

1. Introduction

Japan International Cooperation Agency (JICA) has already been extending its technical cooperation to Ghana in various fields including health and medical aspects. In order to explore future cooperation, JICA decided to carry out a preliminary observation of the present status of infectious diseases as well as the control strategies in Ghana by sending the present observation team composed of 5 members who cover public health, epidemiology, microbiology, parasitology, pediatrics, hospital facilities as well as general administrative structures of the Ministry of Health, Ghana.

The team has been in Ghana for 24 days started from August 17 to September 9, 1987 and visited Accra, the capital of the country and some other regions such as Central, Ashanti, Northern and Volta. In those places the team studied available informations on the health status and other health related documents, and observed the existing institutions for preventive and curative services, manpower programmes and activities to control various infectious diseases. The team also discussed with the authorities concerned on the health status of the people of Ghana and strategies to control the diseases prevailing in the country or the areas visited.

This report summarizes their observations and some recommendations for the future cooperation.

2. An outlook of the infectious diseases in Ghana

2.1. General remarks

With the enthusiastic efforts of the Government of Ghana, the health status of this country has been improved gradually, although there has been some delay in recent years. The infant mortality rate was reduced to 94/1000 live births for the year 1985 from 130 for the year 1971, and average life expectancy at birth was extended to 53 years from 46 also for the respective

years.

However, the information of various infectious and non-infectious diseases in Ghana obtained from the authorities of the Ministry of Health (MOH) indicates that there is still high incidence in several infectious diseases which could be controlled by the adequate measures.

According to the statistics of the government hospitals, health centres and health posts on outpatients in 1986 (Table 1), malaria presents the first place in morbidity (39.3%), upper respiratory diseases at the second (8.2%) and diarrhoeal diseases at the third (8.1%). It is also shown that more than 60% of all the patients are considered to be suffered from infectious and parasitic diseases in the country.

Mortality statistics (1979-1983, Table 2) also indicates that infectious and parasitic diseases are at the first place (26.6%). Diseases of the circulatory system are at the second place (12.2%), followed by the death in the perinatal period at the third place (9.0%) and respiratory diseases at the fourth (8.7%), both of the last two may include considerable number of cases of infective origin. The fact stated above shows clearly that the infections by microbes and infestations by parasites are the most important to be considered to improve the health status of the people in Ghana. (Table 2 & 3)

Malnutrition, especially deficiency in protein seems to influence greatly the incidence and fate of infectious diseases and the perinatal conditions; the problem will be stated later in some details.

High infant mortality (94 per 1000 live births, 1985) seems to be the main cause of short life expectancy (53 years, 1985) of the people of this country.

Among the infectious diseases showing a serious influence on the health status of the people, attention should be focused on

diarrhoeal diseases, respiratory infections including pneumonia, tuberculosis, measles, tetanus, enteric fever and infectious hepatitis as well as malaria and other parasitic diseases. Infectious diseases stated above seems to be the main cause of hazards for children in this country. The majority of such infectious diseases (probably more than 50%) can be controlled by appropriate measures, such as improvement of environmental hygiene, immunization, early and adequate treatment as well as health education.(Table 4)

Regarding the hygienic conditions, safe drinking water is available to only a limited extent, mainly in urban areas. Majority of the rural people use water from river, pond, spring, shallow wells or collected rainwater etc, which may not be suitable for drinking. Facilities for excreta and waste disposal are very rare in rural area where majority of the people (70%) inhabits.

Recently, immunization has been carried out actively in all the 10 regions of the country. In 1984 and 85, the coverage in one-year old children for measles is reportedly 83% but those for BCG, DPT, polio and tetanus toxoid seems to be below 50%. Among those preventive diseases the incidence of measles seems considerably decreased, but the trend of incidence of the target diseases is difficult to estimate because survey of the diseases has not yet been completed.

It seems to the team that there is a considerable shortage of medical personnel. The member of the physicians and dentist registered to the Medical and Dental Board in 1985 is 1,782. There may be also a considerable number of physicians who are residing or going to practise abroad. If the number stated above is correct, the number of physicians per 100,000 population is about 12, which is far from standard to keep the people's health. Actually even in the Korle-Bu Teaching Hospital, which has about 1,500 beds, there are only 147 physicians, among whom 45 are the specialists (consultants). Furthermore, more than half of the doctors (2/3 or more) are concentrated in Greater Accra and some

few urban areas with population of above 80,000, while the population ratio of urban/rural area is 2:8. At present the Ministry provides health services for an estimated 30-40% of the population.

Shortage in the number of nurses and other medical professionals is also a serious problem. It seems that shortage of qualified laboratory and X-ray technologists is in serious condition. Since there is no college for the dentist, shortage of dentists in this country is obvious. The establishment of such a college in Ghana is awaited.

Thus, majority of the inhabitants can hardly access to the modern medical facilities and has to depend on the traditional medical practitioners in rural area. Although health education is a very important factor for "Health for All" strategy, it seems rather difficult in rural area because of shortage of vehicles and/or equipments, and well-trained manpower as well as relatively low literacy rate.

2.2. Existing status of some important infectious diseases and related problems (Table 3 and 4)

2.2.1. Acute bacterial infections

2.2.1.1 Diarrhoeal diseases

The statistics of outpatients in 1985 and 1986 shows that about 15% of whole outpatients are the cases of diarrhoeal diseases. The numbers were reported as 132,102 and 165,768 respectively in each year.(Table 4) It has also been reported that 8,560 deaths occurred due to diarrhoeal diseases from 1968 to 1977 of which 7,454 cases (78%) were children under 5 years of age. Furthermore, 2,921 deaths due to the same diseases were reported from 1979 to 1983 ranking next to measles.(Table 3) However, it seems that not much attention has been paid to these important infections in this country.

Most such patients are treated as outpatients, being given ORS (oral rehydration solution, donation from UNICEF) and some antibiotics without bacteriological examination. Only severe cases are hospitalized and examined more closely.

Since only a few cross-sectional studies on the causative organisms have been carried out, even epidemiology of dysentery, which is the most infective among the diarrhoeal diseases, is not yet clear. In the studies performed recently, it is shown that Shigella species have been isolated from 14.5% of the cases of infantile diarrhoea in a rural area, and an incidence of enterotoxigenic E. coli was about 7% in the same population. (Table 5 and 6) As for the drug-resistance of these organisms, there are also only scarce informations. Further study on the causative agents is an urgent objective to establish control measure and appropriate treatment of the diarrhoeal diseases.

2.2.1.2. Cholera

Cholera is no more a fatal disease at present as far as an appropriate treatment is given to the patients. However, a constant surveillance is necessary because the disease is highly infective and the outbreak always occurs with rapid expansion.

In this country, the diseases first appeared in 1970, and outbreaks with cases more than 10,000 and several hundred deaths took place in 1971, 1977 and 1982-83 respectively. Although there has been no reported case of cholera since 1986, the possibility of its invasion is still present in this country. (Table 7)

2.2.1.3. Enteric fever

According to the statistics from 1979 to 1983, number of deaths due to enteric fever was 1,356 (7.9% of total death due to infectious diseases). (Table 3) However, number of cases has been decreasing gradually after 1971 when the highest number (4,202) was recorded. Numbers of reported cases in 1984 and 1985 were 1,371 and 1,653 respectively. There is apparently an accumulation

of the cases of enteric fever in some particular regions (Central, Eastern, G. Accra and Volta). The reason of such endemicity is not clear.(Table 8)

2.2.1.4. Acute respiratory infections

Acute respiratory infections are the important diseases since they are the main cause of deaths of children in Ghana. Monthly Activity Report for the period 1986(61% of response rate) shows that among the whole outpatients (2,051,501) 8.9% were upper respiratory tract infections and pneumonia.(Table 1) Although the case fatality rate of the respiratory tract infections in 1986 is unknown, diseases of the respiratory system, most of which are suspected as infectious origin, ranked at the fourth place (8.7%) in all causes of death in Ghana during 5 years statistics of death (1979-83).(Table 2) Since causative organisms are not specified in most cases, the prevalence of the infections of viral origin is not clear.

2.2.1.5. Whooping cough and diphtheria

According to Epidemiological Bulletin, the number of cases of whooping cough has been gradually decreasing after 1981 when that of the reported cases was 13,509.(Fig. 1) Morbidity and mortality of diphtheria are even lower than those of whooping cough. Since case fatality rate is very low, and vaccination is commonly accepted, these diseases may not be important health problems in this country.

2.2.1.6. Cerebrospinal meningitis (CSM)

Since northern regions of Ghana locate at the western end of "Celebrospinal Meningitis Belt", CSM breaks out every year in these regions in dry season, i.e., from January to March. In recent years, outbreaks of 1984 and 1985 were the largest in scale, and 4,024 and 4,912 cases were reported respectively. In 1986, total number of the cases reduced in some extent, but the epidemic expanded to the regions which had remained relatively

free from CSM previously. (Table 9)

It is reported that 53% of total cases were under 14 years of age, and 92% were under 29 years in 1985. Vaccination against CSM has been continued since 1984.

2.2.1.7. Gonorrhoea

The number of cases of gonorrhoea among total outpatients was 13,940 in 1985 and 15,858 in 1986, although sex and age of these patients were not clear. (Table 3) There is no available data on the prevalence of PPNG (penicillinase-producing Neisseria gonorrhoeae).

Concerning gonococcal infection, there are number of cases of ophthalmia neonatorum (6,590 cases from 1976 to 1985) reported. This may reflect the fact that instillation of any kind of effective preparations such as silver nitrate solution or antibiotic ointment is not usually given into baby's eyes at birth.

2.2.1.8. Tetanus

Tetanus is also prevalent (783 in 1985: 1,164 in 1986) in this country, and it can not be neglected because of its high fatality rate (ca. 19%). (Fig. 2) Total deaths due to tetanus were 1,172 in 5 years from 1979 to 1983 (6.9% of all deaths due to infectious diseases). (Table 3) As a result of vaccination with toxoid, these numbers are gradually decreasing in recent years.

Neonatal tetanus is a major problem for infants with case fatality rate of about 50%. Although 67 admitted patients were reported in Volta Region (1986), total number of patients affected by neonatal tetanus in Ghana remains unknown.

2.2.1.9. Other bacterial infections

Anthrax is reported occasionally from the northern regions. Because of the lack of hygienic knowledge of the people, handling of carcasses is sometimes inadequate, and they are said even to eat the meat of the dead animals in some cases. Brucellosis, glanders and other zoonoses have not been recorded.

2.2.2. Chronic bacterial infections

2.2.2.1. Tuberculosis

Although there is no reliable data on the total number of infective cases of tuberculosis, annual number of new cases from 1976 to 1985 was about 4,200 in average. (Table 10) Another statistics indicates that the total number of deaths due to tuberculosis in 5 years from 1979 to 1983 was 2,224 which is outranked only by malaria. (Table 3)

In spite of its importance in public health, the counter measure against tuberculosis seems to be not very sufficient. No culture of acid-fast bacilli is practised in any major chest clinics or health service laboratories, because of the lack of facilities, and only bacteriological examination performed is acid-fast staining of the sputum which is also sometimes omitted because of the lack of reagents. Most patients are treated at outpatient clinic, and only severe cases are hospitalized. Since no drug-resistance test is performed, appropriate drug sometimes may be given only after the ineffectiveness of the primary drug(s) is recognized. There is a possibility even to propagate the drug-resistant organisms by such a practice.

It is important to mention that the number of patients above stated is that of the newly reported cases, and the number of cases under treatment and/or to be treated must be larger than that. About 10% of children are positive to PPD by age 14.

BCG vaccination is routinely given to the new-born babies as

a part of EPI. Coverage rate was about 34.4% in the first half of 1986.

There is no available data for infection of atypical mycobacteria.

2.2.2.2. Leprosy

Leprosy is also one of the important chronic bacterial diseases in this country. According to the Annual Report of the Ghana Leprosy Service for 1983, total number of registered patients of leprosy in that year was 22,177. Since the number of cases released from control and that of newly registered cases are almost the same, the total number of cases remained almost unchanged. Its rate against population is much higher in northern regions, and 14% of newly recognized cases were the children.(Table 11 and 12)

Lepromin or Mitsuda reaction is not practised at present because of the lack of antigen. However, 24.5% of the patients are diagnosed as lepromatous type by clinical findings.

Besides 6 leprosaria, mobile teams and static clinics in rural area are working for case-finding and treatment of the patients. The multibacillary patients with B.I.(bacillary index) higher than 3 are treated according to the multi-drug therapy recommended by WHO, i.e., with DDS (Dapsone), Rifampicin (Rifadin, Rimactane) and Clofazimine (Lamprene). Paucibacillary cases (B.I.≤2) are usually treated with Rifampicin and Dapsone. It has been found that such regimen facilitates the disappearance of the leprosy bacillus from the skin specimen. Surgical operation is performed for the patients with deformities and orthopaedic apparatuses are brought into production at Ankaful Leprosarium.

2.2.2.3. Yaws

Yaws has been known as one of the most important infectious diseases in Ghana since long years ago(Table 13). Anti-yaws

campaign in this country started as early as in 1957, and case-finding and mass treatment with penicillin (1,200,000 units for adult, 600,000 units for children under 15, and 300,000 units for children under 5) by mobile field unit (MFU) resulted in the reduction of its prevalence from 1.69% to 0.17% in Volta Region and from 1.15% to 0.11% in Brong-Ahafo Region. As a result of subsequent nationwide campaign, total number of the cases decreased to 5,343 in 1969.

Since the activity of MFU was interrupted because of the invasion of cholera in 1970, prevalence of yaws began to increase again reaching a peak in 1976 (71,765 cases), 87% of these cases were the children under 15 years of age. Therefore, a new project (Yaws/Yellow fever project) was organized in 1981, and the same procedure as before was performed together with vaccination against yellow fever and measles at the same time. In addition, BCG and tetanus toxoid were given to appropriate risk groups. The activity was discontinued in 1984, but significant reduction of the cases was observed in 1984 when the number of the patients was 9,160 with slight increase in the following year (14,103). To maintain such an achievement, continuation of the project is necessary as proved by the interruption of the project in the 1970's, and the next anti-yaws project is expected to start in 1988. (Table 13 & 14)

2.2.3. Viral infections

2.2.3.1. Yellow fever

Presence of yellow fever in Ghana has been known from the old time, and its outbreak has repeatedly occurred to the present. The most recent outbreak took place in 1983 with 372 cases and 210 deaths, but no case has been reported after 1985. (Table 15)

As stated in the previous section, Yaws/Yellow fever project was effectively conducted from 1981 to 1983, and vaccination against yellow fever only was continued to 1985. The campaign is expected to be commenced in 1988. Control of vector (Aedes

eaegypti) has not been practised widely in Ghana.

2.2.3.2. Measles

Measles is the most important of all diseases for which vaccine is available. From 1974 to 1979, about 100,000 cases were reported annually (Fig. 3). Case fatality for total and admitted cases were 0.4-0.5% and at least 10%, respectively. The high mortality rate of children affected by measles is due to diarrhoea which exacerbate protein-energy malnutrition and other complications. The 75% of children are infected by 2 years and the malnutritional status is dominant in this age group. Although the morbidity rate is decreasing from the middle of 1985 as a result of intensive immunization campaign by which total coverage rate of vaccine reached to 83.9%. However, coverage rate of measles vaccination decreased to 30.2% in the first half of 1986 with a high failure rate (26.5%, UNICEF Report). This indicates the necessity of more intensive health education should be given to mother by medical staffs. (Table 16)

2.2.3.3. Poliomyelitis

Poliomyelitis virus is widespread in Ghana (Fig. 4). By 4-6 years, 90% of all children are described to have antibodies to all 3 types of the virus. Residual paralysis due to poliomyelitis is about 6-7 per 1000 (Report of UNICEF). Vaccination against polio has been intensively carried out, but coverage rate in relation to target population was under 40%.

2.2.3.4. Viral hepatitis

The number of the cases of viral hepatitis among the out-patients is reported to be 10,890 in 1985 and 10,670 in 1986. (Table 4) Since no virological examination is performed, prevalence of each type of infections (A, B and non-A non-B) is not known. It has been reported that in the 1970's, 6% of the bank blood was positive for HBs antigen and the rate increased to 9% in recent days. The propagation of HB infection among Ghanaian

population is suggested.

2.2.3.5 AIDS

The first cases of AIDS were reported in Ghana in March 1986, involving a couple who returned from Europe. The number of cases then has been gradually increasing, but still less than that in most other African countries. Up to the summer of 1987, 220 seropositives against HIV have been detected, and 50% of these persons are diagnosed already as AIDS.

Before June, 1987, 18 cases (17 females and one male) have been admitted at Korle-Bu Hospital. In addition, 12 cases with AIDS-related complex have been also hospitalized. Sixteen among 17 female cases are the repatriates from Ivory Coast where they performed prostitution. Characteristically, in this country, male:female ratio of AIDS cases is 1:8, contrasting those in Europe and U.S.A (92:8) and also in other African countries (about 1). There have been 6 congenital cases of AIDS, which have all died.

Screening of the bank blood for HIV has been performed since 1987 at the Health Laboratory Services, Ministry of Health. So far, only 0.2% was found to be seropositive, and the result suggests that the prevalence of AIDS in Ghanaian population is still low.

The AIDS National Technical Committee is taking necessary activity to prevent the diffusion of AIDS including health education, serological tests, counselling for seropositive individuals, and others.

2.2.3.6. Other viral infections

There are about 10,000 cases of chickenpox every year. However, because of its self-limiting nature, the disease is not considered as a major health hazard. Haemorrhagic conjunctivitis is also in the similar situation because of its self-limitedness

at present. Rabies is reported also every year, and the number of deaths in 10 years from 1976 to 1985 was 161 in total. Neither case of Lassa fever nor monkey pox has been reported, but reservoir animals are known to be present in this country, and a possibility of their occurrence can not be neglected.

2.2.4 Vaccination and EPI programme

EPI(Expanded Programme on Immunization) is one of the most important projects for the prevention of infectious diseases in children. Although vaccination programme was introduced in Ghana in 1971, the programme was not carried out effectively until 1975. This period may be called as "Pre-EPI period".

Since the effort was paid to the health education of the people and the establishment of cold chain system from 1976 to 1978, the programme gained its proper form during this period. The cold chain system was propagated to 65 districts in the country after 1979.

Coverage rate of vaccination after 1980 is shown in the attached Table(Table 17). As seen in this table, the rate reached the highest in 1985. This is thought to be a result of "Intensive Mass Immunization Campaign" planned to improve high incidence of measles.

A suggested schedule for immunization is as follows: BCG and oral polio vaccine (1st dose) are given to new born babies, at birth or soon after. DPT (1st dose) and 2nd dose of polio are given at 6 weeks. The 2nd dose of DPT and the 3rd dose of polio are given at 3 months, and the 3rd dose of DPT at 9 months. Measles vaccine is given at 9 months. Tetanus toxoid is given twice to the pregnant women (5 and 7 months) and all school girls in Form 4 (middle school). CSM and yellow fever vaccines are given in the endemic area, when immunization is necessary.

Vaccines are the donations of UNICEF. After arrival, vaccines are stored in the central cold room (as a result of failure of the

cold room in Korle-Bu, vaccines were tentatively stored in the cold room of NMIMR in the summer of 1987). It is proposed that the central cold room will be provided at the Kotoka International Airport, Accra.

Gas refrigerators also have been donated by UNICEF to the district centres for storage of vaccines. However, there is only a poor transportation system for vaccine delivery. To link the cold chain, there is no refrigerator nor freezer truck for the transportation. To provide the vaccines with full biological potency, proper use of refrigerators or freezers, and the vehicles with refrigerating and/or freezing compartment are the essential factors. Health education to mothers to give them a proper knowledge on the necessity of vaccination is also important to get higher coverage rate. We expect that the present EPI programme will achieve its goal in the near future by solving these three problems.

2.2.5. Parasitic diseases

2.2.5.1. Malaria

Malaria is widely prevalent among inhabitants and the most frequently reported communicable disease in Ghana (Table 18). Everybody is at risk of infection and it has recently been reported that the incidence of malaria in patients attending hospitals appears to be increasing. Children are highly susceptible and the disease is the main cause of deaths among children under 5 years of age (about 30% of death). It is estimated that each child under 5 years of age gets at least two attacks of the disease during a year. Furthermore, malaria is a major cause of loss of productivity because of disablement of adult workers.

However, actual control programme seems not to be done because of shortage of budget and facilities as well as manpower. (Table 18)

2.2.5.2. Schistosomiasis

Urinary schistosomiasis (schistosomiasis haematobia) is prevalent mainly in Volta Lake area. A report on outpatients in hospitals of Volta Region indicates that the number of urinary schistosomiasis reaches 3,209 in 1986. On the other hand, the distribution of visceral schistosomiasis (schistosomiasis mansoni) is sporadic, and Navrongo, Kumasi, Tarkwa, Ada and Togzi are known as the highly infested areas.

2.2.5.3. Onchocerciasis

Onchocerciasis (river blindness) is one of the major parasitic diseases which is the obstacle to socioeconomic development. The disease is a particularly serious problem in vast areas of West Africa including northern part of Ghana. The Onchocerciasis Control Programme in the Volta River Basin (Benin, Burkina Faso, Ghana, Ivory Coast, Mali, Niger and Togo) was launched in 1974, financed by development banks and agencies belonging to the United Nations system and has conducted a highly successful operation.

2.2.5.4. Trypanosomiasis

Trypanosomiasis also known as sleeping sickness for its late manifestations has been recognized in Ghana for many years (Table 19); the reported cases were 57 with the fatal cases between 1981 and 1985. The prevalence rate of the disease for the whole country in 1983 and 1984 were 0.04 and 0.05 per 100,000 population respectively. The high infection rate is usually observed in the northern half of the country above latitude 6°30' N.

2.2.5.5. Guinea Worm disease

Guinea worm disease seems to be prevalent especially among inhabitants in rural area. The numbers of reported cases in 1983 and 1984 were 3,040 and 4,244 respectively. A half of the diseases is reported from Northern Region (2153/4244 cases in 1984)

especially during the dry season.

2.2.5.6. Intestinal parasites

Rate of infestation of the inhabitants by intestinal parasites is very high all over the country. A survey carried out on 422 children (1-5 years old) in 4 rural villages of Ghana indicates that ascaris, hookworm, strongyloides, trichuris, entamoeba and giardia were common and found at the total rate of 70.9%. Another survey on the inhabitants in Volta Region showed the rate of infestation as high as 52.9%.

2.2.6. Nutrition

Malnutrition causes a severe problem especially among children, pregnant and lactating women. It was reported by UNICEF that the ratio of children under the age of 5 suffering from mild to moderate/severe malnutrition were 23/7. In recent years an improvement in the food situation has been achieved as a result of better climatic conditions and growing amount of crops. However, imbalance of nutritional elements as well as misunderstanding in appropriate programme of weaning including foods are still the problem. According to the annual summary (1986) of Princess Marie Louise Hospital which covers 19,959 children under the age of 15, the number of children admitted to the hospital for the year was 312, of which 91 died giving a mortality of 29.2%. Although tremendous effort has been done by the health personnels in maternity and children's clinics, nutritional problem is still important in Ghana.

2.2.7 Maternal and infantile health

The improvement of maternal and infantile health has a close mutual interaction with the control of infectious diseases. In Ghana the total fertility rate is estimated to be 6-7 per woman in the recent years, which reflect high crude birth rate. However, infant mortality rate is also very high. The number of deaths of

children under 5 years, which constitutes 18% of the whole population, occupied 33% of total deaths in 1980.(Table 20)

The maternal and neonatal mortality rates from 1983 to 1986 are reported to be 0.3-0.4% and 0.5-0.7% respectively according to Midwives Monthly Return, but each of them seems to be considerably underestimated. On the other hand, the result of survey by UNICEF indicated the maternal mortality of 5-15 per 1,000 live births.

The main causes of maternal deaths are haemorrhage due to various complications (60%), sepsis and other infections (19%) and toxemia(13%).

Infant mortality rate is still considerably high as stated before, and 45% of total infant deaths occur in the neonatal period. According to the report from Komfo Anokye Hospital, the main causes of neonatal deaths are asphyxia(30%) low birth weight (30%), diarrhoea(13%) and miscellaneous infections(9.5%).

To decrease the maternal and neonatal deaths and to improve the maternal and infantile health status, it is desired to promote the adequate health care for pregnant women and institutional deliveries, as well as the health education concerning maternal and child health and family planning.(Table 20)

3. Brief comments to the control measures against infectious diseases

In order to improve health status of the people, the Ministry of Health has continued to endeavour enthusiastically to upgrade health services through various health plans. By these plans, a considerable improvement of the health status of the people has been achieved during last decades. However, in some areas, such an achievement seems not to be completed yet as expected. Since the health authorities have already the plan designed carefully on the basis of previous achievements, it may not be necessary to add any comment by a foreign observation team which stays only a few

weeks in this country.

However, we would like to dare state a short summary of the discussion derived from the observations above described as a duty of our official mission.

3.1. General aspects

The idea to strengthen "primary health care" seems quite appropriate. The strategy of decentralization of health service system as well as integration of the services having different functions at the region or district level will be effective to improve the health status of the people, especially in rural areas where majority of the people inhabit.

The team recognized that various projects and activities of the health services of different levels were effective as the counter measure against some important infectious diseases which have been rampant in the country for long time. However, it seems that lack or shortage of some basic facilities and manpowers renders the situation to be difficult to perform the activities efficiently, and the fact also may result in overloading for the medical personnels in peripheral organizations.

3.2. Facilities for medical care

3.2.1. Curative and preventive services

Modern facilities for medical care are concentrated in Greater Accra and a few urban areas. The difference of the facilities of the institutions between urban and rural areas is also remarkably observed. The team can understand that modern medical facilities and specialization are necessary at the national level, but more effort would be desirable to rehabilitate and strengthen the existing regional and district hospitals as well as health facilities. The team also considers that the establishment of new health posts in rural areas is necessary as many as possible.

3.2.2. Laboratory services

It seems to the team that strengthening and rehabilitation of laboratory activity are urgently required, especially for microbiological and serological examinations. However, in this country, diagnosis of infectious diseases at present seems mostly depending on the clinical findings without support of sufficient laboratory data.

For example, the diarrhoeal diseases which are the commonest and the most important diseases in Ghana may be caused by various bacteria, parasites and viruses, but except some parasites, routine isolation and identification of these organisms are difficult to be performed in most institutions even at district level. The counter measures-against the diseases should be quite different depending on the causative agents. Therefore, It is desirable to strengthen or rehabilitate laboratory activities at various levels.

On the other hand, there are three types of laboratories of microbiology and serology. The first one is a centralized clinical laboratory at the hospital. Processing of any kind of specimens coming from various sections of the hospital is the requirement for the hospital laboratory. The second type is a public health laboratory. This type of laboratory must have facilities for processing the specimens sent from all the levels of the health services. Investigations necessary for public health administration, such as seroepidemiology, environmental research, examination of foods and drugs etc., are also involved. Health Laboratory Services and Public Health Reference Laboratory may fit these purposes. The third one is a research laboratory, and at present in this country, Noguchi Memorial Institute for Medical Research (NMIMR) and Medical School, University of Ghana, may fill the demand for research. At present, NMIMR is only one institution with full facilities and equipments available for the research of modern microbiology in West Africa. As a core of the infectious diseases research, this capacity has to be maintained and developed in the future. However, for the collection of the

basic data for infectious diseases, urgent rehabilitation of clinical and public health laboratories seems to have a priority. It is desirable that strengthening of the laboratories would be done in accordance with their own purposes.

3.3. Health personnel

The primary health care system demands a high level of managerial skills at all levels to make it effective. The Ministry considers that the appropriate variety and levels of skills should be at the district and regional hospitals to enable them to play their roles as referral centres.

Recent shortage of physicians and other professionals for national health service system is a serious problem in this country. Furthermore, majority of physicians are concentrated in Greater Accra and a few urban areas. It is important to improve such a situation and to ensure the young and able physicians in health services including basic sciences and laboratory services.

It is urgently necessary to strengthen the regional and district hospitals by providing sufficient facilities basic as well as more sophisticated to attract them.

The development of postgraduate training systems is also necessary. As for other health professionals, for instance, X-ray and laboratory technologists, the present situation should be improved by the same manner as mentioned above.

3.4. Information system

It seems urgently necessary to establish adequate information system, in order to provide basic and important informations to make proper plans of strategy to control infectious diseases.

At present, in spite of ceaseless efforts of the personnels concerned, it seems that collection, analysis and publication of various health statistics and informations are not carried out

efficiently because of shortage or lack of facilities such as transportation, telecommunication and data-processing equipments. Improvement of intelligence system at national level would be urgently required for the planning of health strategy in this country.

3.5. Considerations on some infectious diseases

The team realized that Yaws/Yellow Fever Project, Malaria Eradication Programme, Ghana Leprosy Service and EPI have been contributing considerably to control important infectious diseases in Ghana.

It is recommended to promote the activities to combat against chronic infections such as tuberculosis, hepatitis B and AIDS. For the control of these diseases, early case-finding must be a key for the effective preventive measure, and no laboratory at present seem to be satisfactorily equipped for this purpose. It is important to strengthen the clinical laboratories of major hospitals and public health laboratories over district level.

It may be also important to establish a system of registration for these chronic infections.

3.6. Diseases caused by parasites

Malaria is a most serious health problem in Ghana but it seems that little study on the epidemiology of the disease has been undertaken and malaria control projects also has been carried out not in a very systematic way. The control methods which appear to be favourable and commonly used are vector control, active examination of blood smear specimens and chemotherapy/chemoprophylaxis. More systematic control programme should be conducted in the limited district to find out more favorable method.

Schistosomiasis and trypanosomiasis are chronic parasitic diseases, therefore, they are not only a public health problem but

also the obstacle to socioeconomic development. Guinea worm disease would also entail considerable health risks for the inhabitants. Epidemiological surveillance study should be conducted and suitable control methods should be established.

3.7. Improvement of environmental hygiene

In order to reduce the food-borne and water-borne diseases, the facilities related to environmental sanitation and food hygiene should be essentially improved. Regarding to safe water supply, the coverage of pipe borne water is 93% of urban population, while in rural area where nearly 70% of the people inhabit, pipe borne water is provided only to 11.4% of population and drilled hand pump wells or dug-wells cover 25% additionally. Not only the coverage of water supply but also quality control must be promoted.

As for sanitation facilities, there are only three pipe borne sewerage system in existence in the country. About 40% of the urban population have sanitation facilities through the provision of septic tank systems while 10-15% of the rural population have adequate facilities such as pan and pit latrines. The provision of these sanitary facilities and establishment of treatment plants for the excreta disposal should be promoted.

Incidence of food poisoning (food-borne infection) is very low (0.1% in average from 1980 to 1984) as far as the government statistics is concerned, but this rate is considered to be far underestimated because of absence of bacteriological facilities and surveillance system.

4. Recommendations

Based on their observations and their discussions with many personnels of the Ministry of Health and other institutions concerned, the team has an honour to recommend the following points to be improved. And some of them are considered to be performed by the cooperation between the Government of Ghana and

the Government of Japan.

4.1. Improvement of the information systems.

To provide efficient facilities to information processing system of national and local level.

4.2. Strengthening and rehabilitation of the laboratory activities.

4.2.1. Strengthening and rehabilitation of the Health Laboratory Services, Ministry of Health.

4.2.2. Establishment of central clinical laboratories at Korle-Bu and Komfo Anokye Teaching Hospitals.

4.2.3. Strengthening of laboratory activities of some regional health or hospital laboratories.

4.2.4. Establishment of reference systems for laboratory services.

4.2.5. Continuation of cooperation with NMIMR.

4.3. Strengthening of the facilities for health services.

4.3.1. Establishment of the case-finding and registration system for chronic infectious diseases, especially for tuberculosis.

4.3.2. Establishment of new health posts in rural area.

4.3.3. Rehabilitation of regional and district hospitals.

4.4. Strengthening of facilities for training of the personnels for health services.

4.5. Cooperation for EPI.

4.5.1. Strengthening of surveillance on EPI target diseases by laboratory examinations.

4.5.2. To provide refrigerator and/or freezer vehicles and small refrigerators for rural areas.

4.6. Improvement of parasitic diseases control.

4.6.1. Cooperation for malaria control unit.

Provision of insecticides, vehicles and spray equipments and establishment of surveillance system supported by

- laboratory examination.
- 4.6.2. Cooperation for schistosomiasis control unit and establishment of epidemiological surveillance system supported by vehicles and laboratory examination systems.
- 4.6.3. Establishment of guinea worm control activities.

- 4.7. Improvement and strengthening of facilities for environmental sanitation; safe water supply, night soil and sewerage treatment and solid disposal treatment.

- 4.8. Establishment of facilities and activities for food control.
 - 4.8.1. Surveillance system for food hygiene.
 - 4.8.2. Laboratory examinations for safety food control.

- 4.9. Promotion of health education.
 - To provide efficient facilities for health education to local health services.

Tables and Figures

Table 1. Ten Main Infectious Diseases
(Outpatients;1986)

Disease	No. of patient	%
Nalaria	807, 019	39.4
Upper respiratory infection	168, 660	8.2
Diarrhoeal diseases	165, 768	8.1
Intenstinal worms	76, 136	3.7
Acute eye infection	42, 714	2.1
Ear infection	21, 730	1.1
Gonorrhoea	15, 858	0.8
Measles	15, 039	0.7
Pneumonia	14, 938	0.7
Schistosomiasis	11, 097	0.5
Others	712, 560	34.7
Total	2, 051, 501	100.0

Response rate;61%

Table 2. Ten Common Causes of Death in Ghana(1979-83)

Disease	No.	%
1. Infectious and Parasitic Diseases	17,102	26.6
2. Diseases of Circulatory System	7,882	12.2
3. Perinatal Period	5,771	9.0
4. Diseases of Respiratory System	5,619	8.7
5. Endocrine, Nutritional and Metabolic	4,821	7.5
6. Diseases of Digestive System	4,521	7.0
7. Ill-defined Conditions	4,075	6.3
8. Blood Disorders	3,828	6.0
9. Diseases of Nervous System	2,525	3.9
10. Neoplasms	2,350	3.7
Subtotal	58,494	90.9
All others	5,799	9.1
Grand Total	64,293	100.0

Table 3. Number of Deaths With Main Infectious Diseases(1979-83)

1. Measles	3,387 (19.8%)
2. Diarrhoea	2,921 (17.1)
3. Malaria	2,613 (15.3)
4. Tuberculosis	2,224 (13.0)
5. Sepsis	1,396 (8.2)
6. Enteric Fever	1,356 (7.9)
7. Tetanus	1,172 (6.9)
8. Viral Hepatitis	975 (5.7)
9. Cholera	594 (3.5)
10. Rabies	94 (0.5)
Total	17,102 (100.0)

Table 4. Important Infectious Diseases(Including Parasitic Diseases)in
Outpatients in Ghanaian Hospitals

	1985	1986
1. Malaria	539,368	807,019
2. Upper Respiratory Infections	126,632	168,660
3. Diarrhoea	132,102	165,768
4. Intestinal Worms	56,192	76,136
5. Acute Eye Infections	34,766	42,714
6. Ear Infections	19,637	21,730
7. Gonorrhoea	13,940	15,858
8. Measles	54,081	15,039
9. Pneumonia	14,268	14,938
10. Bilharzia (Schistosomiasis)	9,142	11,079
11. Infectious Hepatitis	10,890	10,670
12. Chicken Pox	11,347	9,166
13. Whooping Cough	11,783	6,861
14. Tuberculosis	3,673	6,033
15. Yaws	5,081	5,300
16. Guinea Worm	4,608	3,234

Table 5. Age and Sex Distribution of Children: Occurrence of Shigella

AGE GROUPS	S E X					
	MALE	%	FEMALE	%	ALL SEXES	%
0 - 6 MONTHS	1/32	3.1	1/30	3.3	2/62	3.2
7 - 12 "	4/43	9.3	1/53	17.0	13/96	13.5
13 - 18 "	6/30	20.0	2/19	10.5	8/49	16.3
19 - 24 "	7/28	25.0	3/29	10.3	10/57	17.5
25 - 30 "	0/13	0	4/11	36.4	4/24	16.7
31 - 36 "	2/15	13.3	1/3	33.3	3/18	16.7
36 "	4/13	30.8	3/5	60.0	7/18	38.9
TOTALS	24/174	13.8	23/150	15.3	47/324	14.5

Table 6. Age and Sex Distribution of Children and Occurrence of EPEC in Rural and Urban Ghana

AGE IN (MONTHS)	URABAN				RURAL			
	MALES (%)	FEMALES (%)	TOTAL (%)		MALES (%)	FEMALES (%)	TOTAL (%)	
0 - 6	2/50 (4.0)	1/49 (2.0)	3/99 (3.0)		3/12 (25)	0/12 (0)	3/24 (12.5)	
7 - 12	7/88 (8.0)	5/67 (7.5)	13/155 (7.7)		2/23 (8.7)	0/22 (0)	2/45 (4.4)	
13 - 18	2/50 (4.0)	5/62 (8.1)	7/112 (6.3)		2/13 (15.4)	0/5 (0)	2/18 (11.1)	
19 - 24	2/26 (7.7)	4/29 (13.8)	6/55 (10.9)		1/13 (7.7)	0/10 (0)	1/23 (4.3)	
25 - 30	0/1 (0)	0/0 (0)	0/1 (0)		0/2 (0)	0/2 (0)	0/4 (0)	
31 - 36	0/1 (0)	0/1 (0)	0/2 (0)		1/9 (11.1)	0/2 (0)	1/11 (9.1)	
36	0/3 (0)	0/3 (0)	0/6 (0)		1/5 (20.0)	0/3 (0)	1/8 (12.5)	
Total	13/219 (6.0)	15/211 (7.1)	28/430 (6.5)		10/77 (13)	0/56 (0)	10/133 (7.5)	

Table 7. Incidence of Cholera by Year and Region

	Western	Central	G. Accra	Eastern	Volta	Ashanti	B-Ahafo	Northern	Upper E.	Upper W.	Total	Case fatality rate
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	292	1,186	362	288	605	0	0	0	0	0	2,733	6.6%
1971	2,592	4,912	1,251	2,361	1,177	616	118	21	0	0	13,048	4.9
1972	214	80	7	277	20	26	1	0	0	0	625	5.1
1973	242	390	38	7	0	0	0	0	0	0	677	5.8
1974	85	158	168	29	37	5	0	0	0	0	483	7.7
1975	67	79	5	12	0	3	0	0	0	0	166	7.2
1976	3	0	1	0	98	0	0	0	0	0	102	0
1977	219	2,228	771	303	264	1,910	263	0	0	0	5,968	5.6
1978	73	591	262	245	188	325	128	0	0	0	1,812	6.5
1979	60	1,289	46	315	35	32	5	0	0	0	1,783	6.3
1980	27	195	8	14	7	8	2	0	0	0	261	8.0
1981	34	248	226	431	4	0	0	0	0	0	943	6.6
1982	188	6,317	475	972	749	1,058	896	431	0	0	11,086	11.0
1983	14	1,252	2,533	8,179	1,454	338	331	179	0	0	14,160	5.8
1984	159	156	125	385	44	48	98	0	0	0	1,015	9.1
1985	0	47	1	4	7	3	0	0	0	0	68	0
Total	4,226	19,128	6,279	13,822	4,689	4,372	1,842	610	0	0	54,968	6.8
	213	1,601	382	466	456	355	214	44			3,731	
	(5.0)	(8.4)	(6.1)	(3.5)	(9.7)	(8.1)	(11.6)	(7.2)		(0)		

Table 8. Incidence of Enteric Fever by Year and Region

	Western	Central	G. Accra	Eastern	Volta	Ashanti	B-Ahafo	Northern	Upper E.	Upper W.	Total	Case fatality rate
1969	224 12	42 2	145 2	304 6	158 10	444 38	714 8	27 3	81 2		2,089 75	3.6%
1970	131 9	113 2	81 4	460 15	241 9	362 44	723 15	31 4	15 2		2,157 104	4.8
1971	29 4	49 1	63 8	1,555 12	185 10	510 61	998 33	811 10	2 -		4,202 141	3.4
1972	42 1	53 6	112 11	1,962 12	131 6	333 71	551 29	762 -	1 -		3,947 136	3.4
1973	98 6	149 2	160 6	680 9	98 2	480 71	752 40	43 2	5 -		2,506 138	5.5
1974	70 4	221 6	212 8	170 5	224 2	548 88	2,352 52	47 -	16 -		3,860 166	4.3
1975	59 -	72 2	125 1	461 5	137 6	424 81	785 27	7 -	4 -		2,074 122	5.9
1976	99 2	96 2	96 -	416 1	136 7	404 62	676 23	22 1	25 1		1,943 99	5.1
1977	92 2	34 -	71 -	286 1	107 1	311 65	1,317 15	9 -	25 2		2,252 86	3.8
1978	131 -	163 1	66 -	645 8	106 7	320 69	1,481 17	43 1	25 5		2,980 117	3.9
1979	103 9	250 3	147 -	802 3	454 3	312 54	765 9	66 -	106 7		3,005 88	2.9
1980	80 -	754 5	218 1	746 15	84 3	337 50	1,449 31	15 -	113 4		3,796 109	2.9
1981	81 1	156 4	138 -	935 40	129 3	209 3	729 17	44 -	34 -		2,449 88	3.6
1982	56 -	166 3	98 1	703 26	235 -	199 26	810 23	16 -	9 1		2,300 81	3.5
1983	15 -	114 2	31 -	566 -	76 3	136 15	669 21	3 -	21 -		1,631 48	2.9
1984	86 21	41 3	12 -	306 -	35 -	108 17	767 35	- -	13 -	3 0	1,371 56	4.1
1985	115 1	98 3	96 -	695 1	163 -	97 4	380 4	2 -	1 -	6 -	1,653 13	0.8
Total	1,511 52 (3.4)	2,571 45 (1.6)	1,871 42 (2.2)	11,692 159 (1.4)	2,693 72 (2.7)	5,534 839 (15.2)	15,918 399 (2.5)	1,948 21 (1.1)	455 24 (5.3)		46,064 1,653	3.6

Table 9. Incidence of Cerebrospinal Meningitis(patients)

	1983	1984	1985	1986*
Western	/	10	6	16
Central	11	30	83	29
Greater Accra	22	16	4	26
Eastern	68	44	20	108
Volta	14	/	23	43
Ashanti	39	39	47	94
B. Ahafo	56	168	113	73
Northern	18	105	29	186
Upper East	/	3563	3533	228
Upper West	66	49	454	12
合 計	294	4024	4912	813

Source ; Epidemiology Division
 * Statistic Division

Table 10. Reported Numbers of Tuberculosis Patients by Region(new cases/deaths)

Region	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
West	483/15	934/26	991/28	1268/24	1262/27	870/20	905/7	672/8	924/28	790/10	906/8	162/	203/	389/-
Central	600/11	674/17	590/23	601/35	747/21	1150/10	1020/6	850/4	1075/3	772/3	832/8	763/17	559/2	688/11
G. Accra	663/7	1021/5	1098/1	1385/1	691/1	315/-	285/4	538/-	671/-	329/-	530/2	26/	58/	216/2
East	1015/4	838/17	1121/10	1105/5	1162/7	998/12	1168/62	765/54	661/25	874/7	560/8	438/	283/	708/1
Volta	404/4	204/10	227/-	323/3	326/1	335/1	250/-	278/3	275/5	170/5	332/14	111/	49/	280/-
Ashanti	1091/14	1368/6	1393/15	1041/22	1213/12	922/12	667/5	770/4	802/3	640/5	647/11	320/	282/	207/-
B/Ahafo	409/18	415/11	509/6	348/12	470/7	402/11	471/8	397/10	519/8	287/17	413/18	416/15	354/13	421/11
Northern	306/1	297/1	209/4	111/1	106/1	55/-	48/6	37/-	68/-	50/-	44/2	1/	6/-	7/-
Upper	230/1	234/13	216/1	172/3	197/5	197/4	186/12	172/-	212/18	129/4	80/5	137/2	47/1(W) 90/ (E)	76/1 243/6
Total	5201/74	5985/106	6354/88	6355/106	6174/87	5250/70	5000/110	4479/68	5207/90	4041/51	4345/76	2374/36	1935/16	3235/32

Table 11. Summary of Leprosy Patients(1983)

Classification	Lepromatous Patients		Other leprosy patients		Total leprosy patients
	Children 0-14	Adults +15	Children 0-14	Adults +15	
Total patients brought forward from previous year	103 154*	3585 5372*	1708 2559*	9881 14806*	11589 17365*
Added to register	13	291	181	895	1076
Re-admitted, relapsed, transferred in	2	196	17	333	350
Total	15	487	198	1228	1426
Died	-	105	5	140	145
Released from control		50	22	316	338
Out of control	11	423	231	1339	1570
Transferred out	-	-	-	-	-
Total	11	578	258	1795	2053
Total patients remaining at December 31	158	5281	2499	14239	16738
Total number of patients with disabilities	8	660	115	1864	1979

*This figure includes the patients from Ashanti, Upper East and Upper West Regions, not included in last year's report.

Table 12. Table Showing Some Commonly Used Indicators for Delineating the Nature of the Endemicity of Leprosy

	LEPROMATOUS RATE	DEFAULTERS RATE	% OF CHILDREN WITH LEPROSY	% NEW CASES WHO ARE CHILDREN
GREATER ACCRA REGION	42.9%	5.7%	4.6	0.0
CENTRAL REGION	20.7%	18.6%	19.2	10.9
WESTERN REGION	26.7%	15.0%	24.1	8.3
ASHANTI REGION	25.4%	5.2%	8.9	12.8
EASTERN REGION	36.5%	6.1%	6.3	8.0
BRONG-AHAFO REGION	10.9%	5.5%	8.4	14.4
VOLTA REGION	49.0%	4.9%	7.3	5.8
NORTHER REGION	22.0%	2.0%	9.2	19.2
UPPER-EAST REGION	20.7%	6.3%	12.3	19.2
UPPER-WEST REGION	15.8%	12.4%	19.5	16.0
NATIONL AVERAGE	24.5%	9.0%	11.9	14.0

Table 13. Distribution of Notified Cases of Yaws in Ghana

YEAR	ASHANTI*	CENTRAL*	EASTERN*	G. ACCRA	VOLTA	WESTERN	B-AHAFO	NORTHERN	UPPERS	TOTAL ALL REGIONS	TOTAL FOR THREE HYPER- ENDEMIC REGIONS	%
1969	205	1437	2253	11	92	1104	110	55	76	5343	3895	72.8
1970	1614	617	4587	204	292	1778	279	276	57	9704	6818	70.2
1975	15944	16901	15329	225	1276	8198	1715	213	125	59926	48174	80.3
1976	22846	19681	15647	609	932	4377	2197	372	104	71765	58174	81.0
1979	10020	11876	13194	382	1805	8507	1875	156	129	47944	35090	73.1
1980	16134	11518	13916	254	3793	7832	4534	1140	196	59317	41568	70.0
1981	10135	14852	105321	514	2021	5735	1274	349	111	45523	35519	78.0
1982	12195	23112	7776	248	3343	5793	1516	954	166	55092	43083	78.2
1983	5223	10598	7019	204	1879	2253	911	767	183	29066	22840	78.5
1984**	903	2010	2259	200	2350	142	399	541	203	9007	5172	56.4
1985**	709	1363	580	69	78	591	250	312	60	4012	2652	66.1
1984 § 2,089,683 I, 145,520 I, 679,483 I, 420,066 I, 201,095 I, 116,930 I, 179,407 I, 162,645 I, 210,745 I, 2,205,574												

§ Population.

* Hyperendemic Regions

** The data for 1984 and January to June 1985 are all provisional.

Table 14. Age Distribution of Yaws in Ghana, 1981-1983.

Age, year of survey	No. of cases(%)of indicated type of yaws		Total
	Infectious yaws	Noninfectious yaws	
< 15 years			
1981	6,242(30.6)	14,165(69.4)	20,407
1982	3,460(25.5)	10,080(74.5)	13,580
1983	825(17.5)	3,896(82.5)	4,721
> 15 years			
1981	280(2.0)	14,079(98.0)	14,359
1982	110(1.2)	8,919(98.8)	9,029
1983	264(7.5)	3,242(92.5)	3,506

Table 15. Cases of Yellow Fever Recorded in Ghana, 1901-85.

Year	Cases	Year	Cases	Year	Cases
1901	0	1939	2	1977	138
02	2	40	2	78	219
03	0	41	4	79	110
04	0	42	1	80	9
05	0	43	2	81	6
06	0	44	1	82	7
07	0	45	5	83	372
08	0	46	0	84	0
* 09	0	47	0	85	0
10	15	48	2		
11	9	49	22		
12	10	50	13		
13	20	51	25		
14	19	52	8		
15	2	53	0		
16	6	54	1		
17	5	55	19		
18	4	56	0		
19	11	57	0		
20	2	58	0		
21	4	59	2		
22-23	23	60	0		
23-24	19	61	0		
24-25	8	62	0		
25-26	9	63	3		
26-27	86	64	1		
27-28	87	65	2		
28-29	2	66	0		
29-30	0	67	0		
30-31	2	68	0		
31-32	17	69	307		
32-33	2	70	12		
33-34	7	71	3		
1934	2	72	4		
35	7	73	0		
36	3	74	1		
37	75	75	2		
38	15	76	2		

*
Epidemic period

Table 16. Mass Measles Immunization Campaign(1985)

Region	Population	Target population (5% of population)	population vaccinated	Coverage
NORTHERN	1,1623,645	58,132	$\frac{45,000}{54,190}$ * **	$\frac{77.4}{93}$ %
UPPER EAST	771,584	38,579	$\frac{20,953}{23,473}$	$\frac{54.3}{60.8}$ %
UPPER WEST	439,161	21,958	$\frac{16,089}{22,077}$	$\frac{73.3}{100.5}$ %
BRONG AHAFO	1,979,407	58,970	$\frac{18,600}{34,524}$	$\frac{31.5}{58.4}$ %
ASANTI	2,089,683	104,484	$\frac{91,050}{117,892}$	$\frac{87.1}{112.8}$ %
EASTERN	1,679,483	83,974	$\frac{36,880}{60,720}$	$\frac{43.91}{72.3}$ %
CENTRAL	1,145,520	57,276	$\frac{42,962}{57,218}$	$\frac{75}{99}$ %
WESTERN	1,116,930	55,846	$\frac{9,654}{16,633}$	$\frac{17.2}{29.7}$ **%
VOLTA	1,201,095	60,055	$\frac{37,818}{50,126}$	$\frac{62.97}{83.4}$ %
G/ACCRA	1,420,066	71,003	$\frac{49,257}{75,648}$	$\frac{69.4}{106.5}$ %
Total		610,277	$\frac{368,263}{512,501}$	83.9 %

* Number vaccinated in mass campaign period

** Total number of vaccinated people

Source: Mass Immunization Campaign(1986); Review of Programme Performance Report

Table 17. Yearly Achievement of Vaccination(%)

Vaccination year	Measles	B C G	Tetanus		D P T			Poliomyelitis			
			1	2	1	2	3	1	2	3	4
1980	16.3	9.1	3.2		7.3			6.6			
1981	23.0	67.4	11.0		22.0			24.8			
1982	21.1	51.2	9.2		22.5			25.2			
1983	1.4	31.4	6.5		19.3			16.9			
1984	9.6				17.3			18.0			
1985	84.7	55.2			63.3	41.8	29.7	61.7	38.3	23.8	
1986	30.2	34.4	52.5	10.3	45.7	21.7	15.1	43.6	21.2	14.0	5.3

Source ; Epidemiology Division

Table 18. Malaria Morbidity in each Regions of Ghana from 1981 to 1983

Region	Population (1984)	No. of Malaria Patients					
		1981	1982	1983	1984	1985	1986
Western	1, 117, 000		57, 695	14, 656	17, 041	58, 113	58, 756
Central	1, 145, 000	34, 592	51, 078	162, 220	95, 289	10, 179	66, 722
Accra	1, 420, 000		10, 718	30, 839	10, 657	112, 704	95, 881
Eastern	1, 679, 000	21, 584	99, 441	141, 758	103, 610	60, 761	115, 673
Volta	1, 201, 000		10, 902	7, 619	10, 490	100, 438	97, 822
Ashanti	2, 090, 000		15, 493	18, 201	59, 096	103, 876	218, 363
B/Ahafa	1, 179, 000		44, 625	48, 971	91, 083	110, 689	110, 256
Northern	1, 163, 000		360	3, 600	34, 830	28, 314	31, 331
Upper	1, 211, 000	16	8, 696	10, 777	16, 351	8, 294	12, 215
Total	12, 205, 000	56, 212	299, 008	438, 641	438, 447	593, 368	807, 019

(Communicable diseases reported on Cheana, MOH)

Table 19. Positive Cases of Trypanosomiasis by Year in Ghana(1901-1985)

Year	No. cases	Year	No. cases	Year	No. cases	Year	No. cases
1901	0	1922~23	15	1944	4,872	1966	324
1902	0	1923~24	6	1945	5,059	1967	235
1903	1	1924~25	26	1946	4,226	1968	174
1904	6	1925~26	37	1947	4,477	1969	169
1905	7	1926~27	67	1948	3,312	1970	101
1906	3	1927~28	59	1949	2,200	1971	156
1907	34	1928~29	94	1950	2,586	1972	130
1908	16	1929~30	121	1951	2,498	1973	85
1909	45	1930~31	224	1952	2,348	1974	94
1910	52	1931~32	250	1953	1,480	1975	79
1911	83	1932~33	685	1954	992	1976	57
1912	104	1933~34	1,179	1955	710	1977	42
1913	57	1934	1,973	1956	778	1978	34
1914	12	1935	3,885	1957	893	1979	24
1915	17	1936	4,820	1958	830	1980	18
1916	8	1937	5,599	1959	928	1981	17
1917	12	1938	5,611	1960	603	1982	23
1918	10	1939	6,826	1961	322	1983	5
1919	14	1940	6,165	1962	257	1984	7
1920	27	1941	5,630	1963	409	1985	5*
1921	8	1942	4,758	1964	356		
1922	3	1943	4,500	1965	—		

*1985 figure is provisional

Table 20. Age-Specific Fertility Rates for 1967-1978 Average for
3-year Calendar Periods.

Age at Maternity	1967-69	1970-72	1973-75	1976-78
10-14	0.006	0.009	0.002	0.005
15-19	0.130	0.137	0.144	0.130
20-24	0.269	0.259	0.268	0.256
25-29	0.283	0.282	0.285	0.266
30-34	0.267	0.266	0.262	0.236
35-39	0.229	0.212	0.207	0.176
40-44		0.155	0.143	0.133
45-49				0.59
Total Fertility Rate	6.99	6.90	6.85	6.31

Source: Ghana Fertility Survey Vol. 1 (3)
: Situation Analysis of Women and Children,
UNICEF, July 1984

Figure 1. Incidence of Whooping Cough by Year

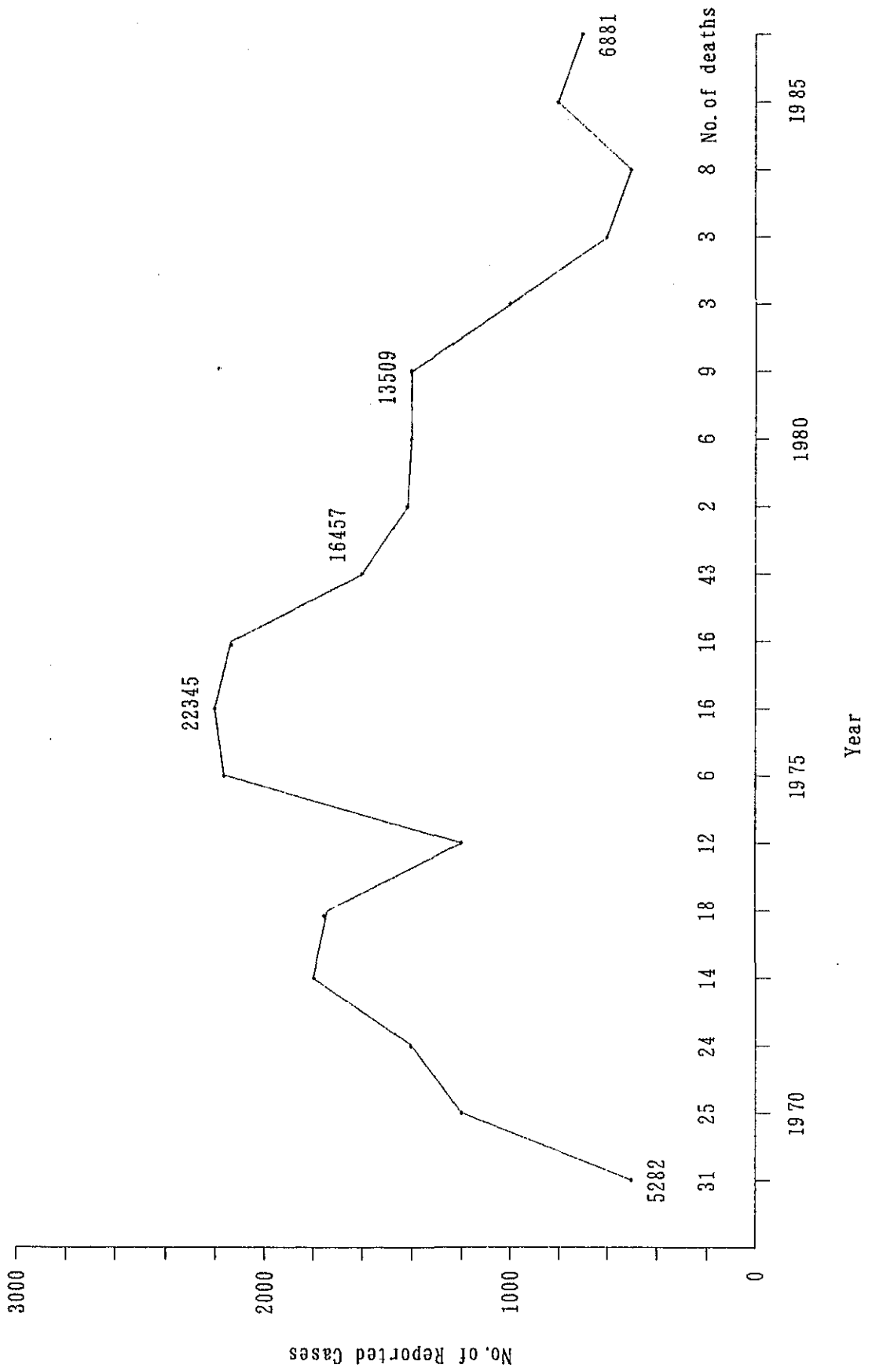


Figure 2. Incidence of Tetanus by Year

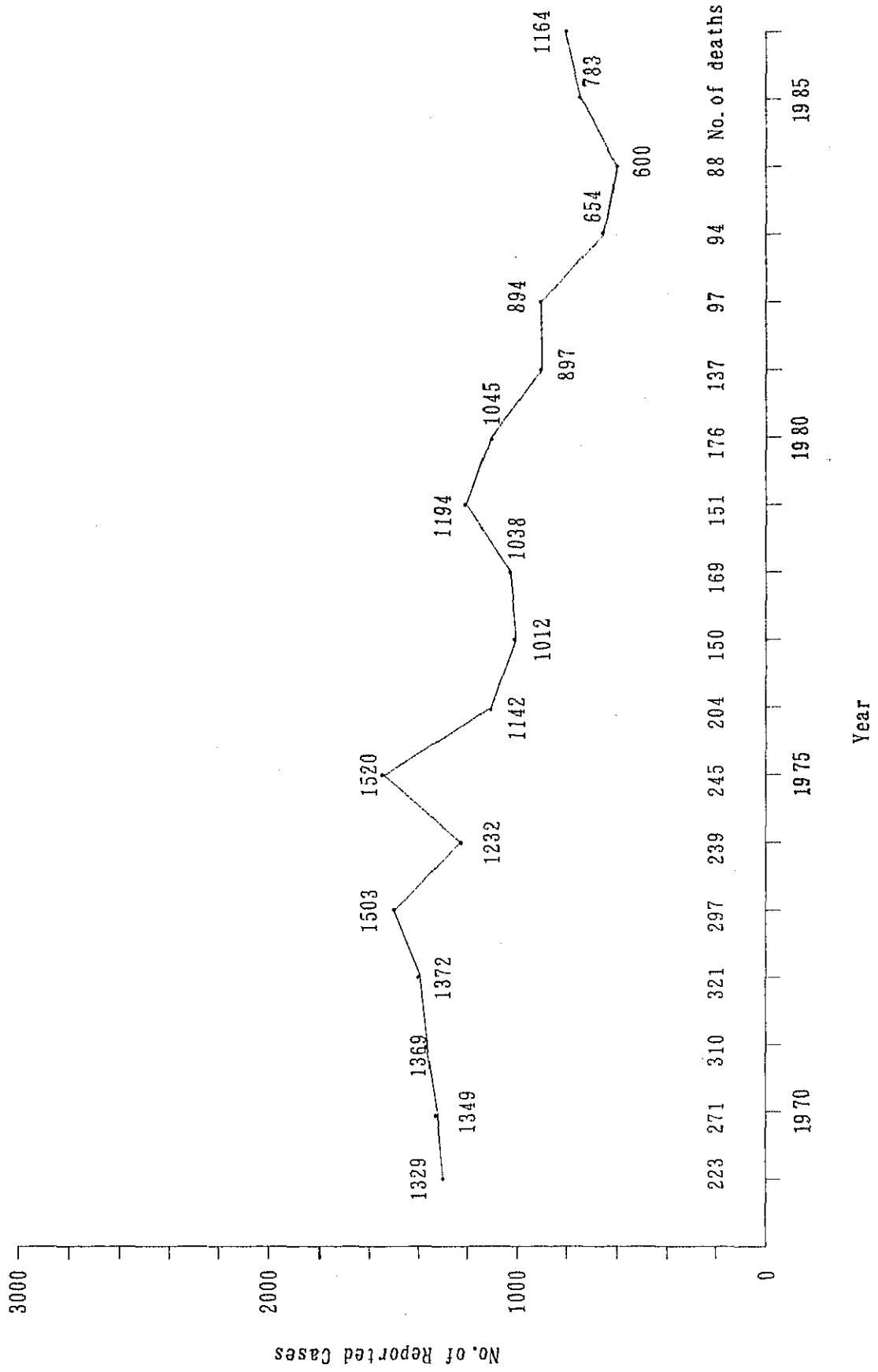


Figure 3. Incidence of Measles by Year (1969-1986)

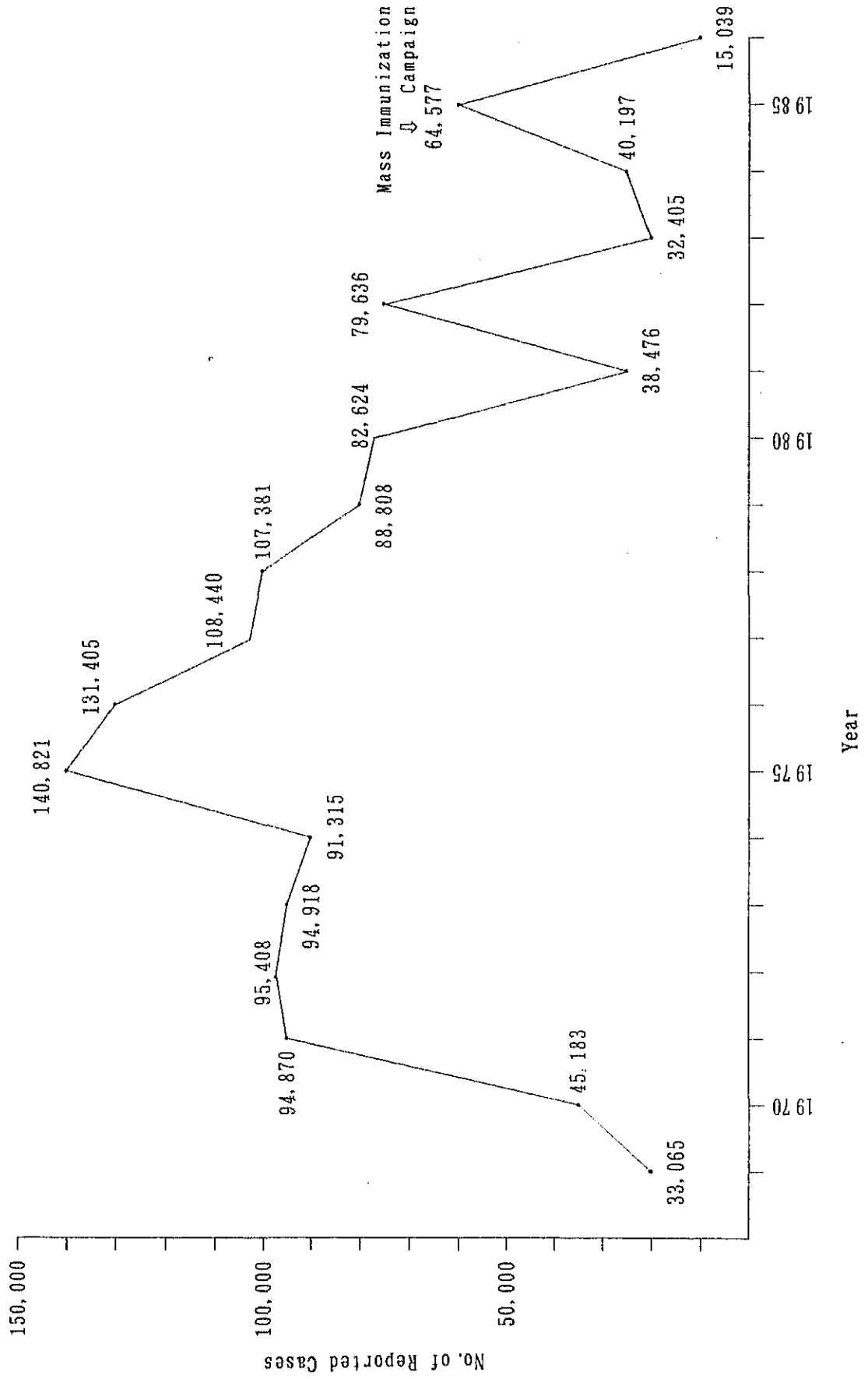
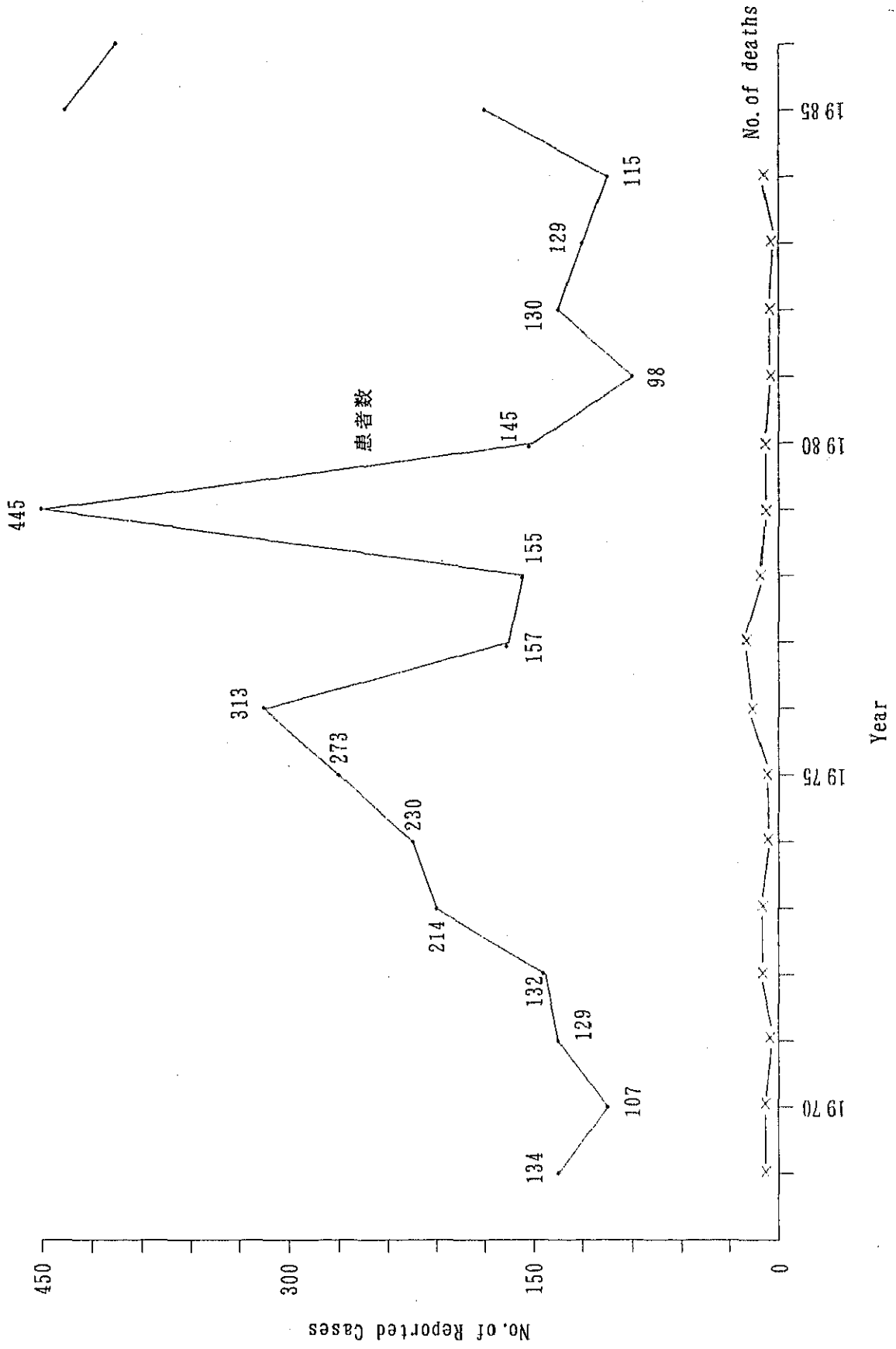


Figure 4. Incidence of Poliomyelitis by Year



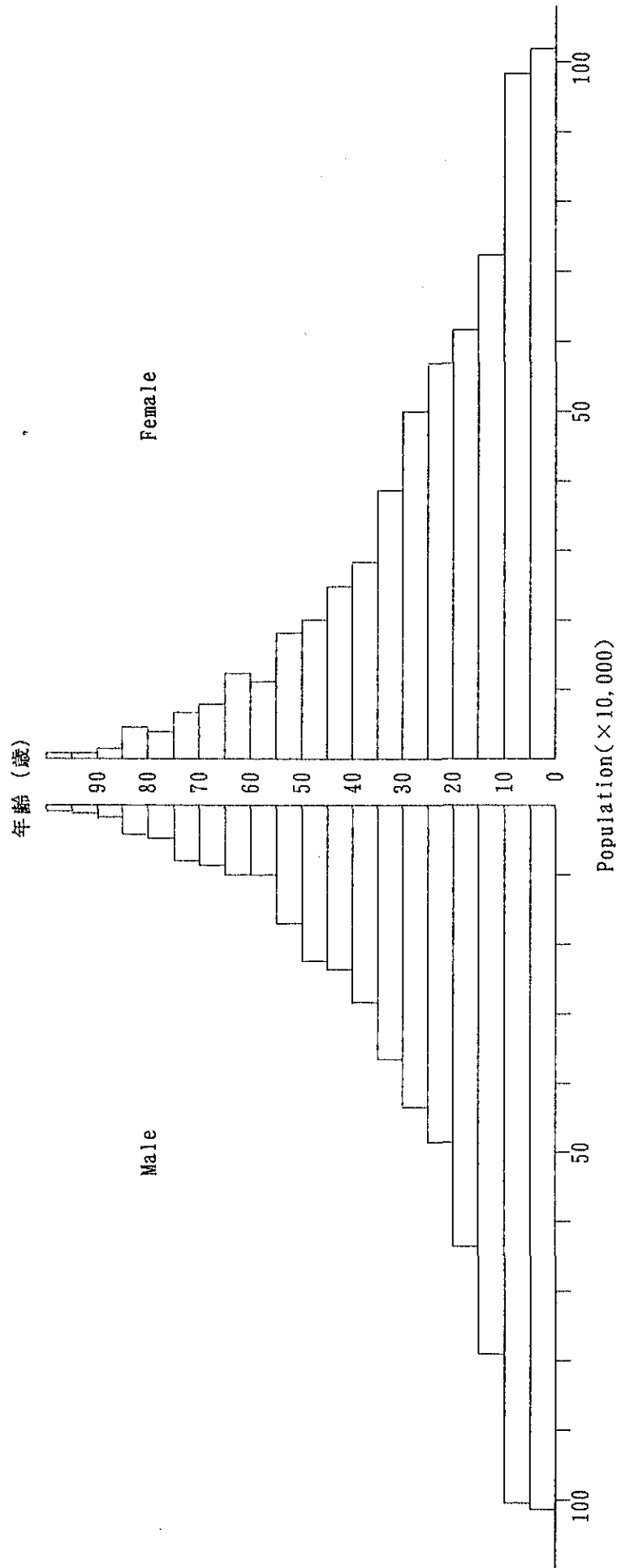
APPENDIX I

Demographic Data

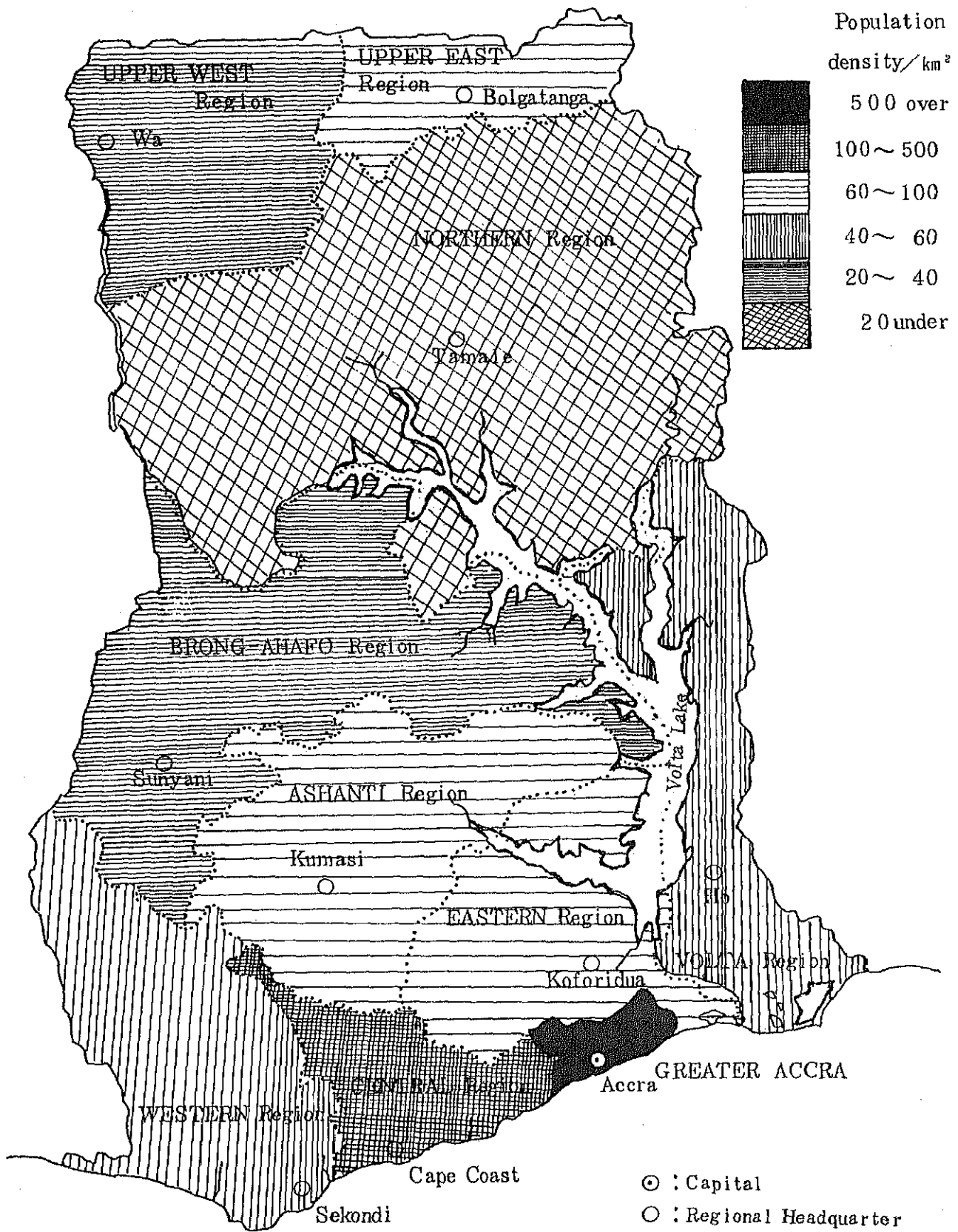
Population(1984 census)

AGES (YEARS)	BOTH SEXES		MALE		FEMALE	
	population	%	population	%	population	%
ALL AGES	12,297,587	100	6,064,584	100	6,233,003	100
LESS THAN 5	2,030,318	16.5	1,015,284	16.7	1,015,034	16.3
5 -- 9	2,002,067	16.3	1,012,907	16.7	989,160	15.9
10 -- 14	1,503,408	12.2	774,936	12.3	728,472	11.7
15 -- 19	1,246,567	10.1	636,702	10.5	609,865	9.8
20 -- 24	1,056,125	8.6	484,052	8.0	572,073	9.2
25 -- 29	945,218	7.7	433,638	7.1	511,580	8.2
30 -- 34	742,881	6.0	351,713	5.8	391,168	6.3
35 -- 39	584,344	4.8	282,371	4.7	301,973	5.0
40 -- 44	473,302	3.8	226,059	3.7	247,243	4.0
45 -- 49	428,261	3.5	217,240	3.6	211,021	3.4
50 -- 54	352,731	2.9	173,273	2.9	179,458	2.9
55 -- 59	213,113	1.7	107,099	1.8	106,014	1.7
60 -- 64	225,813	1.8	107,756	1.8	118,057	1.9
65 -- 69	145,341	1.2	70,519	1.2	74,822	1.2
70 -- 74	128,882	1.0	63,792	1.1	65,090	1.0
75 -- 79	71,830	0.6	36,352	0.6	35,478	0.6
80 -- 84	70,443	0.6	33,569	0.6	36,874	0.6
85 -- 89	30,991	0.3	14,787	0.2	16,204	0.3
90 -- 94	22,986	0.2	11,168	0.2	11,818	0.2
95 & over	22,966	0.2	11,367	0.2	11,599	0.2

Demographic pyramid



Density of Population



Registered Live Births and Deaths Rates By Region: — January — December 1980

REGION	MID-YEAR ESTIMATED POPULATION	RATE PER 1000 ESTIMATED MID-YEAR POPULATION											
		LIVE BIRTHS						DEATHS					
		All Quar. Jan-Dec	1st Quar. Jan-Mar	2nd Quar. Apr-June	3rd Quar. Jul-Sept	4th Quar. Oct-Dec	All Quar. Jan-Dec	1st Quar. Jan-Mar	2nd Quar. Apr-June	3rd Quar. Jul-Sept	4th Quar. Oct-Dec		
All Regions	10 462 796	22.0	22.8	21.6	21.1	22.4	3.2	3.7	3.3	3.2	2.7		
Western	919 600	18.6	18.2	18.7	21.0	16.7	2.5	3.0	2.4	2.6	2.0		
Central	1 034 254	25.1	22.6	24.9	26.6	26.0	4.4	5.3	4.1	4.4	3.6		
Greater Accra	1 225 350	33.8	36.8	30.2	29.5	38.6	5.1	6.0	5.4	4.7	4.4		
Eastern	1 435 612	18.6	20.2	23.3	17.1	13.6	4.0	4.7	4.5	4.3	2.7		
Volta	1 123 834	19.8	17.5	19.9	20.1	21.8	2.0	2.5	1.9	2.0	1.8		
Ashanti	1 868 692	24.6	27.0	20.8	25.5	25.1	2.7	2.8	2.8	2.7	2.6		
Brong Ahafo	952 013	25.2	29.7	27.0	18.5	25.5	3.1	3.7	3.5	2.8	2.6		
Northern	931 257	16.5	17.3	16.1	14.1	18.3	2.3	2.5	1.9	2.3	2.4		
Upper	972 184	11.5	10.2	11.2	12.0	12.8	2.5	3.1	2.5	2.2	2.2		

Births and Deaths Statistical Newsletter
Vol. 21, No. 1, 1982, Births and Deaths Registration Office

Registered Live Births By Age of Mother and Region With Percentages: - January - December 1980

REGION	AGE OF MOTHER (IN COMPLETED YEARS)									
	All Ages	Under 15	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50 & Over
All Regions	229 988 (100.0)	79 (0.0)	24 804 (10.3)	77 181 (33.5)	67 807 (29.5)	35 843 (15.6)	16 956 (7.4)	5 713 (2.5)	1 293 (0.6)	312 (0.1)
Western	17 142 (100.0)	1 (0.0)	2 036 (11.9)	5 495 (32.1)	5 284 (30.8)	2 754 (16.1)	1 191 (6.9)	308 (1.8)	58 (0.3)	15 (0.1)
Central	25 925 (100.0)	10 (0.0)	2 933 (11.3)	9 077 (35.0)	7 114 (27.4)	4 069 (15.7)	1 808 (7.0)	693 (2.7)	176 (0.7)	45 (0.2)
Greater Accra	41 411 (100.0)	12 (0.0)	3 705 (8.9)	13 988 (33.8)	13 323 (32.2)	6 539 (15.8)	2 931 (7.1)	726 (1.7)	160 (0.4)	27 (0.1)
Eastern	26 650 (100.0)	33 (0.1)	2 554 (9.6)	8 913 (33.4)	7 989 (30.0)	4 056 (15.2)	2 036 (7.6)	774 (2.9)	214 (0.9)	81 (0.3)
Volta	22 310 (100.0)	2 (0.0)	2 441 (10.9)	6 862 (30.8)	6 272 (28.6)	3 780 (16.9)	2 068 (9.3)	602 (2.7)	156 (0.7)	27 (0.1)
Ashanti	45 982 (100.0)	13 (0.0)	5 287 (11.5)	17 171 (37.3)	12 789 (27.8)	6 380 (13.9)	2 822 (6.1)	1 279 (2.9)	181 (0.4)	60 (0.1)
Brong Ahafo	23 993 (100.0)	2 (0.0)	2 689 (11.2)	8 106 (33.8)	6 632 (27.6)	3 743 (15.6)	1 963 (8.2)	653 (2.7)	169 (0.7)	34 (0.2)
Northern	15 337 (100.0)	2 (0.0)	1 792 (11.7)	4 104 (26.8)	4 761 (31.0)	2 725 (17.8)	1 345 (8.8)	465 (3.0)	121 (0.8)	22 (0.1)
Upper	11 238 (100.0)	2 (0.0)	1 367 (12.2)	3 465 (30.8)	3 543 (31.5)	1 797 (16.0)	792 (7.1)	213 (1.9)	58 (0.5)	1 (0.0)

Registered Live Births By Place of Birth With Percentages: — January — December 1980

Region	PLACE OF DELIVERY					
	All Places	Hospital	Clinic	Mat. Home	House	Others
All Region	229 988 (100.0)	60 339 (26.2)	30 494 (13.4)	30 448 (13.2)	108 195 (47.0)	512 (0.2)
Western	17 142 (100.0)	5 231 (30.5)	1 186 (6.9)	1 571 (9.2)	9 144 (53.3)	10 (0.1)
Central	25 925 (100.0)	4 247 (16.4)	3 170 (12.2)	1 936 (7.5)	16 492 (63.6)	80 (0.3)
Greater Accra	41 411 (100.0)	14 322 (34.6)	5 493 (13.3)	10 857 (26.2)	10 680 (25.8)	59 (0.1)
Eastern	26 650 (100.0)	7 032 (26.4)	4 565 (17.1)	2 551 (9.6)	12 326 (46.2)	176 (0.7)
Volta	22 310 (100.0)	5 720 (25.6)	4 134 (18.5)	1 453 (6.5)	10 991 (49.3)	12 (0.1)
Ashanti	45 982 (100.0)	10 298 (22.4)	5 275 (11.5)	9 362 (20.4)	20 956 (45.6)	91 (0.1)
Brong Ahafo	23 993 (100.0)	5 803 (24.2)	5 249 (21.9)	2 452 (10.2)	10 485 (43.7)	4 (0.0)
Northern	15 337 (100.0)	3 675 (24.0)	914 (6.0)	162 (1.0)	10 535 (68.7)	51 (0.3)
Upper	11 238 (100.0)	4 011 (35.7)	508 (4.5)	104 (0.9)	6 586 (58.6)	29 (0.3)

APPENDIX II

Acute Bacterial Diseases

Isolation Rate of ETEC From Urban and Rural Ghana

	URBAN			RURAL		
	ST	LT	LT-ST	ST	LT	LT-ST
No. Tested	128	185	127	109	42	33
No. Positive	14	11	2	12	4	-
% Positive	10.9%	5.6%	1.6%	11.0%	9.5%	-

Serotypes of EPEC Isolated From Urban and Rural Communities

URBAN			RURAL		
Serotype	No. of Strains	(%)	Serotype	No. of Strains	(%)
0126:K71	6	(20.7)	0126:K71	1	(11.1)
026:K60	4	(13.8)	026:K60	1	(11.1)
0125:K71	3	(10.3)	-	-	-
0127a:K63	3	(10.3)	-	1	-
0128:K67	3	(10.3)	0128:67	2	(22.2)
044:K74	2	(6.9)	044:K74	1	(11.1)
086a:K61	1	(3.4)	-	-	-
0111:K58	1	(3.4)	-	-	-
0112a/c:K66	1	(3.4)	-	-	-
0119:K69	1	(3.4)	-	-	-
0125:K70	1	(3.4)	-	-	-
0136:K78	1	(3.4)	0136:K78	1	(11.1)
*0143:KX1	1	(3.4)	-	-	-
*0155:K59	1	(3.4)	-	-	-
			*055:K59	1	(11.1)
			UNITYPABLE	2	(22.2)

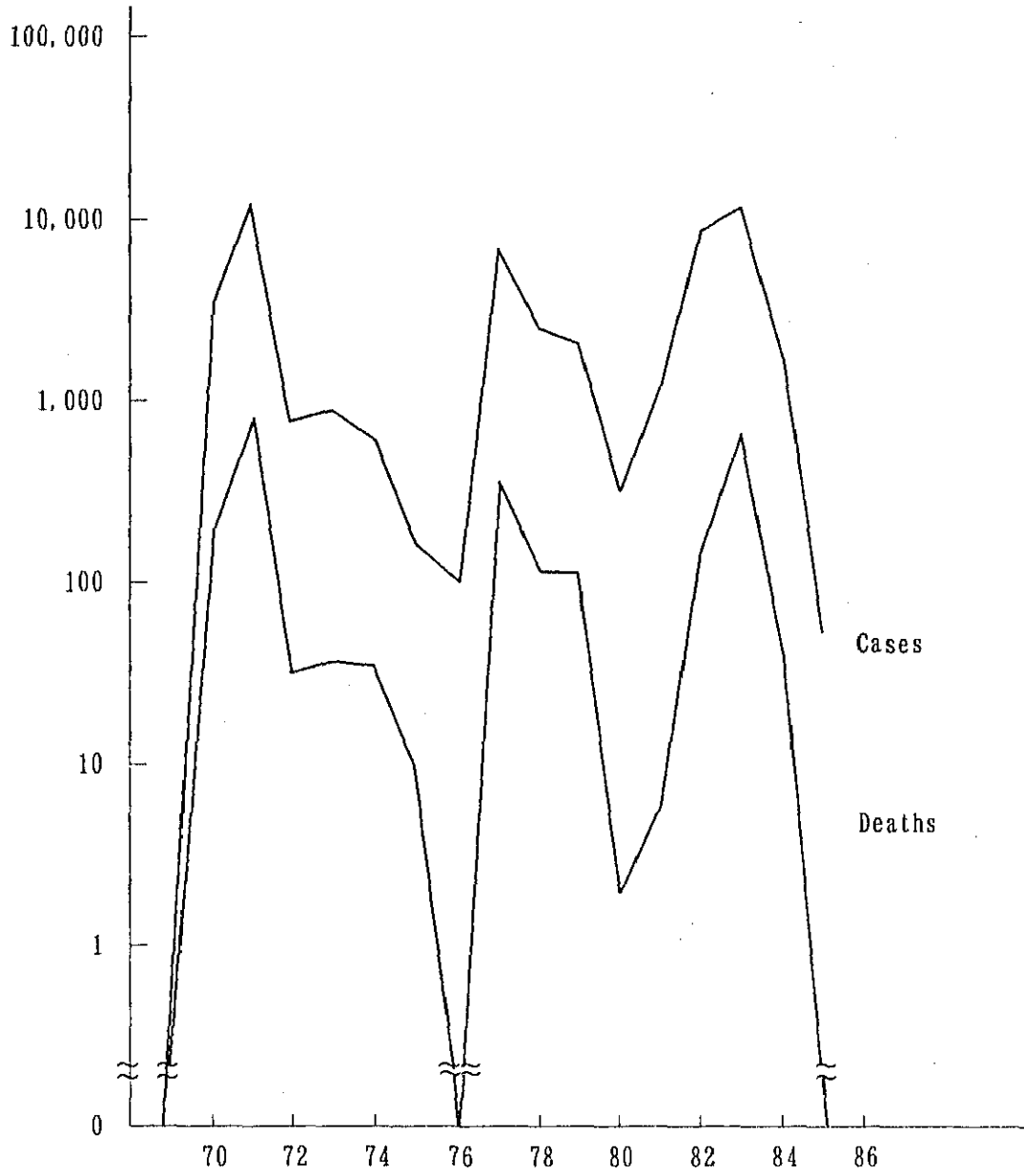
* Being Reported for the first time in Ghana.

Monthly Incidence of Cholera

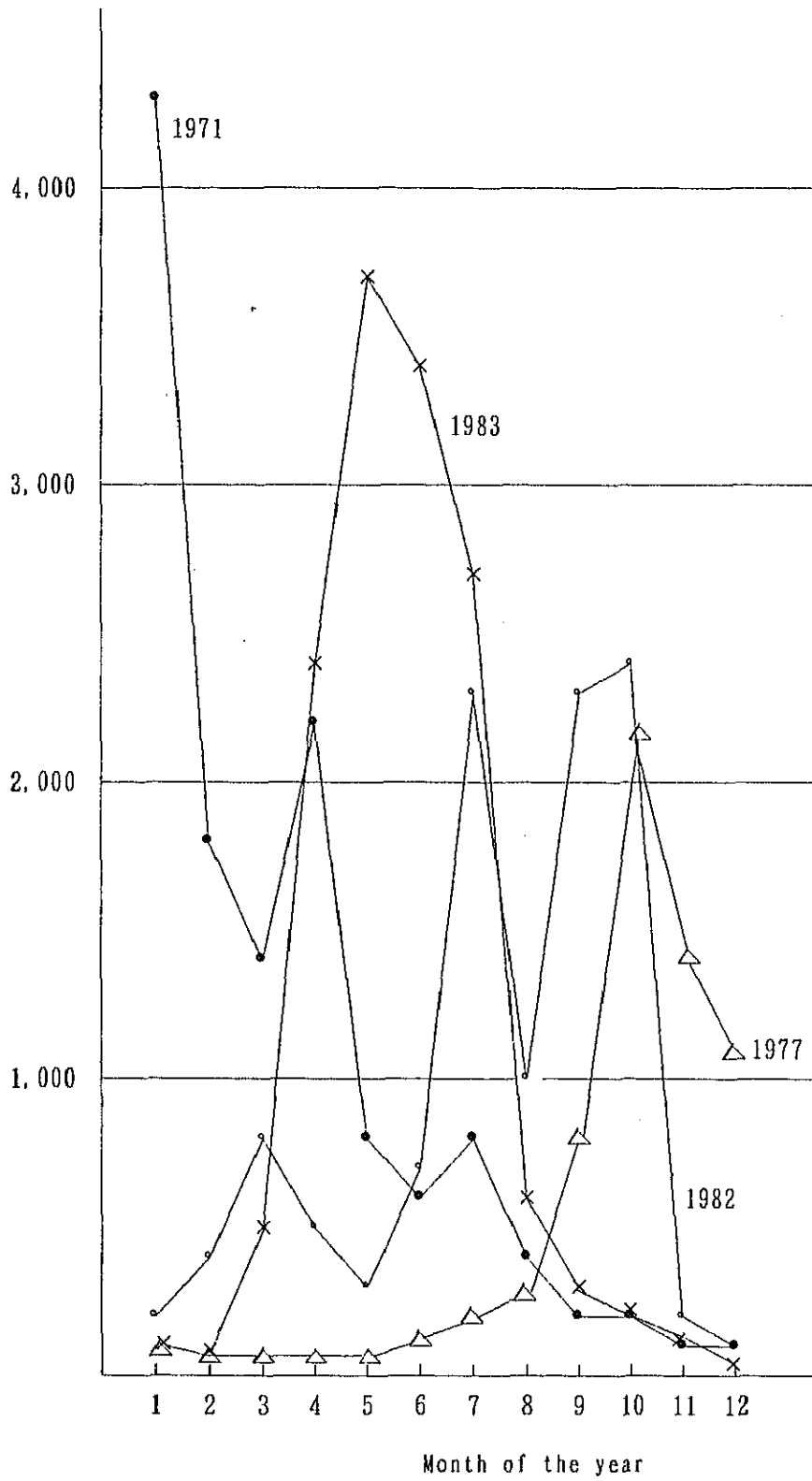
Month	1971	1977	1982	1983
Jan	4304 (224)	51 (1)	207 (36)	116 (13)
Feb	1825 (70)	19 (0)	372 (37)	45 (2)
Mar	1362 (70)	11 (1)	783 (88)	527 (28)
Apr	2176 (83)	8 (0)	504 (89)	2387 (59)
May	875 (65)	15 (2)	330 (38)	3723 (197)
June	601 (28)	113 (16)	699 (88)	3408 (252)
July	821 (34)	168 (11)	2287 (242)	2678 (173)
Aug	398 (19)	229 (27)	997 (68)	616 (41)
Sept	237 (25)	815 (53)	2282 (255)	328 (40)
Oct	225 (10)	2140 (119)	2354 (248)	240 (12)
Nov	115 (7)	1320 (69)	207 (32)	123 (2)
Dec	109 (6)	1069 (34)	64 (13)	69 (0)
Total	13048 (641)	5968 (333)	11086 (1225)	14160 (819)

()No. of deaths

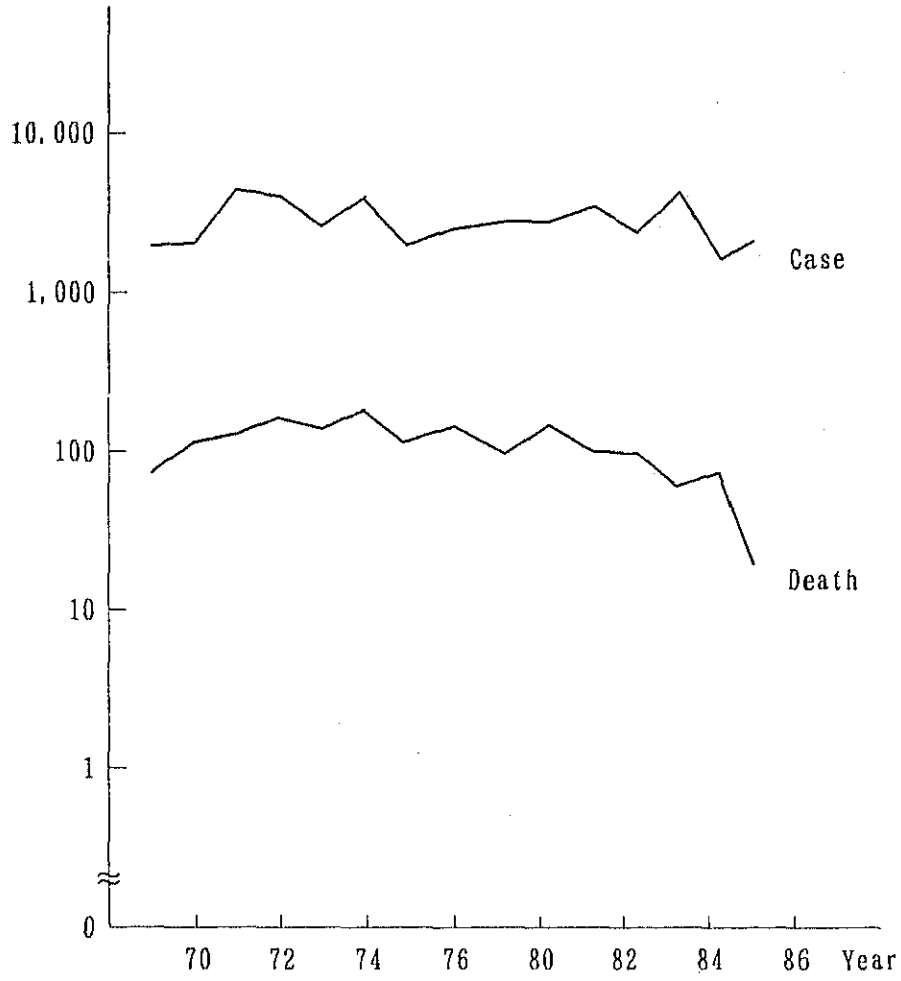
Cholera



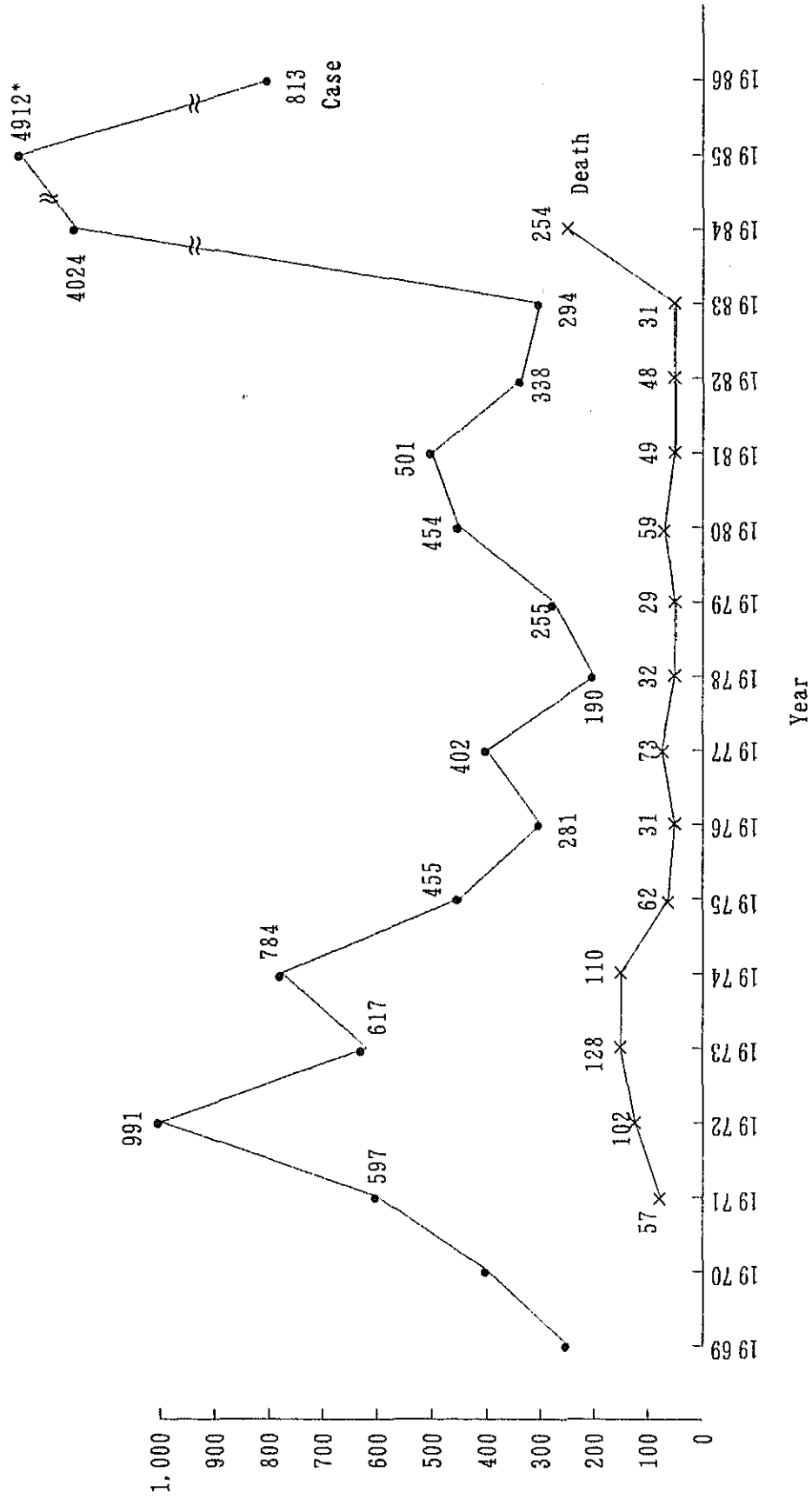
Monthly Incidence of Cholera



Yearly Incidence of Enteric Fever

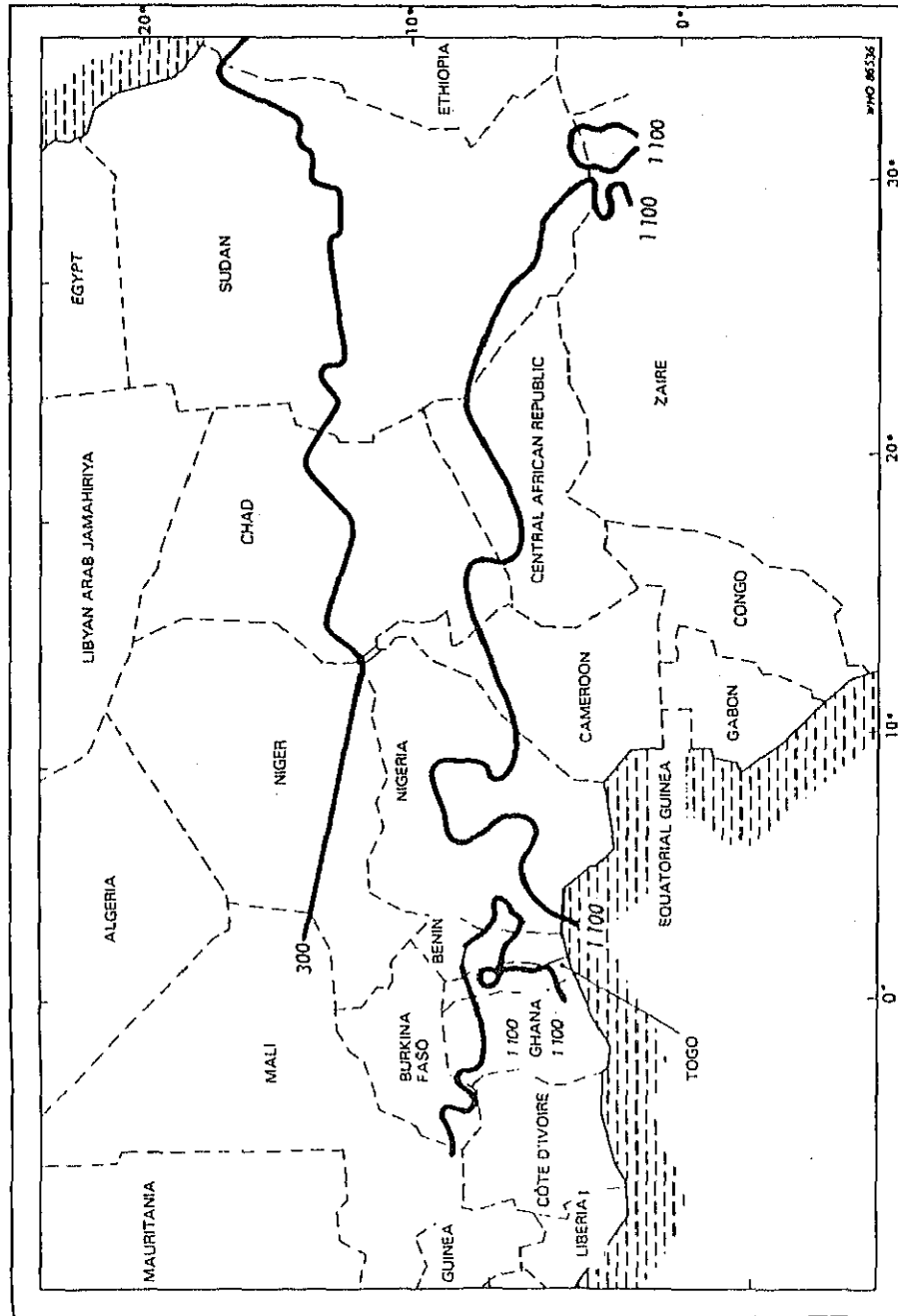


Cerebro-spinal Meningitis

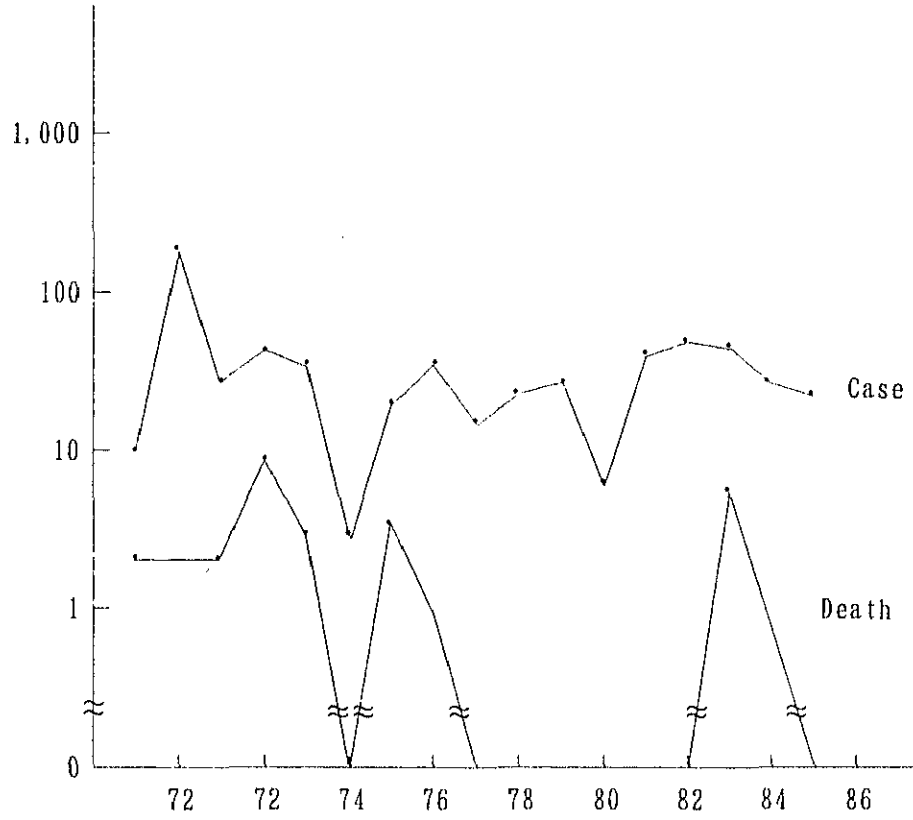


Source : Epidsmiology & Statistic Division *

Meniugitis Belt



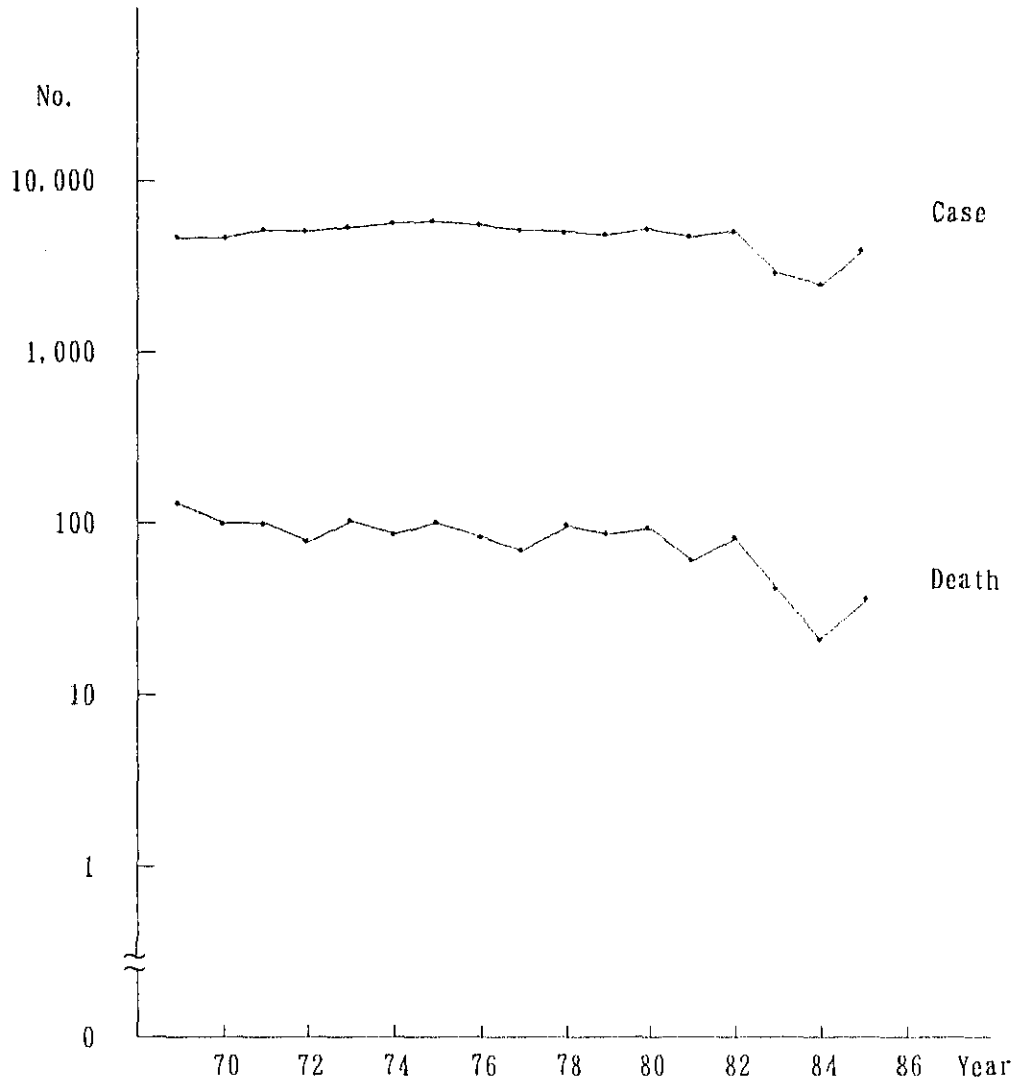
Anthrax of Humans



APPENDIX III

Chronic Bacterial Diseases

Incidence of Tuberculosis by Year



Organization of Ghana Leprosy Service

ORGANIZATIONAL SET-UP

A. Headquarters

Senior Medical Officer in-Charge
Chief Leprosy Control Officer
Assistant Chief Leprosy Control Officer

B. In each Region

Principal Leprosy Control Officer (P.L.C.O.): Regional Head
Senior Leprosy Control Officer (S.L.C.O.): District head
Leprosy Control Officer (L.C.O.): Sub-District Head
Leprosy Control Assistant (L.C.A.): Clinics
Clinic Attendants (C.A.): Clinics

SENIOR STAFF OF THE LEPROSY SERVICE

Headquarters (Ankaful, Central Region)

Medical Officer (Senior Medical Officer in-Charge)
Assistant Chief L.C.O.
2 P.L.C.O.'s
Principal Physiotherapist
Principal Technical Officer (Lab.)
Senior Pharmacist
Medical Assistant
S.L.C.O.
Senior Social Development Officer
Nursing Officer

Northern Region

P.L.C.O. (Tamale)
S.L.C.O. (Tamale)
S.L.C.O. (Damango)
2 S.L.C.O.'s (Kpandai)

Upper West Region

P.L.C.O. (Wa)

Upper East Region

S.L.C.O. (Bolgatanga)

Brong Ahafo Region

S.L.C.O. (Sunyani)

Ashanti Region

P.L.C.O. (Kokofu)
S.L.C.O. (Kokofu)
S.L.C.O. (Mampong)

Eastern Region

S.L.C.O. (Koforidua)

Volta Region

P.L.C.O. (Ho)
S.L.C.O. (Ho)

Greater Accra Region

S.L.C.O. (Accra)

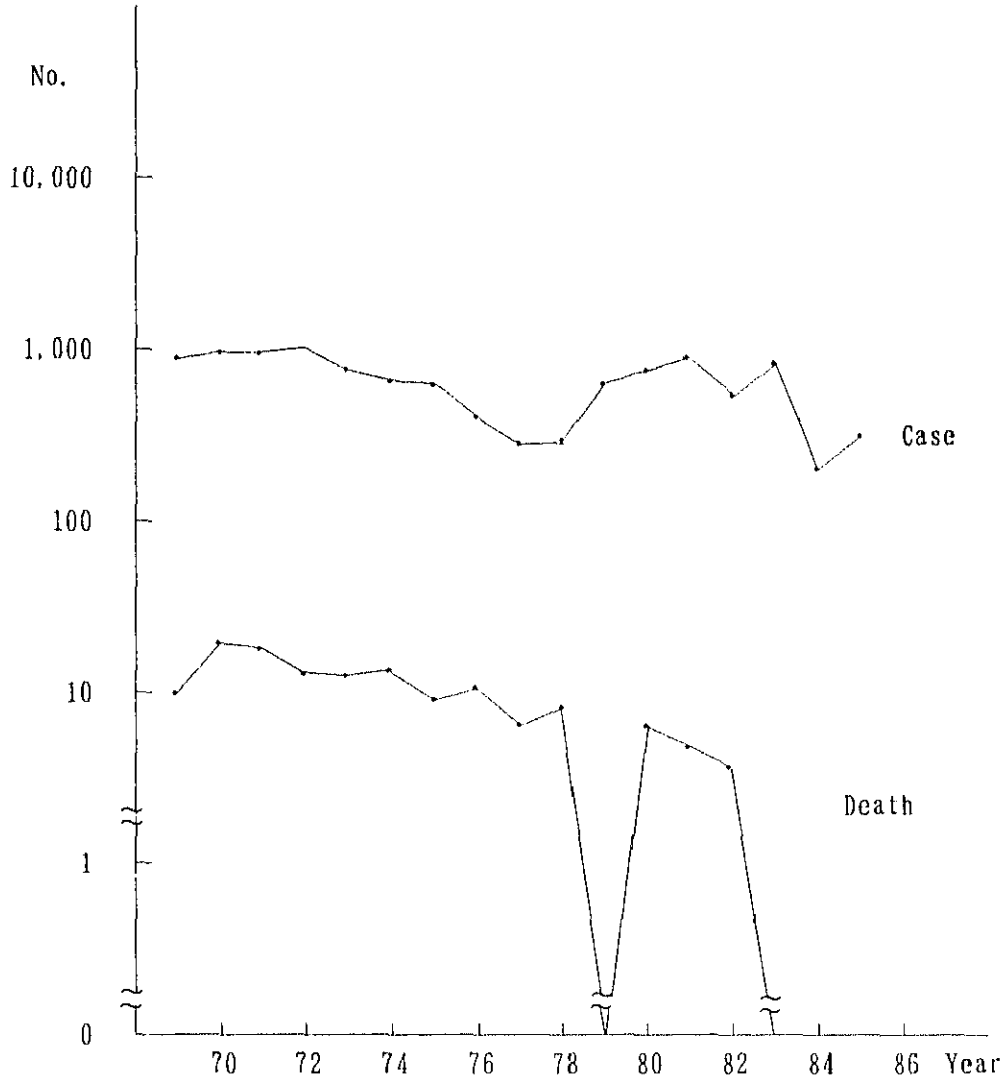
Western Region

S.L.C.O. (Tarkwa)

Central Region

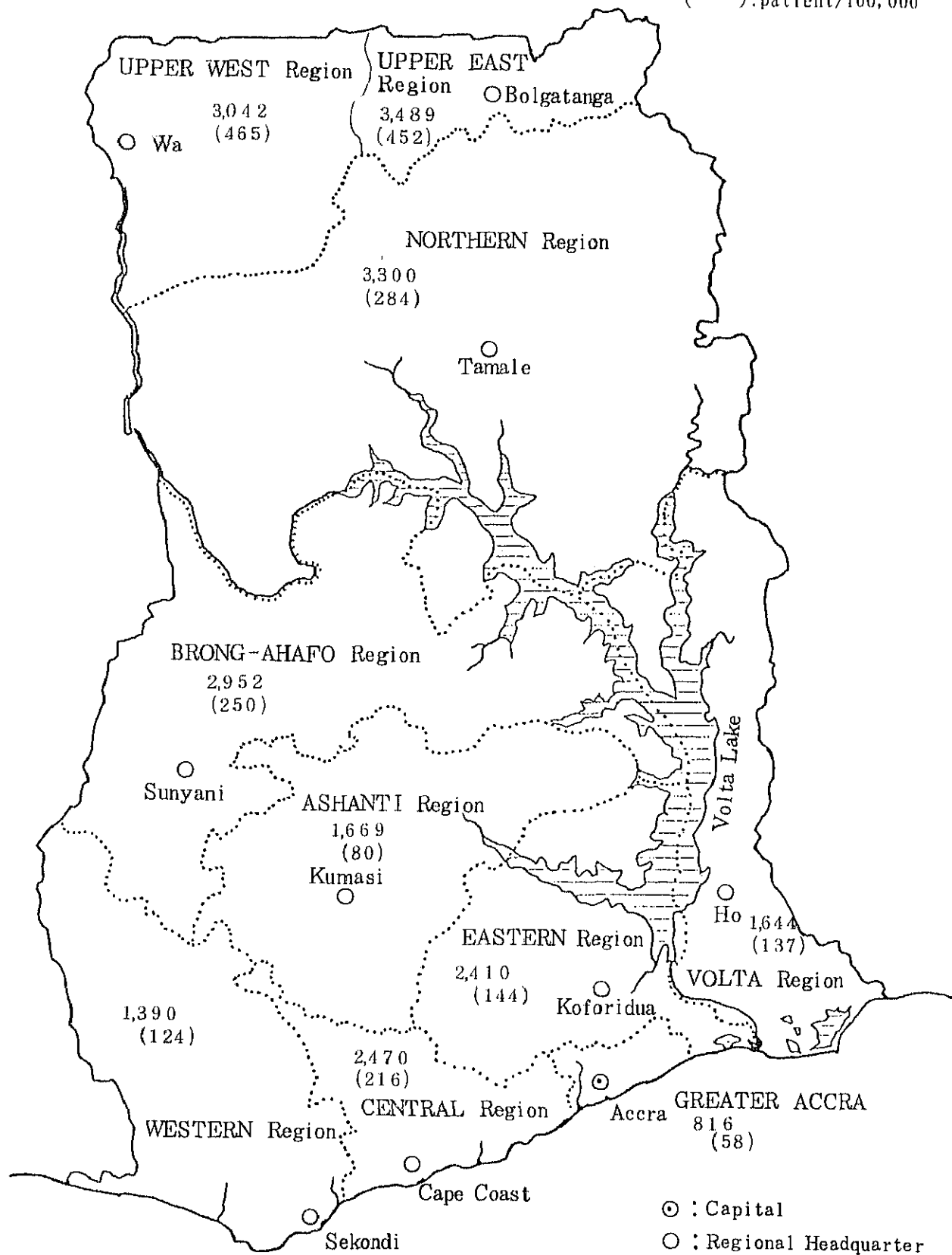
S.L.C.O. (Dunkwa)
S.L.C.O. (Central South)

Incidence of Leprosy by Year

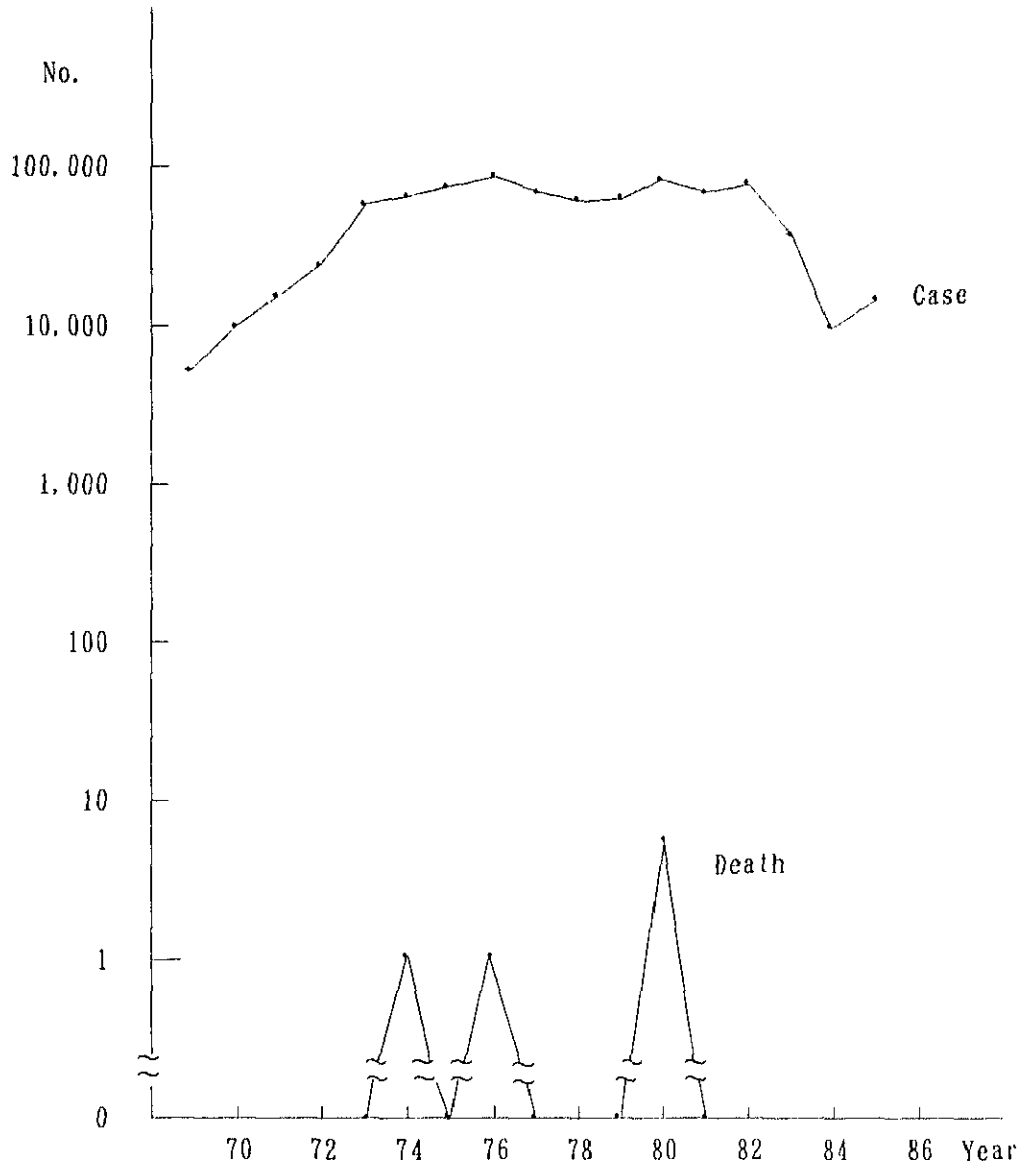


Distribution of Registered Leprosy Patients

():patient/100,000



Incidence of Yaws by Year



Prevalence of Yaws in Some Villages in Rural Area

COMMUNITIES	NO. EXAMINED	NO. OF YAWS FOUND	PREV. RATE PER/1000 POPUL.
TENBIBIAN	287	12	42.0
KOFI KWEI	459	17	39.0
ALL VILLAGES	1,641	33	20.0

Yaws/Yellow fever Project: Organization of Mobile Team

The Team

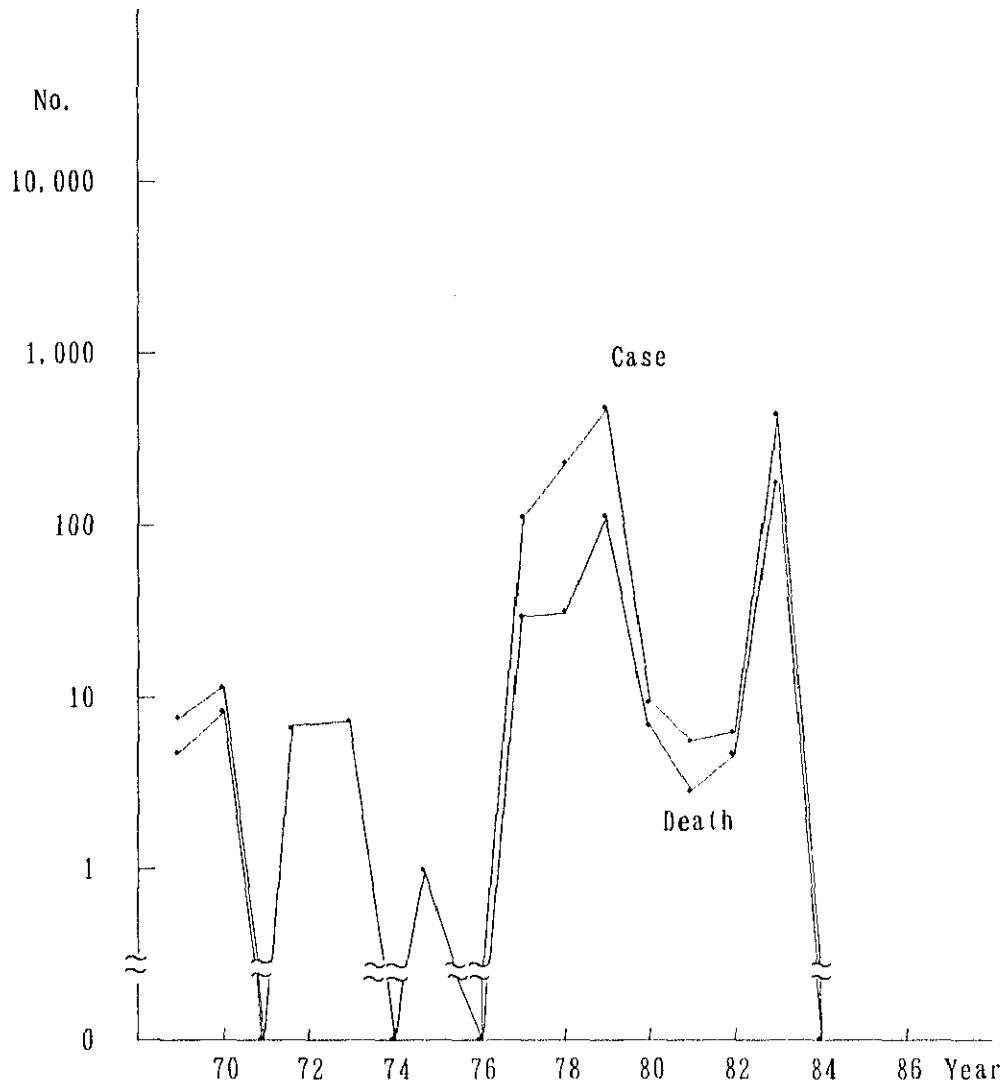
The Assessment teams shall comprise the following;

The leader (MFU Technical officer)	1
Screenener (MFU technical officer)	1
Injector (to give penicillin when cases are found)	1
Recorder	1
Driver	1
Field Labourer (also to regulate the crowd)	1
Total	6

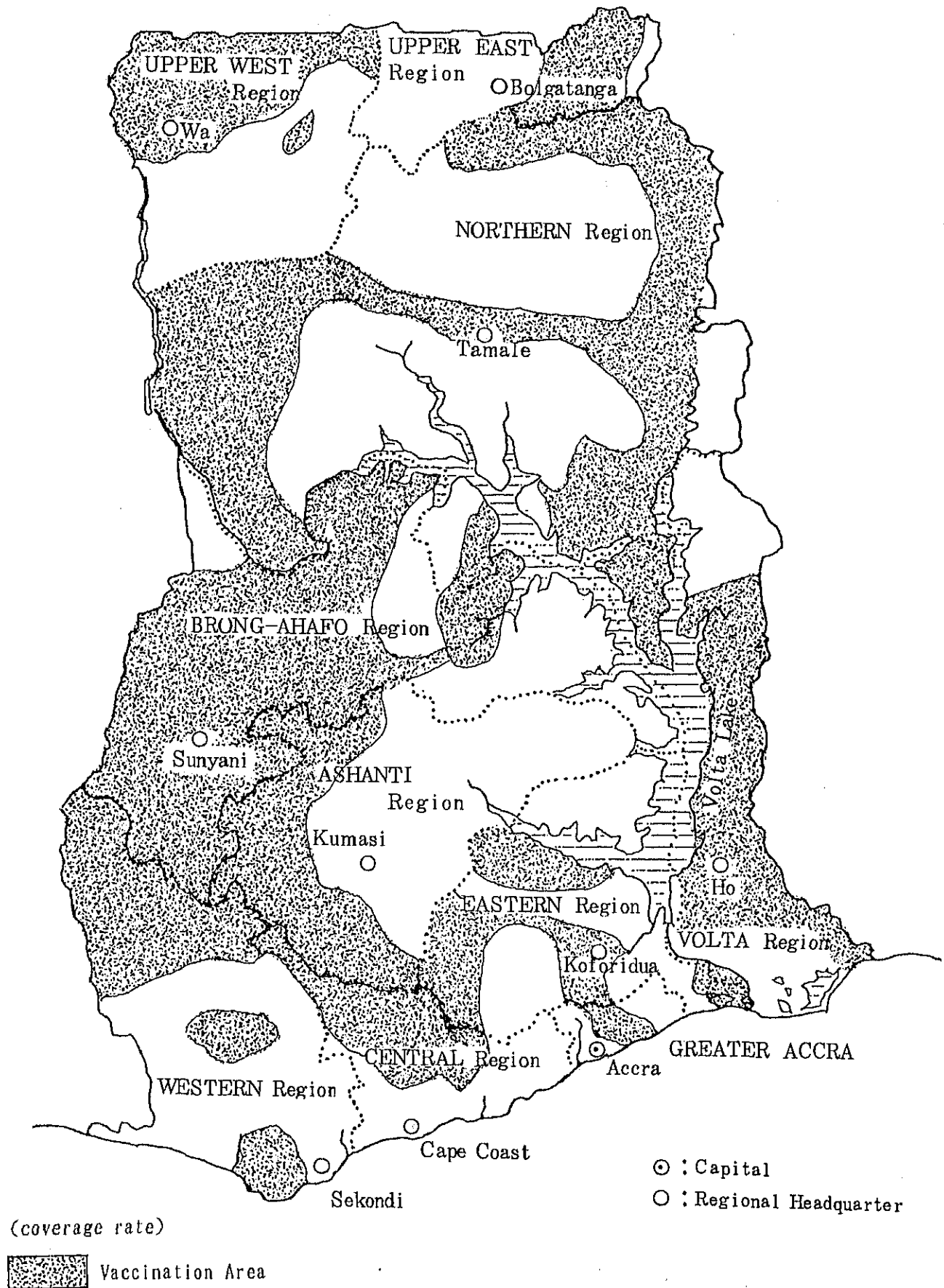
APPENDIX IV

Viral Diseases

Incidence of Yellow Fever by Year



Yellow Fever Immunization(1979-1985)



Yellow Fever Vaccinations in Ghana 1979-1985 Period

REGION	1979	1980	1981	1982	1983	1984	1985	1979-1985	% COVERAGE 1984 POPULATION
BRONG AHAFO	26789	147419	29411	274	90674	639118	38819	972504	82.4
NORTHERN	156	203	9455	80	200833	527727	9755	748209	64.5
UPPER EAST WEST	53	2722	3833	221	84383 29184	145003 97387	25011 90668	478465	39.5
OTHER REGION	458358	270766	441908	147481	116734	142797	238356	1816400	20.9
T O T A L :	483356	421110	484607	148056 928501*	521808	1552032	2075421	6442690*	

1977 81683

1978 263257

*Yaws-Yellow Fever Programme inclusive

Total immunized in a special

Yellow Fever Programme from

1983 to 1985 = 4,123,116.

Results of Yellow Fever Vector Studies

Region and locality	No. of houses	No. of houses with Aedes aegypti larvae	Houses index	No. of containers	No. of containers with Aedes aegypti larvae	Container index	Breteaux index
Upper:							
Jirapa	44	4	9.1	102	6	5.9	14
Doweni	18	3	16.6	52	6	11.5	33
Eastern:							
Maase	77	28	36.4	195	74	38	96
Volta:							
Fodome Xelu	50	8	16	116	8	7	16
Gbefi Tornu	98	7	7	263	7	2.6	7
Fodome Amele	20	3	15	53	3	6	15
Liate Wote	53	2	4	77	2	3	4

Sex and Age Distribution of 35 Patients With Rabies, Korle-Bu Hospital, Accra, 1963-1975

Age groupe	Males		Females		Both	
	No.	%	No.	%	No.	%
0 - 9	5	20.0	1	10.0	6	17.1
10-19	9	36.0	2	20.0	11	31.4
20-29	7	28.0	1	10.0	8	22.9
30-39	1	4.0	2	20.0	3	8.6
40+	3	12.0	4	40.0	7	20.0
ALL	25	100.0	10	100.0	35	100.0

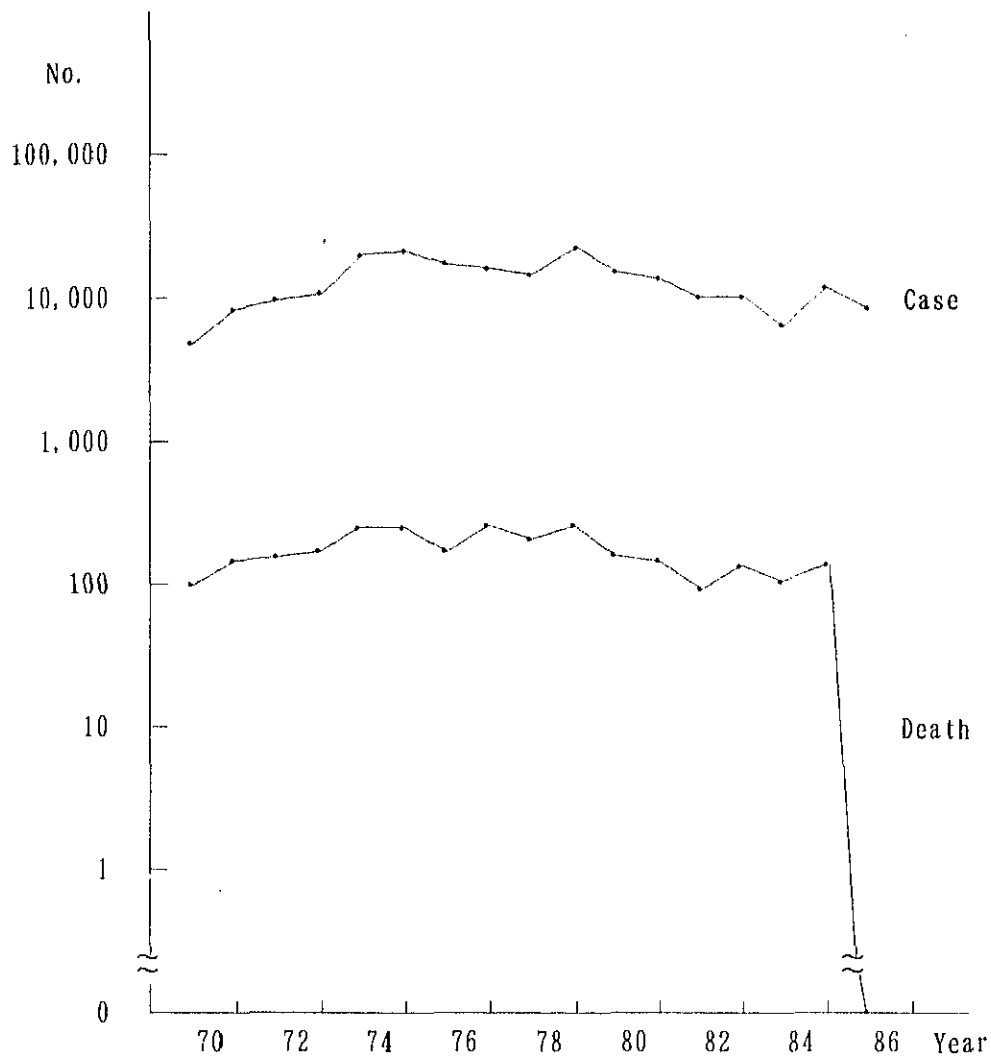
(D. W. Belcher et al., Am. J. Trop. Med. Hyg., 1976)

Cases of Rabies Infection in Each Region of Ghana

Year	Western		Central		Accra		Easter		Volta		Ashanti		B/Ahafo		Northern		Upper		Total	
	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.	C.	D.
1970	-	-	-	-	1	1	3	3	-	-	8	8	1	1	-	-	5	5	18	18
1971	1	1	2	2	2	2	-	-	1	1	7	7	-	-	2	2	3	3	18	18
1972	-	-	3	3	3	3	1	1	1	1	8	8	5	5	1	1	1	1	23	23
1973	1	1	1	1	5	5	-	-	-	-	7	7	11	11	1	1	1	1	27	27
1974	-	-	-	-	1	1	1	1	1	1	7	7	2	2	2	2	2	2	16	16
1975	-	-	-	-	1	1	2	2	-	-	7	7	7	7	-	-	4	4	21	21
1976	1	1	3	3	-	-	-	-	3	3	5	5	6	6	4	4	3	3	25	25
1977	-	-	-	-	-	-	-	-	2	2	4	4	6	6	-	-	1	1	13	13
1978	-	-	1	1	-	-	4	4	-	-	7	7	4	4	1	1	2	2	19	19
1979	-	-	3	3	-	-	-	-	-	-	6	6	1	1	-	-	-	-	10	10
1980	1	1	2	2	-	-	1	1	1	1	5	5	6	6	3	3	7	7	26	26
1981	3	3	-	-	4	4	-	-	1	1	7	7	3	3	2	2	3	3	23	23
1982	1	1	-	-	1	1	6	6	3	3	2	2	4	4	1	1	-	-	18	18
(1983	-	-	18	0	1	0	20	1	9	3	3	1	3	2	3	3	11	1	68	11)
1984	1	1	1	1	-	-	-	-	1	1	-	-	2	2	-	-	2	2	7	7
Total *	9	9	16	16	18	18	18	18	14	14	80	80	58	58	17	17	34	34	264	264

* without 1983 C** ; Cases, D*** ; Dead. (Communicable diseases reported on Ghana, MOH)

Incidence of Viral Hepatitis by Year



APPENDIX V

Parasitic Diseases

Total Blood Smears and Number of Positives by
Health posts in Volta Region(1984-1986)

Year	No. of Examination	No. of Positive	%
1984	11,244	7,094	62.5
1985	13,952	8,185	59.1
1986	11,009	6,917	62.8

Epidemiological Reported data of Malaria in Ghana

Area	Year (month)	No. Exam.	No. Posi.	%	Name of Reporter
Central Accra	1952, 1953 (Aug-Sept)	687	247	36.0	Colbourne & Wright
Central Accra	1954 (Mar.-Apr.)	251	44	17.5	" "
Suburban Accra	1952, 1953 (Aug-Sept)	662	337	50.9	" "
Suburban Accra	1954 (Mar.-Apr.)	196	100	51.0	" "
Bomba (Ashanti reg.)	1953 (Nov.)	503	351	69.8	" "
Bomba (Ashanti reg.)	1954 (Feb.)	348	244	70.1	" "
Yorugu-Bolgatanga (Upper East reg.)	1954 (Oct.)	404	304	75.2	" "
Yorugu-Bolgatanga (Upper East reg.)	1955 (Apr.)	442	341	77.1	" "
Coastal Ghana	1964	3,889	895	23.0	Rothstein
Tema, Nima, Kaneshie	1965	200	45	22.5	R. D. Trent
Gomoa Fetteh	1984 (Jan.-Feb.)	389	70	18.0	M. Ito
Gomoa Fetteh	1984 (Jul.-Sept.)	298	102	34.2	"

Reported Cases of Malaria Patients by Months(1982-1984)

Month	No. of malaria cases							
	1982		1983		1984		Total	
	Cases	%	Cases	%	Cases	%		
Jan.	17,438	4.4	37,276	8.7	40,386	9.2	95,100	7.5
Feb.	20,242	5.1	19,240	4.5	41,181	9.4	80,663	6.4
Mar.	27,301	6.8	31,305	7.3	42,629	9.7	101,235	8.0
Apr.	26,130	6.6	40,358	9.4	36,231	8.3	102,719	8.1
May.	51,579	12.9	40,269	9.4	34,762	7.9	126,610	10.0
Jun.	40,818	10.2	37,486	8.7	56,828	13.0	135,132	10.7
Jul.	39,695	10.0	61,322	14.3	54,809	12.5	155,826	12.3
Aug.	29,649	7.4	49,085	11.4	49,433	11.3	128,167	10.1
Sep.	50,848	12.7	40,872	9.5	35,156	8.0	126,876	10.0
Oct.	48,556	12.2	30,509	7.1	22,651	5.2	101,716	8.0
Nov.	27,493	6.9	27,870	6.5	19,683	4.5	75,046	5.9
Dec.	19,060	4.8	14,054	3.3	4,698	1.1	37,812	3.0
Total	398,809		429,646		438,447		1,266,902	

Age Distribution of Malaria Cases in Ghana(Gomoa,Fetteh,1986)

Age	Dry Season			Rainy Season			Total		
	No. Exam.	No. Posi.	%	No. Exam.	No. Posi.	%	No. Exam.	No. Posi.	%
0 - 5 months	2	0	0	8	2	25.0	10	2	20.0
6 - 11 "	15	0	0	7	3	42.9	22	3	13.6
1 - 3 years	67	10	14.9	58	19	32.8	125	29	23.2
4 - 6 "	53	19	35.8	46	14	30.4	99	33	33.3
7 - 9 "	48	16	33.3	29	14	48.3	77	30	39.0
10 - 14 "	30	6	20.0	29	19	65.5	59	25	42.4
15 - 19 "	31	2	6.5	29	9	31.0	60	11	18.3
20 - 29 "	51	4	7.8	36	9	25.0	87	13	14.9
30 - 39 "	29	1	3.4	9	3	33.3	38	4	10.5
40 - "	62	1	1.6	47	5	10.6	109	6	5.5
Total	388	59	15.2	298	97	32.6	686	156	22.7

(Ito et al., 1986)

Incidence of Malaria by species and localities in Ghana

Investigator	Locality Investigated	Year of investigated	Frequency of occurrence		
			P. falci- parum	P. mala- riae	P. ovale
Colbourne & Wright	Accra, Coastal belt	1953-1954	98 %	14 %	1 %
"	Bomfa, Forest belt Ashanti Region	1953-1954	90.8 %	18 %	5 %
"	Yorugu-Bolgatanga Savanna belt, Upper East Region	1954-1955	97.5 %	30 %	6 %
Beausoleil	Axim and Obuasi Western Region	1966	90 %	15 %	Nil
Medical Field Unit	Ho Volta Region	1972	92 %	4 %	Nil
Noguchi Memorial Research Institute	Gomoa Fetteh Central Region	1984 Pre-rainy season	84.9 %	19.0 %	1.7 %
"	"	1984 Rainy season	95.3 %	3.8 %	2.9 %

Mortality of Malaria by Age and Sex in Ghana(1979-1983)

Age	Male		Female		Total	
	No. of death	%	No. of death	%	No. of death	%
0 - 6 day	0	0	1	0.1	1	0.0
7 - 28day	4	0.3	0	0	4	0.2
1 - 11months	179	12.9	185	15.0	364	13.9
1 - 4 years	817	59.1	654	53.1	1,471	56.3
5 - 14years	195	14.1	165	13.4	360	13.8
15 - 24years	27	2.0	25	2.0	52	2.0
25 - 44years	44	3.2	41	3.3	85	3.3
45 - 64years	40	2.9	35	2.8	75	2.9
>65years	66	4.8	105	8.7	171	6.5
Unknown	11	0.8	19	1.5	30	1.1
Total	1,383		1,230		2,613	

Prevalence of Trypanosomiasis in Northern and Upper Region of Ghana(1937-1949)

Year	North east, South east Mamprussi			North west Laura and parts of Wa and Tumu dist.			All other districts of outside the epidemic area		
	Population examined	No. of Cases	Prevalence	Population examined	No. of cases	Prevalence	Population examined	No. of cases	Prevalence
1937	8,000	486	6.1	--	--	--	--	--	--
1938	18,000	468	2.6	14,000	403	2.9	10,000	110	1.1
1939	25,000	587	2.3	43,000	1,217	2.8	--	--	--
1940	22,000	37	1.8	27,000	253	0.94	--	--	--
1941	8,000	89	1.1	69,000	553	0.80	--	--	--
1942	31,000	386	1.2	--	--	--	28,000	262	0.94
1943	--	--	--	--	--	--	76,000	160	0.21
1944	--	--	--	--	--	--	72,000	448	0.62
1945	--	--	--	--	--	--	47,000	353	0.75
1946	--	--	--	--	--	--	26,000	87	0.34
1947	--	--	--	--	--	--	24,000	71	0.30
1948	--	--	--	--	--	--	37,000	99	0.27
1949	--	--	--	--	--	--	84,000	320	0.38

Prevalence of Trypanosomiasis in Brong-Ahafo and Ashanti Region of Ghana(1939-1950)

Year	Woodland savannah			Forest areas		
	Pop. exam.	No. of cases	Prevalence	Pop. exam.	No. of cases	Prevalence
1940~41	15,692	321	2.05	7,331	117	1.6
1943	8,209	31	0.38	19,051	207	1.6
1946	12,363	27	0.21	19,541	117	0.60
1950	74,254	117	0.16	42,928	82	0.19

Prevalence of Trypanosomiasis by Year(Ashanti Region, 1939-1950)

Year	Ejura survey area (Woodland savannah)			Year	Kumasi environment (Forest area)		
	Pop. exam.	No. of cases	Prevalence		Pop. exam.	No. of cases	Prevalence
1939	971	45	4.6	1941	7,331	117	1.6
1940	3,465	201	5.8	1945	9,882	33	0.33
1941	3,007	78	2.6	1946	6,273	15	0.24
1948	3,806	53	1.4	1949	12,726	12	0.09
1949	3,320	17	0.51	1950	24,223	32	0.13

Number of Positive and Death Cases of Trypanosomiasis by Region(1975)

Region	No. of cases	No. of deaths
Upper	5	—
Northern	22	1
Brong-Ahafo	10	—
Ashanti	34	—
Volta	3	—
Eastern	5	1
Total	79	2

Positive Cases of Trypanosomiasis by Year and Districts(1980-1985)

year	Month	Reporting unit	No. of cases	Month	reporting unit	No. of cases
1980	Jan.	Volta region	2	Jan.	Northern region	1
	Mar.	Northern region	2	Mar.	Upper region	1
	Apr.	Volta region	2	Apr.	Ashanti region	1
	Apr.	Upper region	1	May.	B/Ahafo region	1
	June.	B/Ahafo region	2	Sep.	Northern region	1
	Nov.	Western region	3	Nov.	Ashanti region	1
	Total	for the year				18
1981	Mar.	Eastern region	9	Mar.	Northern region	1
	Apr.	Northern region	2	Aug.	B/Ahafo region	2
	Dec.	Wecheau MFU, Upper	1	Dec.	Bosomtwe Clinic, Ashanti	1
	Total	for the year				17
1982	Apr.	Essem H/P, Western	2	May	Kpandou MFU, Volta	1
	May	Bunkpurugu MFU, Northern	3	June	Hohoe MFU, Volta	12
	June	Gambaga H/P, North.	1	June	Kpasemkpe H/P, North	1
	June	Yendi MFU, North.	1	Oct.	Gambaga H/P, North	1
	Oct.	Donkorkrom H/C, East.	1			
	Total	for the year				23
1983	Jan.	Yendi, Northern	2	Feb.	Wapuli Clinic, North.	1
	Aug	Kpandori MFU, Northern	1	Dec.	C/Accra	1
	Total	for the year				5
1984	Feb.	Mpohor H/P, Western	2	Aug.	Gambaga MFU, Northern	3
	Sep.	Gambaga MFU, Northern	1	Nov.	Berekum, B/Ahafo	1
	Total	for the year				7
1985	Feb.	Volta region	2	May	Bosomtwi clinic, Ashanti	2
	Sep.	Ada H/C, G/Accra	1			
	Total	for the year				5

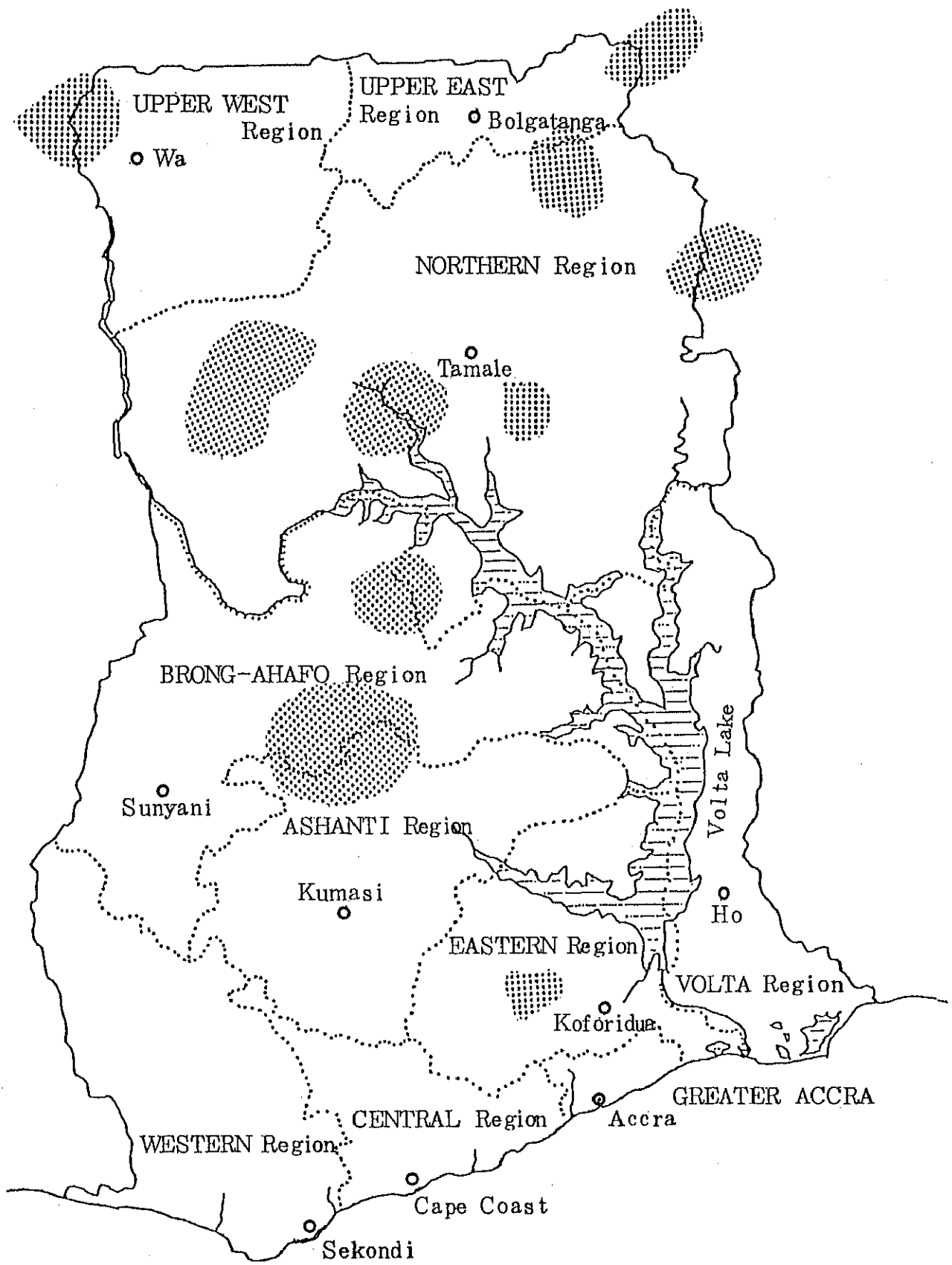
Incidence of Trypanosomiasis by Age Groups in Ghana

Region	Age group	Cases examined	Cases diagnosed	Incidence(%)
Ashanti and B/Ahafo (1952~1954)	0~15	32,664	24	0.07
	16~44	17,834	63	0.35
	45+	4,658	13	0.28
Northern region (1979)	Under 16 years of age			0.04
	Over 16 years of age			0.11
	All age group			0.08

Incidence of Trypanosomiasis by Occupations in Ghana

Group	Occupation	Persons examined	Cases diagnosed	Incidence (%)
Ashanti	Indigenous farmer	22,492	76	0.34
Moshie	Non-indigenous farmer	4,132	46	1.11

Distribution Map of Trypanosomiasis in Ghana



Number of Schistosmiasis Cases by Regions in Ghana(1981-1986)

	1981	1982	1983	1984	1985	1986
West Region	—	248	150	278	1,232	765
Central Region	415	1,749	1,632	986	78	744
G/Accra Region	—	137	26	3	699	637
East Region	390	1,416	1,897	1,347	1,158	2,824
Volta Region	5	469	280	1,270	3,840	2,405
Ashanti Region	—	224	179	1,036	1,035	2,190
B/Ahafo Region	—	52	137	233	506	782
Northern Region	—	1	13	188	356	202
Upper Region	—	552	476	726	238	530
Total	810	4,848	4,790	6,067	9,142	11,079

Reported Cases of Schistosmiasis in Ghana

Locality Investigated	Subject	No. of Exam.	No. of Posi.	Incidence (%)	Investigator(Year)
Waとその周辺 North-Western Ghana	Inhabitants	8,274	1,026	12.4	Lyons(1967-1968)
New Jejeti Eastern Region	School children	139	98	70.5	Odei(1974)
Pawmpawm Villages Volta Lake	Inhabitants	1,392	910	65.4	Scottら(1973)
Afram Villages Volta Lake	Inhabitants	1,116	897	80.4	Scottら(1973)
Pawmpawm Villages Volta Lake	Inhabitants	1,530	988	64.6	Scottら(1974)
Afram Villages Volta Lake	Inhabitants	1,294	1,086	83.9	Scottら(1974)

Incidence of Schistosomiasis by Age Groups in Volta Area, Ghana, 1982

Age (Years)	Survey 2 (1973)				Survey 3 (1974)			
	No. of Examined	No. of positive	%	egg output (5ml)	No. of Examined	No. of positive	%	egg output (5ml)
-4	328	166	50.6	32.5	340	162	47.6	28.1
5-9	574	490	85.2	107.9	674	574	85.1	87.0
10-14	334	309	92.5	154.2	397	373	94.0	135.2
15-24	325	258	79.4	68.3	371	302	81.4	45.6
25-34	363	245	67.5	24.2	384	281	73.2	22.7
35-44	303	184	60.7	16.9	349	203	58.2	14.7
45+	281	155	55.2	12.2	309	179	57.9	11.2
Total	2,508	1,807	72.0	54.0	2,824	2,074	73.4	47.3

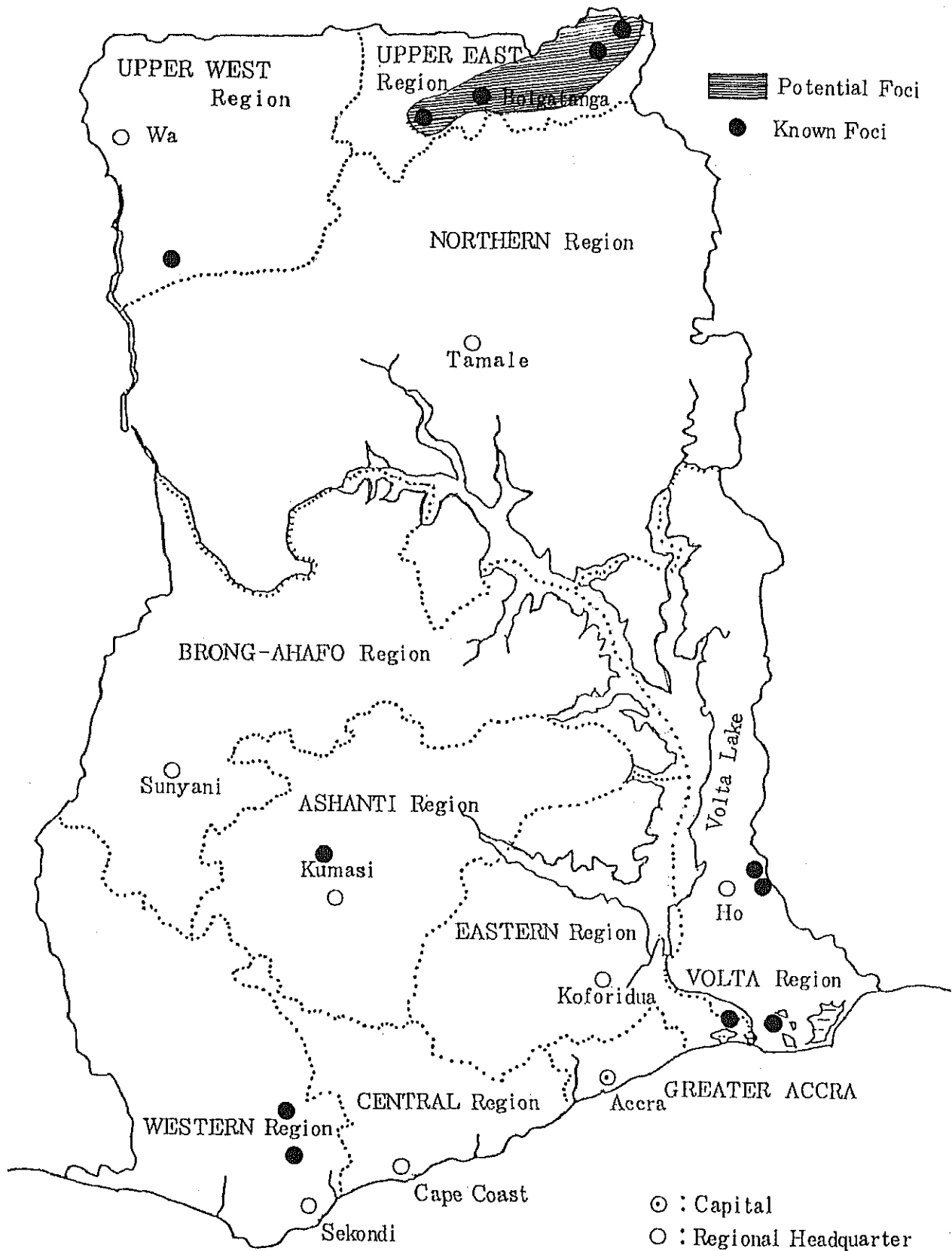
Incidence of Schistosmiasis by Occupations in Volta Lake Area, 1982

	Survey	Prevalence(%)			No. of Egg output(5ml)		
		Male	Female	Total	Male	Female	Total
Ewe族(Fisher man)	2	79.4	65.4	73.0	53.9	47.7	51.0
	4	77.0	67.9	72.7	49.1	38.4	44.1
Krobo族(farmer)	2	77.0	61.7	69.0	62.2	50.6	56.5
	4	79.0	68.8	73.7	63.6	43.8	53.1

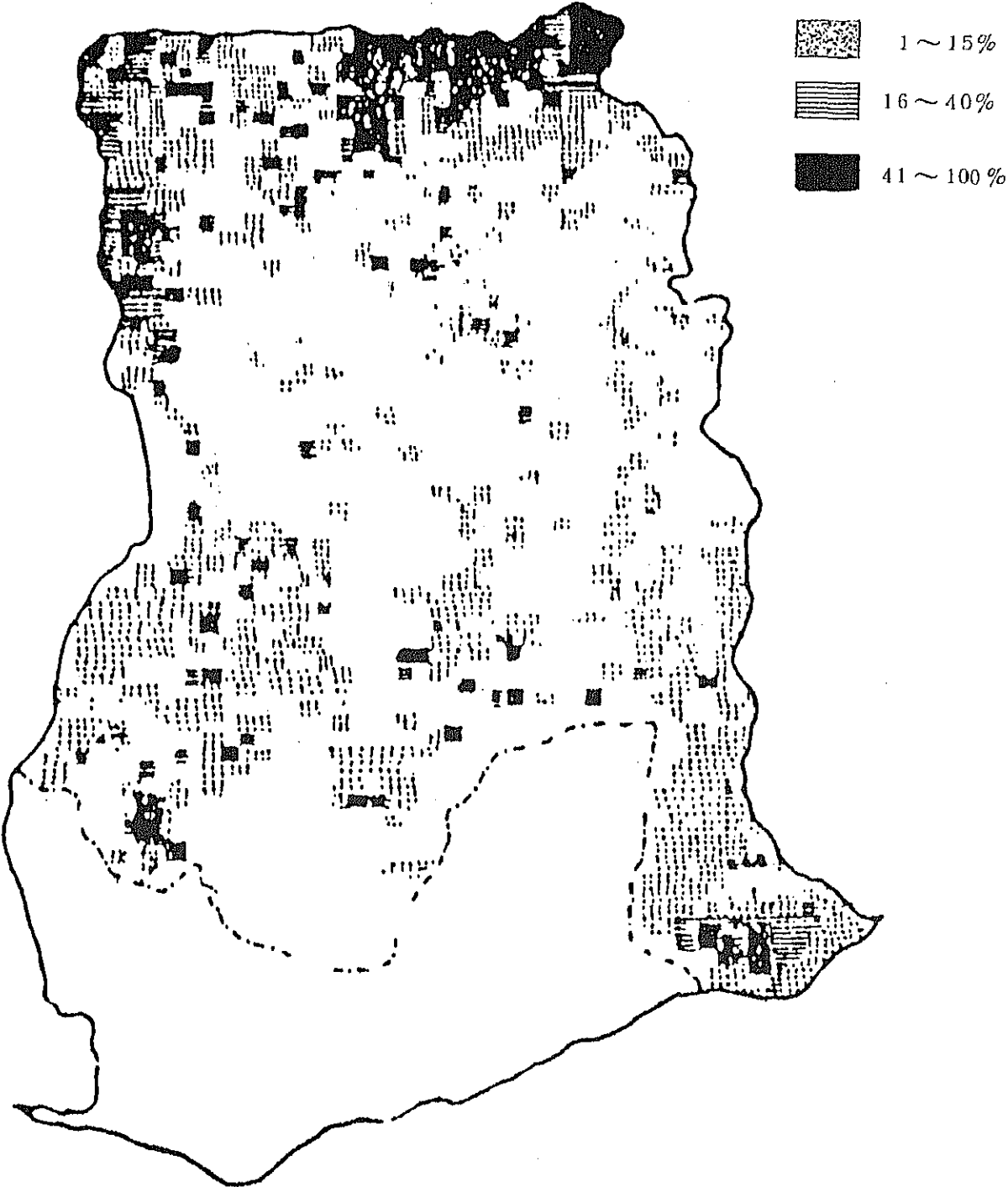
Monthly Number of Mature *S. haematobium* Infections in *B. rohlfsi* per
 Number All *B. rohlfsi* Collected (Klumpp & Chu, 1977)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
No. of snails collected	294	469	297	194	190	132	228	121	51	48	107	156
No. of snails infected	47	64	32	20	3	8	16	7	1	0	1	11
%	16.0	13.6	10.8	10.3	1.6	6.1	7.0	5.8	2.0	0	0.9	7.1
No. of snails collected	855	665	351	166	134							
No. of snails infected	62	41	37	11	10							
%	7.3	6.2	10.5	6.6	7.5							
No. of snails collected	1,149	1,134	1,002	603	864	433	556	290	78	134	292	446
No. of snails infected	109	105	84	52	24	17	31	26	3	2	19	48
%	9.5	9.3	8.4	8.6	2.8	3.9	5.6	9.0	3.8	1.5	6.5	10.8

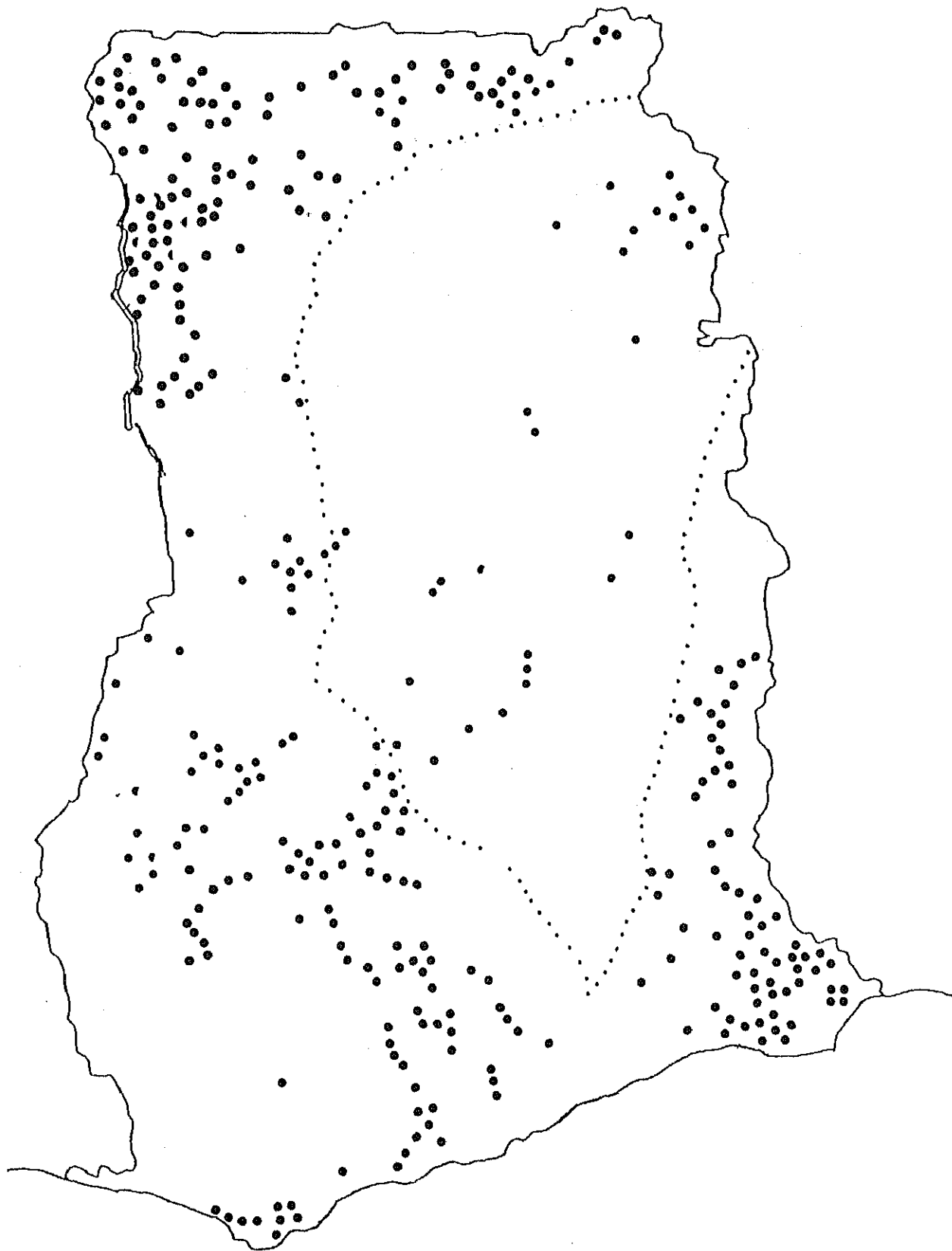
Distribution Map of *S. mansoni* in Ghana
 Surveys Carried Out By the Medical Field Units



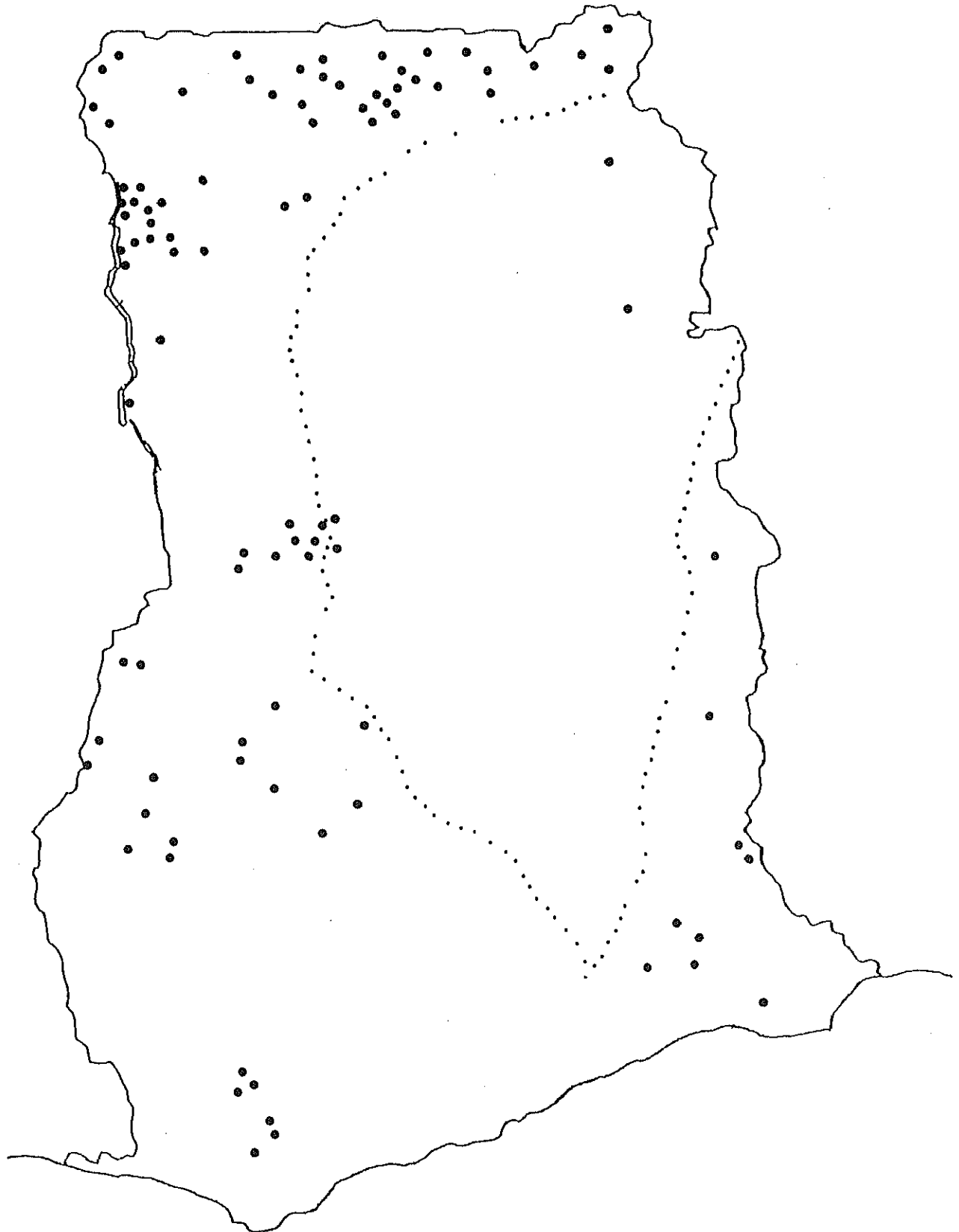
Distribution and Prevalence of *S. haematobium* in Boys, 5-15
Years Old in Ghana. Surveys Carried Out By the Medical Field Units



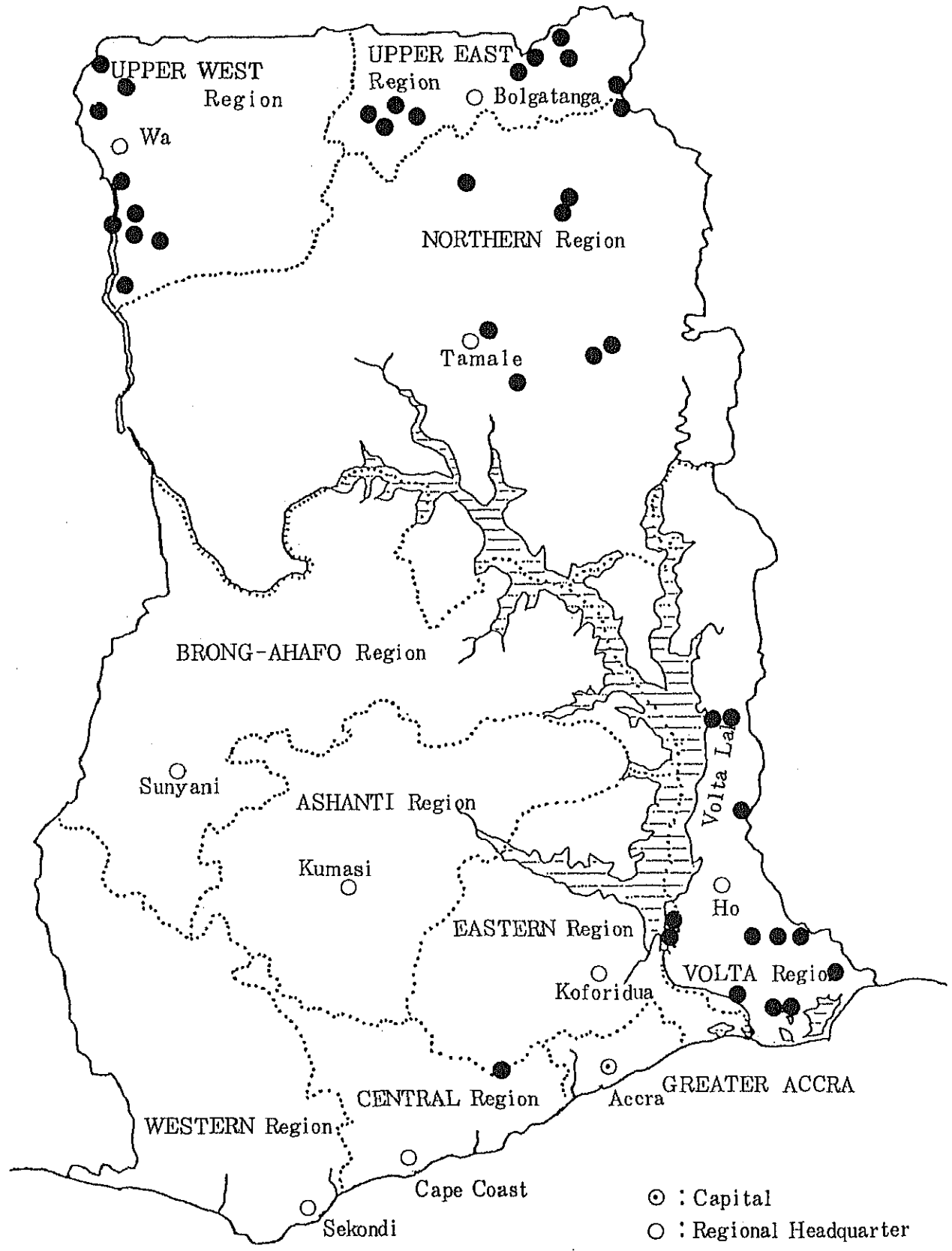
Distribution of *Bulinus(Physopsis)globosus*, Snail Host of *S.haematobium* in Ghana.
(Mc Cullough, 1965)



Distribution of *Biomphalaria* spp., Snail Hosts of *S. mansoni*, in Ghana.
The Dotted Line Encloses the Voltaian Rock Series.



Distribution of *Bulinus Truncatus rohlfsi*, Snail Hosts of *S. haematobium*, in Ghana



Monthly Cases of Onchocerciasis in Ghana(1981-1984)

	1981	1982	1983	1984	Average (1982-84)
Jan.		296	470	882	549
Feb.		304	546	478	443
Mar.		821	610	576	669
Apr.		360	496	462	439
May.		580	569	261	470
June		655	518	627	600
July	5	423	606	668	566
Aug.	158	299	604	115	339
Sep.	150	414	475	659	516
Oct.	175	448	547	277	424
Nov.	45	227	394	265	295
Dec.	66	317	146	29	164
Total	599	5,144	5,981	6,335	5,820

(Communicable diseases reported in Ghana, MOH)

Cases of Onchocerciasis in Each Region of Ghana (1981-1986)

	1981	1982	1983	1984	1985	1986	Total
Western		166	59	54		8	287
Central	552	1,743	2,565	2,994		394	8,248
Accra		48	4	3			55
Eastern	242	1,089	1,726	770	8	84	3,919
Volta		987	570	661	95	895	3,208
Ashanti		46	99	148	617	1,995	2,905
B/Ahafo		761	736	1,021	994	1,072	4,584
Northern		93	27	418			538
Upper	5	219	195	266	97	8	790
Total	799	5,152	5,981	6,335	1,811	4,456	24,534

(Communicable diseases reported in Ghana, MOH)

Cases of Blindness in the Inhabitants of Northern Ghana

River	Village	Popula- tion	Number Examined	Number Blind	%blind found in the population*
	1. Yagaba	802	194	21	2.61
	2. Logiri	911	281	25	2.74
Kulpawn	3. Sisi	28	23	-	-
	4. Giadema	321	75	7	2.28
	5. Tokwari	266	108	2	0.75
	6. Zongoiri	542	100	4	4.42
	7. Digari	32	31	-	-
	8. Kpharipkiri	61	61	1	1.63
White	9. Arigu	921	186	27	2.95
Volta	10. Duu	583	125	28	4.80
	11. Kpasinkpe	600	123	37	6.16
	12. Sogo	91	90	1	1.09
Morago	13. Denugu	707	100	7	0.99
	14. Shieshie	428	136	13	3.03
Sisili	15. Nakong Atinia and Awinia	229	128	22	9.61
Red Volta	16. Arabea	118	95	30	25.33
	Total	6,631	1,856	245	3.69

* Based the blind in sample examined plus the blind the compounds of the total population in the village (C.Senker et. al., Ghana Medical Journal, 1973)

Cases of Microfilaria Positive and Onchocerca in the
Inhabitants of Northern Ghana

River	Village	Popula- tion	Number Examined	Number Positive	% Positive	Nodules only
	1. Yagaba	802	194	89	45.9	22
	2. Logiri	911	281	92	32.7	38
Kulpawn	3. Sisi	28	23	14	60.9	5
	4. Giadema	321	75	55	73.3	4
	5. Tokwari	266	108	53	49.1	30
	6. Zongoiri	542	100	62	62.0	7
	7. Digari	32	31	15	48.4	4
	8. Kpharipkiri	61	61	20	32.8	14
White	9. Arigu	921	186	67	36.0	53
Volta	10. Duu	583	125	57	45.6	17
	11. Kpasinkpe	600	123	40	32.5	27
	12. Sogo	91	90	51	56.7	13
Morago	13. Denugu	707	100	27	27.0	18
	14. Shieshie	428	136	58	42.6	32
Sisili	15. Nakong Atinia and Awinia	229	128	82	64.1	18
Red Volta	16. Arabea	118	95	64	67.4	19
	Total	6,631	1,856	846	45.6	321

Cases of Guinea Worm Infection in Each Region of Ghana(1981-1986)

region	1981	1982	1983	1984	1985	1986	Total	%
Western	—	161	3	90	295	116	665	(3.6)
Central	491	1,568	785	561	199	551	3,664	(19.8)
Accra	—	1	2	18	307	123	451	(2.4)
Eastern	95	259	815	83	26	273	1,456	(7.9)
Volta	2	1,251	600	993	881	474	4,199	(22.6)
Ashanti	—	7	12	75	151	143	388	(2.1)
B/Ahafo	—	34	9	91	259	222	615	(3.3)
Northern	—	69	617	2,153	2,389	1,191	6,419	(34.6)
Upper	—	63	197	180	101	141	682	(3.7)
total	588	3,413	3,040	4,244	4,608	3,234	18,539	

(Communicable diseases reported in Ghana, MOH)

Monthly Occurrence of Guinea Worm Diseases in Ghana

Month	1981	1982	1983	1984	Total	%
Jan.		285	180	181	646	(6.1)
Feb.		355	316	166	837	(7.8)
Mar.		355	316	279	968	(9.0)
Apr.		856	481	714	2,051	(19.1)
May		549	258	473	1,280	(11.9)
June		168	204	729	1,101	(10.2)
July		174	278	429	881	(8.2)
Aug.	172	138	367	317	822	(7.6)
Sept.	76	128	230	284	642	(6.0)
Oct.	66	170	255	304	729	(6.8)
Nov.	161	86	98	307	491	(4.6)
Dec.	113	114	134	61	309	(2.9)
total	588	3,473	3,040	4,244	10,757	

(Communicable diseases reported in Ghana, MOH)

Incidence of Guinea Worm Infection in Relation to Sources of Drinking Water

Source of drinking water	No. of persons examined	No. positive	Percentage
(boreholes, deep wells)	1,418	48	3.4
(Ponds, shallow wells, borrow pits)	3,798	235	6.2
(rivers, streams, pools)	6,090	308	5.1
(dams)	3,366	118	3.5

Age and Sex Distribution of Persons Infected With Guinea Worm(1970)

Age (years)	Males			Females			Total		
	No in age	infected	%	No in age	infected	%	No in age	infected	%
	group	No.	%	group	No.	%	group	No.	%
0-4	99	6	6.1	93	5	5.4	192	11	5.7
5-9	81	26	32.1	75	24	32.0	156	50	32.1
10-14	88	32	36.4	77	30	39.0	165	62	37.6
15-19	52	19	36.5	30	14	46.7	82	33	40.2
20-29	38	9	23.7	73	30	41.1	111	39	35.1
30-39	57	16	28.1	91	29	31.9	148	45	30.4
40-49	65	12	18.5	71	18	25.4	136	30	22.1
≥ 50	59	5	8.5	51	12	23.5	110	17	15.5
Total	539	125	23.2	561	162	28.9	1,100	287	26.1

(G. R. L. Lyons, Bull. Wild. Hlth. Org., 1972)

Percentage of Children at Each Village Infected by the Common Intestinal Parasites

Village	not infected	Entamoeba sp./spp	Giardia intestinalis	Ascaris lumbricoides	Hookworm	Trichuris trichiura	Strongyloides stercoralis	Sample size
Ofankor	41.9	14.0	3.9	41.9	12.4	6.2	9.3	129
Oshiyie	10.5	8.3	7.2	76.2	22.7	64.4	18.8	181
Akuma	45.5	27.3	18.2	0	27.3	0	9.1	33
Maaban	45.6	13.9	10.1	32.9	7.6	2.5	5.1	79

(Akweley Annan et al., Parasitology, 1986)

APPENDIX VI

Environmental Health

Coverage of Water Supply

		1960	1975	1980	1985	1990
Urban	Population	1,302,000	2,547,000	3,088,000	3,677,000	4,621,000
	covered Rate	83.7	92.4	93.0	93.0	100
rural	Population	560,000	1,148,000	2,439,000	3,314,000	7,481,000
	covered Rate	10.8	16.6	29.8	39.3	78
Total	Population	1,862,000	3,695,000	5,527,000	6,993,000	12,102,000
	covered Rate	27.0	38.2	48.1	56.4	85

Mid-decade assessment of water supply and sanitation in Ghana,
E. F. Quashie, 1987

Urban Town Population Provided With Sanitation Facilities

	1970 Population	No. of Houses 1970	% With Private W. C.	% With Pan Latrine In Houses	% Using Public Facility or Other Means
Accra	564, 194	35, 835	30	44	26
Tema	60, 767	10, 021	100	—	—
Kumasi	260, 286	11, 755	40	50	10
Sekondi/ Takoradi	91, 874	4, 469	20	27	53
Cape Coast	51, 653	3, 037	20	40	40
Koforidua	46, 235	2, 332	12	58	30
Sunyani	23, 780	1, 114	35	30	37
Ilo	24, 199	1, 871	19	70	11

Population Provided With Sanitation Facilities

	1980		1985		1990	
	Pop. With Sanitation	% Coverage	Pop. With Sanitation	% Coverage	Pop. With Sanitation	% Coverage
Urban Population	1, 940, 000	58. 4	2, 304, 000	58. 2	3, 235, 000	70. 0
Rural Population	1, 227, 000	15. 0	1, 363, 000	16. 2	2, 882, 000	30. 0
Total	3, 167, 000	27. 5	29, 667, 000	29. 6	6, 117, 000	43. 0

APPENDIX VII

Health Manpower & Medical Facilities

Health Manpower in the Ministry of Health(Data Obtained from the Questionnaire)

	1983	1984	1985	1986
Medical Doctor			482	
Dentist			36	
Pharmacist		50	82	101
Nurse				
Public Health Nurse	288+1	274+1	281+1	256
Assistant Nurse			5134	
Midwife	—	—	—	—
Medical technologist			242	
X-Ray technologist	130	146	146	
Sanitary technologist	—	—	—	—
Radio therapeutic technologist	—	—	—	—
Dental technologist	—	—	—	—
Blood bank technologist	—	—	—	—
Physiotherapeutic technologist	22	22	22	

Health Manpower Development (Data Obtained from the Questionnaire)

	No. of School	Number of graduates			
		1983	1984	1985	1986
Medical school	2	48 *	11 *	49 *	65 *
School of Dentistry	0	—	—	—	—
School of Pharmacist	1	40 **			
Nursing School ***					
School of Medical Laboratory Technologist	1	19	23	18	23
Public Health School	1	30	20	27	39
Health Inspector Training School	1	33	20	32	17

Health Facilities by Region As At June 1985

REGION	HOSPITAL										HEALTH CENTRES	HEALTH POSTS	CLINICS		TRAINING INSTITUTIONS
	TEACHING	REGIONAL	DISTRICT	SPECIAL	CUASIGOV T	MISSION	MINES	GOVT.		MISSION					
								GOVT.	MISSION						
Greater Accra	1	-	4	3	4	-	-	9	10	9	-	7			
Volta	-	1	5	1	1	6	-	49	28	3	3	4			
Eastern	-	1	9	-	1	3	1	6	24	6	8	5			
Central	-	1	3	2	1	4	1	8	28	8	-	3			
Western	-	1	7	1	2	3	3	10	16	10	1	1			
Ashanti	1	-	3	2	2	6	2	10	26	10	7	5			
Brong-Ahafo	-	1	1	-	1	8	-	33	13	33	1	4			
Northern	-	1	2	2	1	2	-	9	18	9	4	3			
Upper East	-	1	1	-	-	1	-	-	7	-	8	1			
Upper West	-	1	1	-	-	2	-	5	8	5	3	2			
TOTAL	2	8	36	11	13	35	7	139	177	139	34	35			

Number of Beds by Type of Hospital

TYPE OF BED/OWNERSHIP	GOVT.	MISSION	QUASI GOVT.	MINES	TOTAL
General Beds	7155	2856	428	195	10634
Maternity Beds	2304	625	47	27	3003
Wooden Beds	532	61	--	--	593
Ordinary Cots	1373	754	102	25	2254
Treasure Cots	1649	333	105	24	2111
Incubators	19	--	--	--	19
TOTAL	13032	4629	682	271	18614

Regional Distribution of Bedstates(1986)

Region/Bed Type	General	Maternity	Wooden	Ord. Cots	Tr. Cots	Incubators	Total
Greater Accra	2374	317	329	252	250	14	3536
Volta	1004	592	57	428	342		2423
Eastern	1129	450	—	308	313		2200
Central	1502	324	86	243	148		2303
Western	788	204	12	199	176		1379
Ashanti	1595	505	51	348	423	5	2927
Brong Ahafo	713	220	48	188	220		1389
Northern	756	121	—	114	52		1043
Upper East	353	135	10	87	111		696
Upper West	420	135	—	87	76		718
	10634	3003	593	2254	2111	19	18614

Health Personnel

YEARS	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Medical Doctors (1)	1011	1071	1388	1482	1553	1665	1435	1562	1715	1782
Medical Assistants	280	290	306	340	217	209	209	220	220	260
Dentists	60	60	67	80	95	95	71	167	167	169
Dental Assitants	77	14	57	77	77	48	50	50	56	--
Pharmacists (2)	519	572	587	579	588	611	504	504	504	487
Pharmaceutical Assistants	300	274	190	284	284	474	489	489	311	311
Professional Nurses (3)	7815	8357	8580	8937	9170	9383	7349	8522	9859	10201
Professional Midwives (3)	5546	5122	5320	5891	6341	6725	7122	7423	7693	8043
Auxilliay Nurses(3)	4117	4268	5362	6412	7739	8375	10610	11128	10116	10150
Sanitary Engineers	1	1	1	2	1	1	1	1	1	1
Health Inspectors	295	309	364	391	322	215	153	240	260	292
Health Inspecting Assistants	454	543	570	790	543	409		116		
Physio-Therapists	16	17	26	27	31	24	22	22	22	22
Laboratory Technologists/Technicians	45	45	50	50	134	257	218		242	242
Assistant Laboratory Technicians	225	240	190	197	164	164	363	363	309	309
X Ray Technicians and Radiographers	32	32	53	59	141	130			146	146
X Ray Operators	90	90	95	95	76	102				
Professional Biosts. Officer	9	8	7	8	9	8	6	6	6	6
Technical Grades (STOS) Biostats.										6

Note : (1) Registered with Medical And Dental Board

(2) " Pharmacy Board

(3) " " Nurses & Midwives Council

Number of Outpatients by Region and Year

Region/年度	1971	1975	1980	1985
Greater Accra	1,493,191	1,689,739	952,711	643,184
Eastern	1,420,283	1,493,571	1,134,013	937,184
Central	608,655	910,843	514,451	248,470
Volta	641,244	734,617	926,338	512,085
Western	1,064,012	1,271,960	537,929	235,884
Ashanti	1,173,631	1,169,205	984,493	741,950
Brong Ahafo	865,437	997,770	976,768	529,655
Northern	443,853	364,668	176,340	108,423
Epper	455,205	566,447	134,597	
West				59,658
East				102,280
Total	8,165,511	9,198,820	6,337,720	4,118,747

Source ; Statistic Division, Ministry of Health

Medical Costs for Out Patients

Service	FEES		
	Adults	Children	Non-Ghanaian
A. 1. Teaching Hospitals:			
(a) Specialist Consultation(1st visit) ..	¢ 200.00	¢ 100.00	¢ 400.00
Follow-up visits	¢ 50.00	¢ 25.00	¢ 100.00
(b) General Consultation	¢ 75.00	¢ 40.00	¢ 200.00
2. Regional Hospitals	¢ 75.00	¢ 40.00	¢ 100.00
3. District Hospitals	¢ 50.00	¢ 30.00	¢ 80.00
4. Urban Health Centres	¢ 50.00	¢ 30.00	¢ 80.00
5. Rural Health Centres and Posts	¢ 30.00	¢ 20.00	¢ 80.00

Costs for Laboratory Examination

Investigations in Hospitals, Health Centres	Fee
B. 1. Laboratory	
Blood	
(a) Parasites, HB, WBC, Differential count, ESR, Clotting time, Bleeding time	¢ 10.00 each
(b) Sickling, Prothrombin time	¢ 20.00
(c) Electrophoresis	¢ 50.00
C. S. F.	
Routine examination for cell count, protein, sugar, etc.	¢ 50.00
Stool:	
Parasites	¢ 20.00
Urine:	
(i) PH, Specific gravity	¢ 5.00 each
(ii) Protein, Sugar, Urobilin, Urobilinogen, Ketone	¢ 10.00 each
(iii) Billirubin, Deposit	¢ 20.00 each
Bacteriology	
(a) Sputum, Urine, Stool, CFS, Vaginal Swabs, and Swabs from wounds for Culture and Sensitivity	¢ 100.00 each
(b) Pregnancy test	¢ 100.00
(c) Sputum test for AFB	Free
(d) Skin Snip Onchocerciasis	Free
2. Special Investigations	
ECG, EEG	¢ 250.00
3. Radiological Investigations	
(i) Plain X rays	
Large films, e.g. Chest	¢ 200.00
Small films, e.g. wrist, joint	¢ 100.00
Special Examination	
(ii) Barium meal, angiogram; IVP, etc.	¢ 500.00 each
(iii) Salpingogram	¢ 250.00

Costs for Surgical Operation

Service	Fee
1. Minor operative procedure as set out in Part A of the Second Schedule:	
Ghanaian	¢ 100.00
Non-Ghanaian	¢ 500.00
2. Minor surgical operation as set out in Part B of the Second Schedule:	
Ghanaian	¢ 500.00
Non-Ghanaian	¢ 1,500.00
3. Major surgical procedure as set out in Part C of the Second Schedule:	
Ghanaian	¢ 1,000.00
Non-Ghanaian	¢ 5,000.00
4. Delivery:	
Regional/District Hospitals	
Ghanaian	¢ 100.00
Non-Ghanaian	¢ 300.00
Polyclinics/Health Centres, Health Posts	
Ghanaian	¢ 50.00
Non-Ghanaian	¢ 200.00

Costs for Dental Surgery

Service	Fee
1. Consultation/Examination	¢ 40.00
Non-Ghanaian	¢ 120.00
2. Operative Procedure:	
(a) Dressing	¢ 100.00
Non-Ghanaian	¢ 300.00
(b) Extraction	¢ 120.00
Non-Ghanaian	¢ 350.00
(c) Filling	¢ 150.00
Non-Ghanaian	¢ 500.00
(d) Root canal Therapy	¢ 200.00
Non-Ghanaian	¢ 600.00
3. Dentures	¢ 200.00
Non-Ghanaian	¢ 600.00 plus
	¢ 20.00 & ¢ 60.00
	for additional
	tooth.
(a) Denture bearing 1-3 teeth	do.
(b) Denture bearing 4-8 teeth	do.
(c) Denture bearing 14 teeth	do.
4. Minor oral surgery, e.g. cyst root	¢ 300.00
Non-Ghanaian	¢ 750.00
5. Major Oral surgery	¢ 400.00
Non-Ghanaian	¢ 850.00
6. Gold Filling special Dental procedure:	
Gold (Cap or Filling)	per cost of material

Number of Medical Doctors in Korle-bu Teaching Hospital

	Consultant	Resident	House physician	Total
Paediatrics	2(8)	4	9	15
Gyn & Obs	11(14)	6	12	29
Medicine	6(12)	4	14	24
Surgery	5(12)	6	14	25
Brain Surg	1(1)	1	1	3
Urology	1(2)	1	1	3
Pediat. Surg	1(1)	1	1	3
Chest Surg	0(1)	0	0	0
ENT	1(2)	1	0	2
Eye	2(4)	2	0	4
Orthapedic Surg	1(3)	1	1	3
Dental Surg	2(3)	2	1	5
Laboratory				
Blood	1(1)	1		2
Chemistry	1(2)	0		1
Pathology	1(4)	4		5
Bacteriology	1(1)	0		1
Virology	1(1)	0		1
Radiology	1(6)	1		2
Polyclinic	0(1)	5		5
Casualty	0(1)	5		5
Blood bank	1(1)	1		2
Health laboratory	1(1)	1		2
Chest Clinics	1(2)	1		2
Total	45(87)	48		147

Constitution of Beds in Komfo Anokye Teaching Hospital

Total	Beds	846 beds
	Medicine	112
	Surgery	248
	Pediatric	129
	Obstetrics & Gynecology	163
	Orthopedics	/
	Otolaryngology	12
	Ophthalmology	9
	Urology	9
	Dermatology	/
	Psychiatry	10
	Tuberculosis	65
	Infant Cots	89
ICU		none
Neonatal	ICU	11
Operation	ICU	6
Delivery	Room	18
Emergency	Centre	48
Dialysis	Centre	none
Patients Data		
No. of patients in 1986	Total	263,009
	Out patients	225,622
	In patients	37,387
	<u>Pediatrics</u>	
	Total	63,694
	Out	56,103
	In	7,591

Number of Personnel in Komfo Anokye Teaching Hospital

1.	No. of Medical Staff Specialized in :	
	Medicine	6
	Surgery	6
	Obstetrics & Gynecology	7
	Pediatrics	4
	Orthopedics	2
	Otolaryngology	2
	Ophthalmology	1
	Urology	1
	Dermatology	—
	Anaesthesiology	3
	Psychiatry	1
	Radiology	1
	Dentistry	2
	Microbiology	2
	Immunology	1
	Pathology	1
2.	No. of Nursing Staff :	
	Nursing officers	79
	Nurse	116
	Assistant Nurse	262
	Midwife	79
	Ward assistants	37
3.	No. of Other Paramedical Staffs :	
	Pharmacist	11
	Nutritionist	1
	Dispensing Technicians	8
	Dispensing Assistants	41
	Laboratory Technologist	1
	Technical Officer	17
	Laboratory Assistant	13
	Physical Therapist	5
	Driver	14
4.	No. of Residents (including intern)	5
5.	No. of Medical Student	110
6.	No. of General Practitioners	48
7.	No. of Others	
	Supply Department	14
	Laundry	50
	Catering Dept	56
	Medical Records	41
8.	No. of Administrative Staffs	45

Items and Number of Tests in the Laboratory of
Komfo Anokye Teaching Hospital(1986)

1. Bacteriology Statistics-1986

ROUTINE EXAMINATIONS:

1. SPUTUM:

Total No. of Specimens	..	..	2092
Positive AFB ' S	..	278	
Nogative AFB ' S	..	1814	

2. VDRL

Total No. of Specimens	..	..	553
Reactive	..	168	
Non Reactive	..	385	

3. EYE SWABS:

Total No. of Specimens	..	..	132
Positive GNID	..	65	
Nogative GNID	..	67	

4. URETHRAL SMEARS:

Total No. of Specimens	..	..	446
Positive GNID	..	243	

5. HIGH VAGINAL SMEAR(6 months)

Total No. of Specimens	..	..	2332
Trichomonas vaginalis	..	141	
Candida	..	361	
Gonorrhoea vaginalis	..	490	
GNID	..	121	

CULTURES:

1. Urino:

Total No. of Specimens	..	..	2067
E. Coli	..	162	
Klebsiella Sp	..	67	
Proteus Sp	..	21	
Pseudomonas	..	23	
S. aureus	..	54	
Coliform Bacilli	..	198	
No. of Sensitivity tests	..	298	

2. Blood:

Total No. of Specimens	..	..	860
Salmonella typhi	..	13	
Salmonella non-typhi	..	12	
S. aureus	..	92	
E. Coli	..	10	
Coliform Bacilli	..	150	
Proteus Sp	..	25	
Strept. faecalis	..	15	

Strept. viridans	..	4
Strept. pneumonia	..	4
Pseudomonas aeruginosa	..	4
Bactoides Sp.	..	5
B. Haemolytic Strept.	..	1
Acinetobactor	..	3
Total No. of Sensitivities	..	338

3. Cerebro Spinal Fluid:

Total No. of Specimens	..	..	754
Strept. pneumoniae	..	68	
Neisseria meningitidis	..	16	
Haemophilus influenzae	..	7	
Coliform Bacilli	..	2	
Sensitivities	..	93	

2. Bacteriology Laboratory Statistics - 1986

CULTURES:

MISCELLANEOUS:

	Wounds Pus	Ear Swabs	Nasal Swabs	Throat Swabe	Body Fluids	Sputum
Total No. of Specimens	452	104	3	42	83	149
Staph. aureus	120	37	2	1	23	11
Pseudomonous aeruginosa	47	32	—	—	4	11
Proteus Sp.	57	14		—	1	—
Klebsiella Sp.	22	4		—	1	44
Coliform Bacill	51	18	1	1	5	4
E. coli	42	7		1	2	5
B. Haemolytic Strept.	11	2		4	—	1
Strept. pneumoniae	—	—		7	2	12
Candida	2	1		3	—	4
Total No. of Isolates	352	101	3	17	38	59

ARCBS:

Total No. of Specimens	..	..	147
E. coli	..	23	
Salmonella typhi	..	4	
Total No. of Sensitivities	..	27	
GRAND TOTAL	..	9,770	

3. Parasitology Statistics—1986

<u>BLOOD FILMS:</u>			
No of Blood samples examined	..	..	661
Plasmodium falciparum		61	
Wuchereria bancrofti	..	1	
Trypanosomess	..	N11	
Leichmania donovani	..	N11	
<u>STOOLS:</u>			
Total No. of Stools examined	..	..	93975
Ascaris lumbricoides ova	..	1392	
Hookworm ova	..	695	
Strongyloides stercolaris larva	..	180	
Giardia lamblia	..	208	
Trichomonas hominis	..	1054	
Entamoeba histolytica	..	43	
Balantidium coli	..	14	
Schistosoma mansoni ova	..	23	
Taenia(solium/saginata)ova	..	27	
Hymenolepis nana	..	22	
Oxyuris vormicularis ova	..	19	
Trichuris trichiure ova	..	67	
White Blood Cells	..	105	
Red Blood Cells	..	103	
Occult Blood Tests		..	39
<u>URINE:</u>			
Total No. of urines examined	..	..	19770
Pus Cells	..	4196	
Red Blood Cells	..	1554	
Schistosoma haematobium ova	..	782	
Albumin	..	3441	
Glycogen	..	110	
Ketone Bodies	..	137	
Epithelial cells	..	2695	
Granular, Cellular and Hyaline Casts	..	471	
Various Crystals	..	720	
Bile Salts	..	97	
Bile Pigments	..	53	
Bilirubin	..	125	
Urobilinogen	..	119	
Trichomonas vaginalis	..	116	
Yeast Cells(Candida)	..	158	
Specific Gravity	..	35	
H. C. G. PREGNOSTELON TESTS	..	..	1365
Positives	..	564	
Nogatives	..	801	
Grand Total			115,810

4. Blood Bank Statistics—1986

Miscellaneous:

A.	Total No. of all Donors	..	..	5179
	Voluntary Donors	..	1723	
	Replacement Donors	..	3456	
	Total No. of Patients Grouped	..	2906	
	Direct and Indirect Coombs	..	20	
	Anitibody Detection Tests	..	..	10
	Total No. of Crossmatching Tests	..	..	5142
B.	<u>Discarded Blood:</u>			
	Expiered, Clotted or Haemolysed	..	100	
	No. of Blood not replaced	..	222	
	Loans to Voluntary Donors	..	31	
			353	
C.	Approx. of Various Blood Groups			
	Groups ' O ' Rh Positive	..	4293 =	59.78%
	Groups ' O ' Rh Negative	..	124 =	1.73%
	Groups ' A ' Rh Positive	..	1275 =	17.75%
	Groups ' A ' Rh Negative	..	9 =	0.12%
	Groups ' B ' Rh Positive	..	1395 =	19.43%
	Groups ' B ' Rh Negative	..	7 =	0.10%
	Groups ' AB ' Rh Positive	..	78 =	1.09%
	Groups ' AB ' Rh Negative	..	0 =	0.00%
				100.00%
	GRAND TOTAL	—		10,331

5. Haematology Laboratory Statistics-1986

A.	Total No. of Samples analysed	..	..	32984
	Haemoglobin Estimation	..	25450	
	Erythrocyte sedimentation Ratio	..	4598	
	P. C. V. (Haematocrit)	..	377	
	Reticulocyte Count	..	1012	
	Sickling Tests Positive	..	2093	
	Sickling Test Negative	..	9751	
	Total White Cell Count	..	13876	
	Differential White Cell Count	..	9064	
	Thrombocytes Count	..	413	
	Bleeding and Clotting Time	..	278	
	Prothrombin Time	..	45	
B.	Haemoglobin Electrophoresis	..	..	3871
	AS	..	3000	
	SC	..	345	
	SS	..	321	
	AA	..	190	
	AC	..	15	
C.	Miscellaneous Analysis	..	..	226
	Foetal haemoglobin	..	54	
	Haemoglobin A ₂	..	11	
	DGPD Assay	..	84	
	Direct Coombs Test	..	77	
	GRAND TOTAL		37081	

6. Biochemistry Laboratory Statistics-1986

Total of Blood Samples analysed	..	..	24180
Blood Sugars	..	12392	
Urine Sugars	..	..	10097
Urine Sugars Positive	..	3073	
Urine Sugars Negative	..	7324	
Urine Sugars Acetone	..	110	
Bilirubin	..	3780	
Urea	..	5480	
Uric Acid	..	652	
Creatinine	..	2246	
Cholesterol	..	810	
Serum Analysed	..	35	
Acid Phosphatase	..	480	
Alkaline Phosphatase	..	740	
Trans - SGOT	..	141	
SGPT	..	141	
Serum Proteins	..	810	
Urine Acetone	..	110	
Electrolytes	..	..	553
Cerebrospinal Fluids(CSF)	..	..	1482

GRAND TOTAL 36,312

7. Histology Division Statistics-1986

Biopsies:

Total No. of Specimens examined 1011

Skin Snips:

Total No. examined 2063

Positive .. 298

Negative .. 1765

GRAND TOTAL 3074

Laboratory Works in Urban Health Centre
Kumasi South Urban Health Centre LAB Statistics—1986

<u>Blood:</u>			
Total No. of Blood Examined	..	..	1132
Haemoglobin	..	761	
Blood Film for malaria	..	35	
Blood Film Negative	..	27	
Blood Film Positive	..	8	
Sickling Cells	..	362	
Sickling Cells Negative	..	213	
Sickling Positive	..	149	
Erythrocyte Sedimentation Rate	..	69	
<u>Stool:</u>			
Total No. of specimens examined	..	..	1394
Ascaris ova	..	740	
Hookworm ova	..	92	
Teania saginata ova	..	21	
Trichuris trichiura ova	..	4	
Oxyuris vermicularis ova	..	5	
Strongyloides larvae	..	19	
Flagellates	..	60	
Entamoeba histolytica	..	8	
Giardia lamblia	..	32	
S. Mansoni ova	..	9	
Hymenolepis nana ova	..	7	
White Blood Cells	..	152	
Red Blood Cells	..	8	
<u>Urines:</u>			
Total No. of urines examined	..	..	1592
Pus Cells	..	192	
Rod Blood Cells	..	271	
Schistosoma haematobium ova	..	198	
Albumin	..	315	
Sugar	..	72	
Epithelial Cells	..	395	
Bile Salt	..	15	
Bile Pigments	..	23	
Crystals	..	41	
Trichomonas Vaginalis	..	42	
<u>Skin Snips:</u>			
Total NO. of specimen examined	..	..	945
Negative	..	729	
Onchocerca volvulus	..	216	
<u>Sputum:</u>			
Total NO. of specimen examined	..	..	7
A. F. B. Present	..	2	
GRNAD TOTAL		5070	

APPENDIX VIII

Laboratory Activities

Kind and Number of Tests Carried Out in
Main Laboratories in 1986

Kinds of test	Institute				
	P H R L	Korle-Bu T. H	Komfo Anokye T. H	Urban centre	Regional* Hospital
MICROBIOLOGY Gram stain	302				
Ziehl-Neelsen st.					
Giemsa stain					
Parasitological		9117			
Blood culture		3040	860		
aerobic					
anaerobic					
Upper respiratory culture	26				
Sputum culture					
aerobic					
anaerobic					
TB					
Urine culture		8840	2067		
aerobic					
anaerobic					
Genital tract culture			2778		271
Gonococcal					
aerobic					
anaerobic					
Skin culture					
fungal					
aerobic					
Eye culture					

* Regional Hospital-Cape coast

Kinds of test	Institute				
	P H R L	Korle-Bu T. H	Komfo Anokye T. H	Urban centre	Regional* Hospital
Gonococcal					
Fungal					
aerobic					
Bar culture					
aerobic					
anerobic					
Wound culture(pus)					
aerobic					
anaerobic					
CSF culture		2249	754		
aerobic		2249			
CO ₂		2249			
cytology					
biochemistry					
TB		Nil			
Stool culture	108	1214			
Salmonella					
Shigella	18				
Cholera vibrio					
Campylobacter					
anaerobic					
BIOCHEMISTRY(Blood)					
Sodium		12, 072	}		
Potassium		12, 072		553	9
Chloride					
Bicarbonate					
Total protein		9, 020	810	187	

* Regional Hospital=Cape Coast

Kinds of test	Institute				
	P H R L	Korle-Bu T. H	Komfo Anokye T. H	Urban centre	Regional* Hospital
Albumin		8,850			
Calcium		840			
Phosphate		840			
Cholesterol		4,800	810		41
Uric acid		3,380	652		
Creatinine		9,600	2,240		
Total Bilirubin		8,684	3,780		183
Direct bilirubin					
Alk. phosphatase		8,500	740		
LHD					
SGOT		} 8,200	282		
SGPT					
PH					
Pco ₂					
Po ₂					
Acid phosphatase		1,422	480		23
Amylase		850			
Creatinine kinase					
Copper					
Copper oxidase					
Glucose		12,372	12,392		988
IgM					
IgG					
IgA					
Lipoproteins					

* Regional Hospital=Cape Coast

Kinds of test	Institute				
	P H R L	Korle-Bu T.H	Komfo Anokye T.H	Urban centre	Regional* Hospital
Magnesium					
Triglyceride					
Urea		12,708	5,480		175
Xylose					
Cholesterol		4,800	810		
BIOCHEMISTRY(CSF)			1,482		13
Protein					
Glucose					
Chloride					
BIOCHEMISTRY(Urine)	472			3,843	6,511
Bence-Jones protein					
Urobilinogen	25				2
Bilirubin	391			47	20
Ketones	441		110		3
Glucose	445		10,394	10	44
Protein	433			210	4
Blood					
Nitrite					
pH					
White/red cells					5,614
HAEEMOTOLOGY(Clinical)					
Hb.	287	63,819	25,850	4,816	10,098
PCV			377		
Total WBC count	203	29,525	13,960	251	4,232
Total RBC count					1
Differential		23,903	9,064		1,189

* Regional Hospital=Cape Coast

Kinds of test	Institute				
	P H R L	Korle-Bu T. H	Komfo Anokye T. H	Urban centre	Regional* Hospital
Platelets count	7	1,571	413		3
MCV					
MCHC					
MCH					
Reticulocytes		82	1,012		
ESR	205	11,143	5,498	15	3,416
Prothrombin time			45		
Fibrinogen					
Ostomic fragility test					
Direct Coomb' s test			77		
Indirect Coomb' s					
G6PD			84		
Clotting time			278		1
HAEMATOLOGY(Blood bank)					
Cross-matching		10,087	5,142		1,820
SEROLOGY					
ASOT(Antistrept.)					
Widal test		2,512			21
Rheumatoid factor	44				
Paul-Bunnell					
VDRL	4,319	420	553		16
TPHA					
Rabies					
Hepatitis A					
Hepatitis B					

* Regional Hospital=Cape Coast

Kinds of test	Institute				
	P H R L	Korle-Bu T. H	Komfo Anokye T. H	Urban centre	Regional* Hospital
Poliovirus					
Herpes viruses					
Influenza viruses					
Measles virus					
Rubella virus					
Pregnant test	1035	109	726		

JICA