *Enterobius* and *Hymenolepis* are transmitted by the faecal-oral route and *Taenia* (tapeworm) have the intermediate route of cattle and pigs. *Ascaris* and *Taenia* were more common at the coast than elsewhere in Kenya (23% and 10%, respectively), even though pigs are uncommon at the predominantly Muslim coast. Hookworm is more prevalent and the mean prevalence of a range of surveys was 56% (Chunge *et al.* 1985). Most of these surveys had been conducted among school children, but studies in Coastal Kenya also showed the importance of intestinal worms for adults. Studies among road workers in four different regions of Kenya showed that men in Coast Province had the highest number of intestinal helminth infection after faecal examination (1.23 infections per person; Hall *et al.* 1982).

The hot and humid coastal lowlands appear to provide a highly suitable environment for transmission of hookworm infections. Among the coastal roadworkers, 68% had evidence of hookworm in the faeces (Hall *et al.* 1982). Hookworm infection predisposes to anaemia (Foy & Kondi 1960; Latham *et al.* 1982, 1983b), and affects productivity of workers. *Ascaris* infection is also common and can interfere with child growth. Seven percent of coastal roadworkers had evidence of infection in their faeces (Hall *et al.* 1982). Among school children in Coast Province, 30% were found to be infected (Unicef 1989).

Generally, the efforts to reduce the prevalence of intestinal helminthic infections do not seem to have been very successful. With regard to exposure and general hygienic practices it is noted that in 1993 an estimated 24% of households in Coast Province did not have a latrine or other toilet facility (NCPD 1994). Dysentery due to *Entamoeba histolytica* frequently occurs. For instance, antibodies against *E. histolytica* in breastmilk were more common in Mombasa (31% positive) than elsewhere in Kenya (Grundy *et al.* 1983).

*Malaria*

Using the spleen rate among children of 2-9 years as an indicator of the malaria transmis-

sion, coastal Kenya can be described as a holoendemic area (Roberts 1974). This implies there is a high intensity of transmission for at least six months per year. Malaria is one of the leading diagnoses in outpatients, but this is often based on clinical symptoms (fever, malaise). Malaria morbidity has considerable cost to the community and not only in terms of time, treatment seeking, travel etc. Malaria may be a direct cause of death in children and cause cerebral malaria, convulsions, severe anaemia and malnutrition. It also affects pregnancy, especially in primiparae (Rukaria *et al.* 1992), causing severe anaemia, fetal loss and low birthweight. It also has negative effects on school performance and workers output.

Eradication of the vector is nowadays considered improbable, and for the past decade efforts have focused on treatment and, to a lesser extent, prophylaxis. Chloroquine has long been an effective treatment against malaria. During the past decade, resistance against chloroquine has been increasingly reported including Coast Province since 1982. A progressive increase in prevalence of in vitro chloroquine resistant *Plasmodium falciparum* malaria in schoolchildren was shown over a period of three years near Malindi (Sixsmith *et al.* 1983). By 1984, 71% of parasites at the Coast had some degree of resistance in vitro, while 69% of patients had recurrence or did not clear the parasites (Unicef 1989).

Considerable research has been carried out to determine the most effective drugs not only for treatment but also for prophylactic purposes (Watkins *et al.* 1984, 1987; Spencer *et al.* 1986). The tourist industry is important for the coast and reports in the foreign press on deaths from cerebral malaria easily deter tourists A variety of drugs and combinations of drugs have been evaluated and this will no doubt continue. A study in Kilifi Hospital suggested that home use of drugs for a febrile child is very common: 94% of severe malaria cases admitted to the hospital had received salicylates at home. In 21% the dose was inappropriately high which may contribute to the development of complications of severe malaria with high mortality (English, Marsh & Amukoye 1996).

Recently, impregnated bed nets are considered an effective method of drastically reducing the number of mosquito bites (by as much as 90%), although the effects on the epidemiology and individual risk of malaria are less certain.

*Schistosomiasis*

Schistosomiasis or bilharzia is a common parasitic disease in Kenya, with the highest prevalence reported in the Coastal, Lake Victoria and Central regions. The distribution of schistosomiasis depends on the existence of the correct snails. *Bulinus africanus* (Physopsis) are the vectors of *Schistosoma haematobium* and are present in the streams of the coastal strip. *Bulinus globosus* is present at the coast and up the Tana River. There are no snail vectors of *Schistosoma mansoni* at the coast. Infection rates for urinary schistosomiasis are high in school children in Tana River (78% infected) and Malindi Districts (60%). A study in Kwale (Shimada *et al.* 1987) found a prevalence of 68%, and the prevalence of gross haematuria and heavy infections were higher in females than in males, especially after adolescence. This was attributed to differences in water contact. The incidence and prevalence of schistosomiasis is highest among school children. For

instance, the prevalence of hematuria – generally due to schistosomiasis – was up to 85% in a study among schoolchildren (Warren *et al.* 1979). Generally, infection rates peak at 10-14 years of age.

Urinary schistosomiasis is known to cause damage to the urinary tract. Schistosomiasis, however, causes haematuria and proteinuria, and therefore has nutritional consequences (Kinoti *et al.* 1986). Studies in Kwale have shown that *S. haematobium* infections are associated with growth retardation, anaemia and a lower level of fitness among primary school children (Stephenson *et al.* 1985a, 1985b, 1985c). Even though schistosomiasis has been endemic in Coastal Kenya for a long period and many people are affected by the disease, knowledge about its causation is limited. In Kwale District neither parents nor children have adequate knowledge and are not able to undertake preventive measures (Stephenson *et al.* 1986). For instance, 55% of the parents did not know the cause of schistosomiasis and only 19% said it was caused by standing in infected water.

Combined treatment of hookworm, bilharzia and weekly chloroquine for malaria among coastal roadworkers led to weight gain and improved haemoglobin levels. Kinoti, Latham & Oduori (1986) treated primary school children having light to moderate *Schistosoma haematobium* infection with metrifonate. The results showed better growth, improved haemoglobin levels and higher fitness scores, as measured by the Harvard step test. Splenomegaly and hepatomegaly also regressed. They suggested that such yearly mass treatment (or screening with reagent strip tests for haematuria) would reduce not only bilharzia, but also hookworm. School children have the additional burden of walking often long distances to school on an empty stomach or minimal breakfast and hunger can then impair their learning capacity. In areas with high infection rates mass treatment (with four times per year metrifonate or once a year Praziquantel) was successful in reducing the incidence of the disease (Kholy *et al.* 1989). Such campaigns, however, do not preclude the introduction of preventive measures, such as improving the water supply and sanitary habits (Unicef 1989).

*Anaemia*

Anaemia can be caused by nutritional deficiencies and parasitic infections or both. Coastal Kenya has long been known to have a high prevalence of anaemia (Young, Kondi & Foy 1974), and it is the sixth most common outpatient diagnosis in health facilities (Kenya 1988). The high prevalence of malaria, hookworm and, to a lesser extent, schistosomiasis are leading causes of anaemia, which occurs in children, pregnant women (Boerma & Mati 1989) and adult men (Latham *et al.* 1982). Anaemia has a negative effect on productivity. Genetic causes may contribute to anaemia, especially sickle-cell diseases. High sickle-cell trait rates have been found in western Kenya and the Coast. Among the Mijikenda the prevalence of sickle-cell trait ranged from 10-35%, and among the Taveta it was 24% (Foy & Kendall 1974). Sickle-cell trait (homozygous) is an important cause of anaemia in children.

Bs Haplotype 20 is characteristically found in association with the very severe form of sickle-cell anaemia in western Kenya. Ojwang *et al.* (1988) found this in patients along the coastal belt as well and suggested that it might have been introduced with the slave

trade from the western shores of Lake Victoria. Another genetic condition, deficiency of glucose-6-phosphate-dehydrogenase (G6PD) is common among the Mijikenda (16%) and Luo (32%), but not among the Kikuyu (5%). This condition, as with sickle-cell trait and sickle-cell anaemia is most common where malaria endemicity is highest. It can lead to anaemia after ingestion of certain drugs, for instance some antimalarials.

*Filariasis*

*Filaria bancrofti* affects a large proportion of the population at the Kenya coast (Wijers 1974). It is transmitted by the mosquito and causes a wide range of symptoms associated with the destruction of the lymphatics (recurrent attacks of lymphangitis, lymph node infection, hydrocele and elephantiasis). Hydroceles (accumulation of fluids in the testicle: *mapumbu* in Kiswahili) is very common and many patients have a history of previous epididymo-orchitis. There is often an association with inguinal hernia. Hydroceles occur among men aged 20 and 50 years and are not related to a decline in fertility. Men often receive treatment from traditional 'hydrocele tappers' (Saeed & Miller 1984). It is rare in children.

Filariasis is a disease especially of poor, overcrowded badly housed areas and the disease process evolves following prolonged exposure to very many infected mosquito bites. Unlike onchocerciasis (river blindness) the vectors' bites are not so irritating and the consequences are not as severe as blindness and constant itching. So people in highly endemic areas do not migrate but put up with symptoms which appear in later life. Although elephantiasis is a social handicap, a hydrocele unless enormous is not and is hidden by the local attire.

A survey among persons aged 15 years and over found 9-26% prevalence of microfilaria in night blood films in nine study sites (Nelson, Heisch & Furlong 1962). In Mombasa, prevalence was lower (3% positive). Infected mosquito are *Culex quinquefasciatus* which breed in pit latrines in urban areas and *Anopheles gambiae* and *funestus* and *merus* in rural areas. Coastal and inland villages have different rates of transmission of malaria and filariasis by different anopheles (Mosha & Petrarca 1983). The problem of culex breeding in pit latrines which go into the water table has been tackled in many ways – with insecticidal pellets, polystyrene pellets and even detergent (Subra, Service & Mosha 1984). The fight against filariasis has taken a new tempo with the new drug ivermectine (Wijers & Kaleti 1984).

*Dengue*

Dengue virus infection may be without symptoms or may lead to fever, or fever with symptoms of severe headache, muscle and joint pain and rash, or dengue haemorrhagic or dengue with symptoms of shock. The latter is a much feared possibility in areas where the vector *Aedes aegypti* is common. The female mosquito bites during the day and breeds in peri-domestic collections of water, such as coconut shells and old motor tyres. *Aedes* has also been shown to breed in clay pots especially if they are not emptied regularly (Subra 1983). An epidemic did occur at the coast in June-October 1982 but without severe symptoms. The first case was a tourist and positive blood samples were obtained

from people from Malindi, Diani, Mombasa, Lamu and Kilifi, reaching a seroprevalence of 59% (Johnson *et al.* 1982).

*Sexually transmitted diseases*

The most important sexually transmitted diseases (STD) are gonorrhoea, chlamydial infection, syphilis, chancroid and AIDS. All diseases are thought to be common in Coastal Kenya, but few data are available. Genital discharge, often a symptom of gonorrhoea or chlamydial infection, is among the leading diagnoses in outpatients (Kenya 1988). In 1988, HIV prevalence among blood donors was 3.5% in Coast Province. STD and particularly HIV infection may be common in Coastal Kenya.

Mombasa is an important harbour and a starting or delivery point for many truck drivers, a known high risk group for STD. Long distance drivers who ply between Mombasa and Nairobi, Uganda, Congo, Rwanda and Burundi have been investigated for STD as they may spread from the coast inland or bring disease from inland to the coast. In a survey of 331 drivers in 1991 the seroprevalence of HIV was 18% and of syphilis 5%. Of those with gonorrhoea half were resistant to penicillin. Although 99% had heard of AIDS and most knew about condoms only 30% had ever used a condom although a large proportion visited prostitutes (Bwayo *et al.* 1991a, 1991b).

Mombasa, with its large population of commercial sex workers, is also a city where thousands of marines and sailors come for recreation. Mass tourism is now well-established along the Kenya Coast, which also attracts commercial sex workers, and attracts a mobile Kenyan population, of which many men and women are away from home for prolonged periods. Multiple partnerships are an established risk factor for STD transmission. Among men in Coast Province, 37% reported more than one partner in the last six months, and 18% more than two partners (NCPD 1994). Among women, the corresponding figures are 3 and 4%.

*Hepatitis*

The most important type of hepatitis is hepatitis B, a viral condition which can cause serious acute morbidity or become chronic with development of cirrhosis and cancer of the liver. It has been found that over 50% of Kenyans show previous infection by the third to fourth decade of life with 7-10% becoming carriers of hepatitis B antigen; and coastal Kenya is no exception. The antigenaemia is rarely found in the first year of life, so vertical transmission is unimportant. It is acquired horizontally after the third year of life (Greenfield *et al.* 1986). This makes it possible to control the disease by immunisation of infants – three doses of vaccine given simultaneously with polio and DPT.

*Leprosy and skin conditions*

In 1984 Kenya had 9,596 registered cases of leprosy with the majority in Coast, Eastern, Nyanza and Western Provinces. Prevalence of registered cases in these districts varied between 1-3% and one-fifth of new cases are multi-bacillary infectious patients. Treatment success is now very good with new drug regimens. In the early days of the ‘leper settlements’ there were small settlements at Malindi, Lamu and Tumbe in Kwale District,

but this method of control is fortunately part of history. However, even when cured, patients still have disability from anaesthetic areas and resulting deformity if treatment was not started early (NLTP 1987).

Pityriasis versicolor, a fungus infection, is very prevalent at the coast due to the high temperatures and humidity. Jiggers and scabies, with or without secondary bacterial infection, are also common – the latter often occurring in small epidemics in schools.

## CONCLUSION

The health conditions of people living in coastal Kenya appear to be less than in most other parts of Kenya. Mortality levels are higher than the national average and there has been a lack of mortality decline since the 1950s. Nutritional status, a consequence of illness and inadequate nutrition, is also well below the national average and the burden of morbidity is high. Women's health and nutritional status is poor, which contributes to low birthweight and high maternal mortality.

At first sight, coastal Kenya appears to have a good health infrastructure, at least in comparison with other areas of Kenya. Health service availability data do not indicate that services are more distant than in other areas of Kenya. Utilisation of modern health services does not appear to differ much from that in most other provinces. Yet, this may be somewhat misleading. Most of the services are concentrated in Mombasa or along the coastal roads. Services inland are much poorer and more distant. Furthermore, many people are rather traditional and conservative in their way of life, including their health seeking behaviour, and less likely to rapidly adopt new interventions and implement these effectively than elsewhere in Kenya. Non-biomedical explanations of illness are very prominent and guide the health actions undertaken by the household in many cases.

Levels of education at Coast Province are relatively lower than elsewhere. Particularly mother's level of education has been shown to be one of the most powerful determinants of child survival. In 1993, 37% of women 15-49 years in Coast Province had no formal education at all, compared to 18% illiteracy in Kenya as a whole (NCPD 1994)

Coastal Kenya has a tropical humid climate, which is a favourable environment for many tropical diseases. Presently, malaria is the leading problem, but also schistosomiasis, intestinal worm infections and filariasis are important public health problems. Recent interventions, such as impregnated bednets to reduce mosquito bites and control of schistosomiasis or intestinal worms, may have significant effects on health at the Kenya Coast.

The nature of health problems amplifies the need for integrated and co-ordinated development planning to obtain the advantage of inter-sectoral collaboration for health – water, agriculture, education, roads and works, community development etc. This, of course, should be accompanied by increased emphasis on training in effective programmes for malaria, STD, tuberculosis, MCH and family planning, nutrition and improvement in quality of care in all clinics.

REFERENCES

Bermejo A., Veeken H. & Berra A. (1992). Tuberculosis in incidence in developing countries with high prevalence of HIV infection. *AIDS*, 6, 1203-1206.

Bjerregaard P., Steinglass R., Mutie D.M. *et al.* (1993). Neonatal tetanus mortality in Coastal Kenya: a community survey. *International Journal of Epidemiology*, 22, 163-169.

Blacker J.C.G., Mukiza-Gapere J., Kibet M. *et al.* (1987). Mortality differentials in Kenya. Paper presented at IUSSP seminar on mortality and society in sub-Saharan Africa, October 19-23. Yaoundé, Cameroon.

Boerma J.T. & Baya M.S. (1990). Maternal and child health in an ethnomedical perspective: traditional and modern medicine in coastal Kenya. *Health Policy and Planning*, 5, 347-357.

Boerma J.T. & Mati J.K.G. (1989). Identifying maternal mortality through networking: results from coastal Kenya. *Studies in Family Planning*, 20, 245-253.

Brass W. & Jolly C.L. eds. (1993). *Population dynamics of Kenya.* Washington: National Academy Press.

Bwayo J.J., Omari A.M., Mutere A.W. *et al.* (1991a). Long-distance truck drivers 1. Prevalence of sexually transmitted diseases. *East African Medical Journal*, 68(6), 425-429.

Bwayo J.J., Mutere A.W. & Omari A.M. (1991b). Long-distance truck drivers 2. Knowledge and attitudes on sexually transmitted diseases. *East African Medical Journal*, 68(9), 714-719.

Chunge R.V., Kamunvi F. & Kinoti S.N. (1985). Intestinal parasitosis in Kenya: a review of intestinal helminths in Kenya, 1900-1983. *East African Medical Journal*, 62(8), Suppl: 1-27.

De Geus A., Kranendonk O. & Bohlander H. (1969). Clinical leptospirosis in Kwale District, Coast Province - a pilot study. *East African Medical Journal*, 46(9), 491-496.

Dirie M.A. & Lindmark G. (1992). The risk of medical complications after female circumcision. *East African Medical Journal*, 69(9), 479-482.

English M., Marsh V. & Amukoye E. (1996). Chronic salicylate poisoning and severe malaria. *Lancet*, 347, 1736-1737.

Ewbank D.C., Henin R. & Kekovole J. (1986). *An integration of demographic and epidemiologic research on mortality in Kenya. In: United Nations. Determinants of mortality change and differentials in developing countries: the five country case study project.* Population Studies No. 94. New York: Department of International Economic and Social Affairs.

Foy H. & Kendall A.G. (1974). Haemoglobinopathies. In L.C. Vogel, A.S. Muller, R.S. Odingo *et al.* eds. *Health and disease in Kenya* (pp. 437-443). Nairobi: Kenya Literature Bureau.

Foy H. & Kondi A. (1960). Hookworm in the aetiology of tropical iron-deficiency anaemia. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 54, 420-433.

Gerlach L.P. (1959). Some basic Digo conceptions of health and disease. In *Proceedings of Attitudes to Health and Disease among some East African Tribes, a one day symposium* (pp. 9-34). Kampala: East African Institute of Social Research.

Greenfield C., Wankya B.M.W., Musoke V. *et al.* (1986). An age related point prevalence study of markers of Hepatitis B virus infection in Kenya. *East African Medical Journal*, 63(1), 48-53

Grundy M.S., Cartwright-Taylor L., Lundin L. *et al.* (1983). Antibodies against Entamoeba histolytic in human mild and serum in Kenya. *Journal of Clinical Microbiology*, 17(5), 755-758.

Haaga J., Mason J., Omoro F. *et al.* (1986). Child malnutrition in rural Kenya: a geographic and agricultural classification. *Ecology of Food and Nutrition*, 18(4), 297-307.

Hall A., Latham M.C., Crompton D.W.T. *et al.* (1982). Intestinal parasitic infections of men in four regions of rural Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 76, 728-733.

Hedley R. & Dorkenoo E. (1992). *Child protection and female genital mutilation.* Foundation for Womens Health Research and Development. London : Forward.

Johnson B.K., Ochieng D., Gichogo A. *et al.* (1982). Epidemic dengue fever caused by dengue type 2 virus in Kenya. Preliminary results of human virological and serological studies. *East African Medical Journal*, 59(12), 781-784.

Kenya, Republic of (1986). *Kenya Contraceptive Prevalence Survey 1984. Provincial Report.* Nairobi: Central Bureau of Statistics / Ministry of Planning and Development.

Kenya, Republic of (1988). *Annual report Health Information System Coast Province 1987*. Nairobi: Ministry of Health.

Kenya, Republic of (1991). *Fourth rural child nutrition survey, 1987.* Nairobi: Central Bureau of Statistics.

Kholy H. el, Siongok T.K., Koech D. *et al.* (1989). Effect of borehole wells on water utilization in Schistosoma haematobium endemic communities in Coast Province, Kenya. *American Journal of Tropical Medicine and Hygiene,* 41, 212-219.

Kinoti S.N., Latham M.C. & Oduori M.L. (1986). Nutritional implication of schistosomiasis (editorial). *East African Medical Journal,* 63, 225-227.

Kiragu K. (1995). *Female gential mutilation: A reproductive health concern*. Supplement to Population Reports No 41, Vol XXIII, No.3. Baltimore: Johns Hopkins Centre for Communication Programmes .

Kwamunga D., Githui W., Agwanda R. *et al.* (1993). BCG Scar Survey among primary school children in Kenya. *East African Medical Journal,* 70(9), 568-571.

Latham M.C., Stephenson L.S., Hall A. *et al.* (1982). A comparative study of the nutritional status, parasitic infections, and health of male roadworkers in four areas of Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 76, 734-740.

Latham M.C., Stephenson L.S., Eliott T.C. *et al.* (1983a). Nutritional status, parasitic infection, and health of roadworkers in 4 areas of Kenya. Part 1. Kwale District Coastal lowlands. *East African Medical Journal,* 66(1), 2-10.

Latham M.C., Stephenson L.S., Hall A. *et al.* (1983b). Parasitic infections, anaemia and nutritional status: a study of their interrelationships and the effects of prophylaxis and treatment on workers in Kwale District, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 77, 41-48.

Makino Y., Matsumoto I., Chibu Y. *et al.* (1983). Virological study of children in Nyeri and Mombasa: Monthly survey of rotavirus in faeces. *East African Medical Journal,* 60(8), 536-541.

McPake B., Hanson K. & Mills A. (1993). Community financing of health care in Africa: an evaluation of the Bamako initiative. *Social Science and Medicine*, 36, 1383-1395.

Melgaard B., Kimani G. & Mutie D. (1987). A community study of neonatal tetanus in Kenya. *East African Medical Journal,* 64 (7), 458-463.

Melgaard B., Mutie D. & Kimani G. (1988). A cluster survey of mortality due to neonatal tetanus in Kenya. *International Journal of Epidemiology,* 17, 174-177.

Mosha F.W. & Petrarca P. (1983). Ecological studies on Anopheles gambiae complex sibling species on Kenya coast. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 77(3), 344-345.

Mosley W.H., Werner L.H. & Becker S. (1982). *The dynamics of birth spacing and marital fertility in Kenya*. WFS Scientific Reports 30. Voorburg, NL: International Statistical Institute.

Mott F.L. (1982). *Infant mortality in Kenya: evidence from the Kenya Fertility Survey.* WFS Scientific Reports 32. Voorburg, NL: International Statistical Institute.

Muhuri P.K. & Rutstein S.O. (1994). *Socioeconomic, demographic and health indicators for subnational areas.* DHS Comparative Studies No.9. Calverton, Md: Macro International.

Naggar A.R. al (1985). Islam and female circumcision -Cairo family Planning Association, Communication presented at Inter-African Committee Workshop on Traditional Practices Nairobi 12 July 1985.

Narain J.P., Raviglione M.C. & Kochi A. (1992). HIV-associated tuberculosis in developing countries: epidemiology and strategies for prevention. *Tubercle and Lung Disease,* 73, 311-321.

NCPD (1994). *Kenya Demographic and Health Survey 1993*. Calverton, Md: National Council for Population and Development, CBS & Macro International.

NCPD (1989). *Kenya Demographic and Health Survey 1988/89.* Columbia, Md: National Council for Population and Development & Macro Systems.

Nelson G.S., Heisch R.B. & Furlong M. (1962). Studies in filariasis in East Africa. II. Filarial infections in man, animals and mosquitoes on the Kenya Coast. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 65, 256.

NLTP (1987). *National Leprosy and Tuberculosis Control Programme Manual.* Nairobi: Ministry of Health, National Leprosy and Tuberculosis Control Programme.

Ojwang P., Ogada T., Gonzales-Redondo J. *et al.* (1988). Bs Haplotype and Thalassemia along the coastal belt of Kenya. *East African Medical Journal,* 66(6), 377-380.

Omambia D., Njogu W. & Oduol E. (1985). *Kwale District village water survey and sanitation project.* Nairobi: AMREF.

Roberts J.M.D. (1974). Malaria. In L.C. Vogel, A.S. Muller, R.S. Odingo *et al.* eds., *Health and disease in Kenya* (pp. 305-319). Nairobi: Kenya Literature Bureau.

Rukaria R.M., Ojwang S.B.O., Oyieke J.B. *et al.* (1992). In vivo and in vitro response of Plasmodium falciparum to chloroquine in pregnant women in Kilifi District, Kenya. *East African Medical Journal,* 69(6), 306-310.

Saeed S. & Miller B.J. (1984). A study of hydroceles in Kilifi. *East African Medical Journal,* 61(1), 60-62.

Shimada M., Hirata M., Ouma J. *et al.* (1987). Epidemiological study of Schistosoma haematobium infection in the coastal area of Kenya. *Japanese Journal of Tropical Medicine and Hygiene,*15(3), 173-184.

Sixsmith D., Spencer H., Watkins W. *et al.* (1983). Changing in vitro response to chloroquine of Plasmodium falciparum in Kenya. *Lancet,* ii, 1022.

Snow R.W., Armstrong Schellenberg J.R.M., Forster D. *et al.* (1994). Factors influencing admission to hospital during terminal childhood illnesses in Kenya. *International Journal of Epidemiology,* 23, 1013-1019.

Snow R.W., De Azevedo I.B., Forster D. *et al.* (1993). Maternal recall of symptoms associated with childhood deaths in rural East Africa. *International Journal of Epidemiology,* 22, 677-683.

Snow R.W., Armstrong J.R.M., Foster D. *et al.* (1992). Childhood deaths in Africa: uses and limitations of verbal autopsies. *Lancet,* 340, 351-355.

Spencer H.C., Watkins W., Sixsmith D. & Koech D. (1986). Response of Plasmodium falciparum to dihydrofolate reductose inhibitors in Malindi, Kenya. *Transactions of the Royal Society of Tropical Medicine and Hygiene,* 80(2), 201-203.

Stephenson L.S., Elliott T. & Kinoti S.N. (1986). Water, sanitation and knowledge about urinary schistosomiasis in a Kenyan coastal community: a study combining ethnographic and survey techniques. In L.S. Stephenson ed., *Schistosomiasis and malnutrition*. Cornell International Nutrition, Monograph Series No. 16 (pp. 69-192). Ithaca, NY: Division of Nutritional Sciences, Cornell University.

Stephenson L.S., Latham M.C., Kurz K.M. *et al.* (1985c). Urinary iron loss and physical fitness of Kenyan children with urinary schistosomiasis. *American Journal of Tropical Medicine and Hygiene,* 34, 322.

Stephenson L.S., Latham M.C., Kurz K.M. *et al.* (1985a). Relationships of Schistosoma haematobium, hookworm and malarial infections and metrifonate treatment to growth of Kenyan school children. *American Journal of Tropical Medicine and Hygiene,* 34, 1109.

Stephenson L.S., Latham M.C., Kurz K.M. *et al.* (1985b). Relationships of Schistosoma haematobium, hookworm and malarial infections and metrifonate treatment to haemoglobin level of Kenyan school children. *American Journal of Tropical Medicine and Hygiene,* 34, 519.

Subra R. (1983). The regulation of preimaginal population of Aedes aegypti on the Kenya Coast. I. Preimaginal population dynamics and the role of human behaviour. *Annals of Tropical Medicine and Parasitology,* 77(2), 195-201.

Subra R., Service M. & Mosha F. (1984). The effect of domestic detergents on the population dynamics of the immature stages of two competitive mosquitos Culex cinereus and Culex

quinquefasciatus in Kenya. *Acta Tropical,* 41(1), 69-75.

Unicef (1989). *Situation analysis of children and women in Kenya.* Nairobi.

Unicef (1988). Preliminary results of CSD baseline survey, Kwale District. Unpublished document. Nairobi.

Waiyaki P.G., Sang F.C. & Ngugi J.M. (1986). Enterotoxigenic Escherichia coli infection in childhood diarrhoea in Mombasa Kenya. *East African Medical Journal,* 63(1), 29-34.

Warren K.S., Mahmoud A.A.F., Muruka J.F. *et al.* (1979). Schistosomiasis haematobia in Coast Province, Kenya: relationship between egg output and morbidity. *American Journal of Tropical Medicine and Hygiene,* 28, 864-870.

Watkins W.M., Brandling-Bennett A., Oloo A. *et al.* (1987). Inadequacy of chlorproguanil 20mg per week as chemoprophylaxis for falciparum malaria in Kenya. *Lancet,* i, 125-128.

Watkins W.M., Sixsmith D.G., Spencer H. *et al.* (1984). Effectiveness of amodiaquine as treatment for chloroquine resistant Plasmodium falciparum infection in Kenya. *Lancet,* i, 357-359.

WHO (1982). *Traditional practices affecting the health of women and children* (T. Baasher *et al.* eds). Alexandria : WHO/EMRO.

Wijers D.J.B. (1974). Filariasis. In L.C. Vogel, A.S. Muller, R.S. Odingo et al. eds. *Health and disease in Kenya* (pp. 358-362). Nairobi: Kenya Literature Bureau.

Wijers D. & Kaleti N. (1984). Bancroftian filariasis in Kenya V. Mass treatment given by members of the local community. *Annals of Tropical Medicine and Parasitology,* 78(4), 383-394.

Young S., Kondi A. & Foy H. (1974). Anaemias. In L.C. Vogel, A.S. Muller, R.S. Odingo *et al.* eds. *Health and disease in Kenya* (pp. 431-436). Nairobi: Kenya Literature Bureau.

## REVIEW DETAILS

*Source*

Boerma J.T. & F.J. Bennett (2000). Health and Illness. In Hoorweg J., Foeken D. & Obudho R. eds. *Kenya Coast Handbook:Culture, resources and development in the East African littoral.* (pp. 261-277). Hamburg: LIT Verlag