DISSERTATION

PREVALENCE OF YAWS IN ASSIN DISTRICT

SUBMITTED TO THE SCHOOL OF PUBLIC HEALTH, LEGON,
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE
AWARD OF THE MPH DEGREE

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Yaw

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LIST OF ABBREVIATIONS

i WHO	World Health Organization
ii UNICEF	United Nations Children Fund
iii EPI	Expanded Programme of Immunization
iv NYCP	National Yaws Control Programme
v MOH	Ministry of Health

CHAPTER 1

1.0 INTRODUCTION

1.1 BACKGROUND

Yaws is a chronic non-venereal infectious disease caused by a spirochete organism Treponema pertenue. It is endemic in the tropics and common in the rural areas among the low socio-economic groups. It affects mainly children aged 15 years and below, who live in poor, overcrowded and insanitary conditions. The infection is transmitted from one person to another by direct skin to skin contact with material from infectious lesions. Lack of soap and water, cloths and footwear and the presence of cuts and abrasions, and possibly flies settling on moist lesions facilitate the spread of the disease. The treponema cannot penetrate intact skin

The disease is characterized by highly contagious primary and secondary lesions and non-contagious tertiary \ late destructive lesions. Within two to eight weeks of infection the lesion known as "mother yaws" or primary yaws appears in the form of a granulamatous ulcer at the point of implantation of the spirochaetal infection on the face or extremities usually the leg. The primary yaws is painless unless it is secondarily infected. There is also an enlargement of regional lymph glands which usually accompanies the appearance of the primary yaws but they usually disappear several weeks later. It proliferates slowly and may form a frambesial (raspberry) lesion or undergo ulceration.

A patchy erythematous rash follows the mother yaws after a variable period of latency and ushers in the secondary yaws, which is the common characteristic form of the disease found

mainly in children below 15 years of age. A typical lesion is a multiple papular and granulamatous eruption that can cover any part of the body. In dryer climate however they may be confined to the moist parts of the body such as the armpits and the nasal cleft.

Periostitis of the long bones (saber shin) and fingers (polydactylitis) and mild constitutional symptoms often accompany the initial lesions. Papillomata and hyperkeratoses on the palms and soles may appear in both early and late stages. These lesions known, as "crab yaws" are very painful and usually disabling. The lesions heal spontaneously, but relapses may occur at other sites during early and late phases.

Destructive lesions of the skin and bone characterize tertiary or late yaws, and they occur in about 10%-20% of untreated patients, usually 5 or more years after infection. Healing is accompanied by extensive scarring and where joints are involved there may be debilitating contractures. Darkfield or direct fluorescent or immunofluorescent antibody test (direct FA) microscopic examination of exudates from primary and secondary lesions confirms diagnosis.

1.2 PUBLIC HEALTH IMPORTANCE OF YAWS

Yaws is a crippling, disfiguring disease, which attacks children and leads to severe disability and loss of work capacity in young adults. This leads to poverty in the rural areas. Before 1950 the global disease burden of yaws was very high. In 1948 it was estimated that about 50 million people worldwide were afflicted with yaws. (WHO, 1998). Worldwide prevalence of yaws was drastically reduced by the mass penicillin treatment campaigns in the 1950s and 1960s. Within 15 years after the launch, the global burden of yaws was reduced to almost zero (WHO, 1998)

This halted transmission of yaws in many countries, and held out the promise of ultimate yaws eradication globally had an intensive surveillance of active infectious cases continued during the final consolidation phase of the campaign. But in most countries, surveillance activities was prematurely delegated to health workers of the static rural health services, who often without adequate training in yaws control, mounted passive surveillance which was ineffective. This left the disease untouched resulting in the re-establishment of endemic foci in a number of countries in the developing countries, particularly in West and Central Africa, and also in South-East Asia (WHO, 1982)

Yaws was also considered as a disease of a low public health importance and therefore resources were diverted from its control program to areas like malaria control and EPI, which have higher morbidity and mortality. Lack of public apathy, lack of education, failure to treat contacts of treated cases and failure to recognize the disease as a result of inexperience on the part of the health worker were also contributing factors to the failure of the control program. Other factors were failure to coordinate yaws control efforts in adjoining countries or areas with the aim of creating yaws-free areas. Finally, the growth and increasing mobility of the populations have place severe limitations on the control methodology successfully employed in the past. (WHO, 1982)

Similarly, before the early fifties yaws was highly prevalent in Ghana. It was an important public health problem and an obstacle to socio-economic development. Secondary and tertiary forms of yaws, especially plantar yaws, posed a serious impediment to farmers and also contributed to the high rate of absenteeism among school children. Efforts to control the disease have not been

very successful. After each successful mass campaign the incidence drops but it is soon followed again by another increase in the incidence. This has made the disease highly endemic in Ghana and making it a source of infection to neighbouring countries.

1.3 HISTORICAL BACKGROUND

Presumably the earliest clinical description of yaws was made by Captain Don Gonzalas Fernandez de Oviedo Valdez in 1510, he wrote "The (American) Indian naturally had the entire or major portion of the skin ulcerated with the skin lifted up in a harden scar. They appear ugly but more commonly are robust with considerable strength until they became shriveled and this wrinkling is disease that is finished when the itching or disease has changed the whole skin of the person. It is confirmed that this disease is contagious, and is taken in many ways such as a healthy person using the clothes of the sick, as in eating and drinking in the company, or using plates and cups which the sick have used for eating and drinking..... The truth is that it is a true plague of this land and as common to the Indians as other disease are common in other people." (Hardy, P. H ,1985)

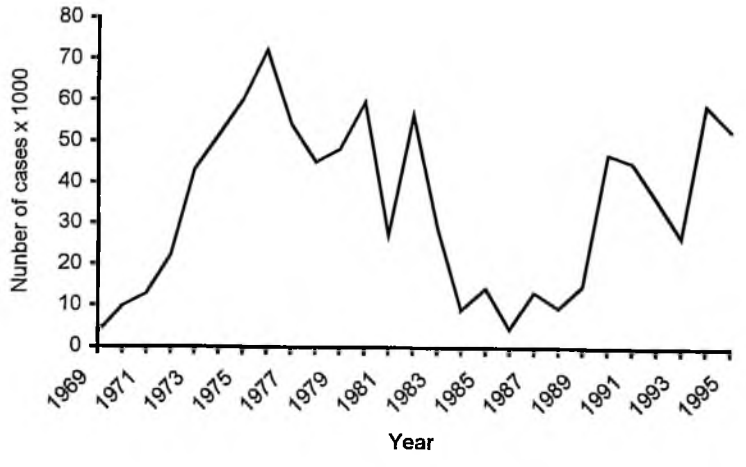
Yaws has been endemic in Ghana for generations. It was among the first diseases for which western treatment was available in the Gold Coast. In the 1920s, *Salvarsan* (potassium iodide) was used to treat yaws. In 1927, the District Medical Officer of Health for Akwapim District treated 7,982 cases of yaws. [Ashley, GA.; 1994]

From 1956 to 1966 a mass yaws campaign was conducted by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) using long acting penicillin (PAM). It was able to reduce the incidence of yaws worldwide. In Ghana, the prevalence of yaws was

as high as 10% -15% before the campaign, but as a result of this vertical campaign it was reduced to less than 0.5%. In a survey conducted immediately after the campaign in 1968 only 6593 cases of infected yaws was detected and treated. [Agadzi, V. K et al, 1983]

Unfortunately, the campaign was prematurely discontinued in the late sixties when it was thought that the disease was controlled. The executing agency, the Medical Field Unit of the Ministry of Health, pursued yaws surveillance actively for 5 years after which it was disbanded and the staff integrated into the general health services. It was thought the general health services could continue to control the disease. However, personnel of the general health services were ill prepared for their new task and the passive surveillance mounted by them was ineffective, this left the disease untouched resulting once again in the increase in the incidence of yaws in Ghana. The number of reported cases of yaws in 1969 and 1976 were 3,343 and 71,763 respectively. Thus, between that period the number of reported cases increased 21 folds. [Graph 1]

Reported Cases of Yaws in Ghana 1969-1996



Graph 1 Source: National Yaws Control Program

Another short-lived campaign that included the combined immunization of yellow fever was mounted in 1979, and once again the incidence dropped. The campaign was however discontinued in less than a year because of financial constraints. From January 1981 to December 1983, another three year campaign was introduced in an attempt to reduce an unusually high prevalence of the disease that had once again reached an estimated 0.5% in some areas of the country. Prevalence was reduced to 0.062% at the end of the campaign in 1983. [National Yaws Control Program, 1998].

4 CURRENT SITUATION

Since the end of the last mass campaign in 1983, reported cases of yaws has increased in most parts of Ghana. At the end of the campaign the prevalence was 62 per 100,000 and in 1995 when 52,387 cases were reported, the prevalence was estimated to be more than 300 per 100,000. (National Yaws Control Program, 1998).

Considering the incomplete and inefficient surveillance system that existed, the number could have been much higher than what was reported. A field survey conducted in 1993 by the National Yaws Control Program found out that only 30 per cent of the cases were being reported (NYCP, 1998). This is suggestive that, clinical cases of yaws that are identified and reported by the health service may reflect the epidemiological situation only to a limited extent. This is so because detection of the cases depends on the accessibility of the primary health care service, the availability of treatment and the intensity of case-finding activities in the community Based on these findings, it was expected that 174,623 cases should have been reported in 1995

instead of the reported 52.387 cases had the surveillance system been efficient. Looking at the trends, it is obvious that yaws, which was once controlled, has once again resurged in most parts of Ghana.

The Assin District Health Management Team has also acknowledged the increase in the reported number of yaws cases all over the district since the early nineties. The number of reported yaws cases in the district from 1994 to 1997 was always higher than the number of reported cases of schistosomiasis and onchocerciasis. [Table 1]

Yaws is prevalent among the under 15 years old. This age group forms the majority of school children and they are the future leaders of the communities. Late yaws, which occurs usually five or more years after infection, can disable and disfigure the victim. The socio-economic base of the community may be destroyed, if it is allowed to develop in that age group, because they form the future working class of the community. This problem needs to be tackled if any headway is to be made in our socio-economic development and any future fight against poverty.

1.5 RATIONALE / JUSTIFICATION

A reliable data on the disease is very essential for planning an effective control program. Unfortunately, no nationwide active surveillance of yaws has been carried out since the end of the World Health Organization assisted yaws campaign in the late sixties. A reliable data of the disease for the entire country is therefore not available (National Yaws Control Program, 1998) Report by the WHO Expert Committee on Treponemal Infection had earlier indicated that lack of interest and lack of data on the extent of the problem and its growth has prevented the implementation of appropriate control measures. (WHO, 1982)

Therefore, in order to plan an effective control program, it is very important to determine the status of the disease in the district. This study was therefore initiated to determine the prevalence of yaws in the district and to study the community's perception of yaws. Results from this study may be very relevant to the District Health Management Team in planning a control program for yaws in the district.

1.6 STUDY OBJECTIVES

1.6.1 MAIN OBJECTIVE

To determine the prevalence of yaws in Assin District

1.6.2 SPECIFIC OBJECTIVES

1. To determine the age and sex distribution of yaws in the communities
2. To determine the frequency of late yaws in the communities.
3. To determine the communities' perception of yaws.
4 To study the completeness of the surveillance system for yaws in the Assin District.

CHAPTER 2

2.0 LITERATURE REVIEW

2.1 Resurgence of yaws globally.

At the International symposium on yaws and other endemic treponematoses held in Washington DC, 16-18 April 1984, it was reported that major endemic foci have appeared in West Africa, Indonesia and the coastal regions of Columbia. Sporadic cases have also re-emerged in remote areas like Surinam, Papua New Guinea, Saudi Arabia, inaccessible pigmies of central Africa and the nomads of Togo. (Burke. J.K et al, 1985). Table 2 shows the number of reported cases of yaws by country and year, between 1971 and 1979.

Fig 2 Reported cases of yaws by country and year,1971-1979

Country	1971	1972	1973	1974	1975	1976	1977	1978	1979
Ghana	12747	22199	43766	51432	59926	71765	53875	44836	47944
Congo	1248	919	1026	1053	981	566	126	277	28
CDI		17376	17098	14176	14887	15506	13018	10671	13200
Togo		4251	3991	2463	2868	4866	5497	4062	2670
Columbia	18	67	73	22	55	131	144	127	64
Brazil	581	1124	73	22	55	131	144	127	64
Indonesia	37644	14599	9113	5237	3506	2781	-	-	-
Sri Lanka	-	-	-	-	-	-	2	-	-
PNG		-	954	504	-	-	930	880	77

PNG-Papua New Guinea

CDI- Cote D'Ivoire

Country reports at the symposium attributed the variation in the prevalence to endemic foci areas, which were inaccessible and were not covered by the mass campaign. This situation is still valid today especially in Ghana where the present health system does not cover most of the rural communities.

2.2 Clinical Changes of yaws

It has been reported that, in areas where yaws has reappeared or in low endemic areas relatively mild forms of early lesions are observed, contrasting with more florid multiple lesions of former years. It is however not known whether or not the devastating late lesions will follow this relatively mild form of early disease if left untreated. (WHO, 1982)

A study of the prevalence of yaws done on Kar Kar Island, Papua New Guinea, also found out that only 55 out of the 986 persons tested serologically showed any clinical evidence of yaws. This led them to question whether yaws was changing clinically, in that people in the endemic areas may develop a resistance to the appearance of clinical lesions. They also raised the question whether, in some population yaws is becoming like syphilis where it passes unnoticed clinically in its early stages. (Garner, M. F. et al, 1972)

This phenomenon of 'attenuated' treponemal infection puts limitation on the use of clinical manifestations in determining the prevalence of yaws in a community. It has also been noted that, with the changing appearance of early yaws infection and the waning familiarity of medical personnel with the disease, a considerable number of clinical cases may not be recognized. (Vorst, F.A., 1974) This will result in a lower prevalence in a study than expected.

In the WHO Technical Report Series 674 it was stated that, only a sero-epidemiological survey of a large population sample would provide the information on endemicity necessary for designing an effective control program.

2.3 Distribution of yaws.

2.3.1 Distribution by place

Reports from the National Yaws Control Program indicated that, yaws predominantly prevalent in the remote rural areas in Ghana is now spreading to periurban fringes of metropolitan areas and other large towns. Yaws cases have been reported in some parts of Accra.

This observation was also reported after the last initial treatment survey in 1983. It was noted that, as in the past yaws, which was particularly prevalent in more remote rural areas of southern Ghana, could now be found in the major urban areas such as Accra and Kumasi. (Agadzi, V.K. et al., 1983). A study done in Jamaica also indicated that, although yaws does not commonly occur in large urban areas or suburban areas in Jamaica at present time it can be imported by the movement of infected patients from other areas, and it may spread if conditions are favorable. (Green, A. 1977). Favorable conditions that facilitate the spread of the disease include overcrowding, unhygienic and moist conditions. This explains the increase incidence of yaws in the raining season. (Burke, J.P et al., 1985)

2.3.2 Age and sex distribution

Yaws is very rare before age of 18 months and the peak of incidence of the onset of the disease is between two and five years. The prevalence of the disease increases with age. (Findley, 1948)

It has also been established that yaws after two years of age occurs more in the male than the female.(Maqvi, 1961). This is linked with the presence of traumata on the skin, which facilitates the point of entry of the organism into the body. Because boys are more active than girls are, they are more susceptible to traumata. Secondly, school-going females are better clothed than their male counterparts and this tends to protect them from trauma. This protective measure tends to reduce the incidence of yaws in girls. (Hill, 1953)

CHAPTER 3

3.0 METHODOLOGY

3.1 Study Design

The study design was cross-sectional descriptive study.

3.2 Study Population

The study population was made up of one hundred ninety-six (196) children under 15 years old randomly selected from 28 communities in the Assin District.

3.3 Sample Size

The sample consisted of children under 15 years old who lived in the selected communities.

The sample size (n) was determined by the formula below:

$N = pq\ (E \setminus 1.96)^2$

where

n - is the minimum sample size required

p - is the maximum expected prevalence rate (%)

$q = 100 - p$

E = is the margin of sampling error tolerated (%)

p = 15%

q = 85 %

E = 5

$n = 15 \times 85 / (5 / 1.96)^2$

= 196 children under 15 years.

This formula was chosen because the study was designed to measure a single variable, thus children under-15 years infected with yaws in the communities

3.4 Sampling Procedure

A two-stage, "28 clusters of 7" sampling technique was used. The first stage of sampling was systematic selection of twenty-eight (28) communities from the 1984-population census register. (The 1984 population census register was projected to 1998.) This was achieved by listing the cumulative population of all the communities on the census register. The sampling interval was determined by dividing the total population (170,206) of the communities by 28. The first community was selected by picking a random number to be equal to the sampling interval of 6079. The next community was identified by adding the sampling interval to the random number and identified by where that number fell on the cumulative population list. This process was repeated to identify the remaining communities. (Table 3).

In the second stage of sampling a house was randomly selected from a previously selected community and from that house seven children were identified and examined for clinical evidence of yaws. The selection of the house was achieved by going to the center of the community and walking to the periphery in a randomly selected direction and the number of houses between the center and the periphery were counted and one was selected by using a random number table. If the required number of cluster of seven children was obtained from that particular house then the next community was visited. But if that number was not obtained then as many consecutive houses as necessary were visited in order to obtain the desired number of seven (7) children per community. This procedure was repeated in all the remaining communities until that a total of 196 children were obtained from all the 28 communities.

3.5 STUDY AREA

Assin District is one of the12 districts in the Central Region of Ghana. It has a surface area of 2375 sq. km. and an annual population growth rate of 3.3% The projected population of the district is 184,838. It is one of the least densely populated in the region.

The district is predominantly rural with 85% of the people living in the rural areas. It has a wet semi-equatorial climate with an average annual rainfall between 125 to 200 cm. Farming is the main occupation of the inhabitants. The main farm produce is cocoa, palm nut, cassava, plantain and citrus. There are few small-scale industrial activities such as mining and sawmills. It is accessible by the main Cape Coast-Kumasi trunk road and by the Accra-Takoradi railways.
The district has 304 schools, one teacher training college and few vocational training institutions. It has a 106-bed hospital at Assin Fosu, the district capital and six health posts

3.6 Variables

The dependant variable was clinical manifestation of yaws. The independent variables were age, sex, place of residence and education. Others are type of treatment received, place of attendance for medical care service and cost of medical service, attitude to personal hygiene, attitude to sanitation and knowledge of causes of yaws.

Susceptibility to the infection of yaws is higher in a particular age group and sex. This is so because attitude to personal hygiene and sanitation and activities that predisposes someone to traumata are important in the transmission and infection of yaws. Medical seeking behaviour of

the people and their general attitude has a lot of influence on any control program. The reason being that the people may not be seeking the appropriate medical care because of either constraints to financial or geographical accessibility to the formal health sector or some other socio-cultural belief. As the result of that they tend to the "quack" doctors or they may be practicing self- medication. These issues need to be addressed if any headway is to be made in yaws control program.

3.7 DATA COLLECTION

3.7.1 Data Collection Techniques.

In each selected community, a house was randomly chosen within which a cluster of seven (7) children under-15 years of age was also randomly selected and screened clinically for Yaws. The screening was based on the external manifestation of Yaws and a checklist was used. (Appendix 1). If the required number of seven children per community was not obtained from the first house then as many consecutive houses as necessary were visited in order to obtain the required number of seven (7) children. This procedure was repeated in each of the selected 28 communities.

In each house a structured questionnaire containing both open and closed questions were administered to the selected person. But since the selected person is a child under 15 years of age, his or her parents answered the questionnaire on his or her behalf. The screening was done by the principal investigator and was assisted two research assistants. The research assistants were disease control officers who have been involved in the Yaws Control Program since the 1970s

3.7.2 Data Collection Tools

1. Screening of household members for Yaws.
2. Administration of questionnaire
3. Review of Yaws records in the District and Subdistrict

3.8 Training of Research Assistants

The training involved the identification of lesions of yaws. Field practice was done at Dosci and Haruna. Some of the lesions seen during the training were mucous patches around the mouth, ecthymatous ulcers of the lower and upper limbs and pustular lesions of the trunk. Hyperkeratoses of the sole were also identified. Some of the difficulties seen were the differential diagnosis with planter warts and other skin sepsis.

3.9 Data quality

The principal investigator checked all the questionnaires to ensure that they were accurate and there were no missing values. They were coded, packaged into well-labeled envelopes and stored.

3.10 Data Processing and Analysis

The analysis of the data was done with Epinfo computer software and by simple tabulation and frequency tables.

3. 11 Ethical Issues

Informed consent was obtained from the chiefs and assemblymen of the communities. Verbal informed consent was obtained from heads of families and also from the people of the house. Confidentiality was ensured by not including names and addresses of the respondents on the questionnaires. Codes were used for both the houses and names.

3.12 Pre-Test

Tools for data collection were pre- tested in Assin Juaso in the Assin Fosu subdistrict.

3.13 Limitation

1 Assin Fosu, the district capital was excluded from the list of selected communities because of its over-representation due to its large population. This therefore introduced a certain degree selection bias

2.The potential of misclassification of yaws is very high when the diagnosis is determined on clinical manifestation only. It is proposed that a sero-pidemiological survey of a large population sample should be designed in future in order to give the true endemicity of yaws in the community.

3 Re-call bias was introduced when some of the parents could not recall some event that occurred more than five years ago

CHAPTER 4

4.0 Results

4.1 Prevalence of yaws

Out of the 196 children under 15 years of age who were examined, 31 (15.8%) had clinical manifestations of yaws. Using the value of 15.8% as the prevalence of yaws among the population, the number of children under 15 years of age in the district infected with yaws was estimated. The population of the children under-15 years of age was estimated to be 44% of the total population.

Population (1998) = 184,838

Population <15 = 184,838 x 44%

= 81,329

Prevalence = 15.8%

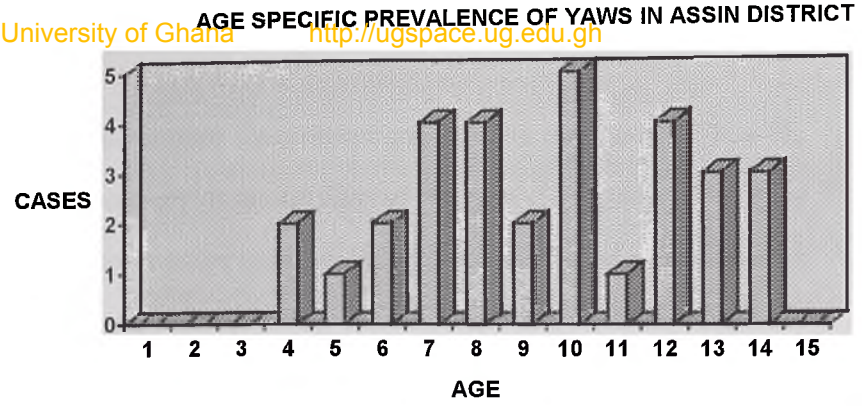
Number infected =81,329 x 15.8%

=12,850 children under 15 years old.

This means that about 12,850 children under 15 years of age are clinically infected with Yaws in the Assin District.

4.2 Age and Sex Distribution of Yaws.

Clinically, Yaws was prevalent in the age group 4-14 years. The peak age at which Yaws was more prevalent was also in the 4-14 age group. [Graph 2]. They form 83.9% of the positive cases No clinical evidence of yaws was seen in the age group 0-3 years.



In the study, 19 (61.3%) of the children with clinical manifestation of yaws were males and 12 (38.7%) were females. Forty-eight (48%) of the positive yaws cases are school children whilst the remaining 52% do not attend school.

4.3 Distribution of Yaws in the communities

The positive cases were prevalent in 15 (53.6%) out of the 28 communities. These fifteen communities are evenly distributed in the whole district. A tendency for familial aggregation of yaws was also observed within individual communities and households (Map)

Prevalence of Active Yaws.

Infectious yaws was found on 27 (87%) of the children and, 4 (12.9%) had hyperkeratoses of the sole. The hyperkeratoses are believed to be of the early stage although it was difficult to differentiate hyperkeratoses of early stage from the late stage.

Twelve (38.7%) had the lesions on the trunk, 11 (35.5%) on the lower limb, 4 (12.9%) on the face and 4 (12.9%) on the upper limbs. Late stage of yaws was not seen among the children.

4.5 Medical Seeking Behaviors

Twenty-five (80.6%) of the positive cases seek medical treatment for the disease. Whilst the remaining 6 (19.4%) did not seek any medical treatment. Thirteen (52%) were given some injections by "quack doctors", who visit the communities very regularly. Some of the injections they could recall were penicillin, procaine penicillin and some other injections they could not name. The number of injections per person ranged from one injection to five injections, which are given at different times. Various sums of money ranging from C1000 cedis to C5000 cedis are charged for the services rendered. In most cases the lesions never heal or they reoccur after healing.

Eight (32%) bought penicillin V tablets from drug peddlers or from the drug store without any prescription. The number of tablets bought ranged from 5 tablets to 20 tablets. No cure was noticed in this category of patients. Only 4 (16%) went to the health center for treatment. Two of them had previously tried penicillin V tablets on a number of occasions without any remission of the lesions. The low rate of people seeking medical help from the general health services also reflected in the answers given when they were asked to name where they prefer to seek treatment. Only 38% preferred seeking treatment at the health centers. 32.6% opted for self- medication. 3.6% said they prefer using bluestone. Those who replied "I don't know" were 23.6%

4.6 Community Perception on Yaws

When they were asked about the causes of yaws, 55.6% said it was contracted through unhygienic practices, such as not bathing regularly. 13.3% said it came from the transformation of old sores. 1.9% claimed it was in the blood and another 1.9% said it came from the stomach. 22.3% however, said they "do not know"

They were also asked to make suggestions on how to improve the health of the people of the community. 61.6% suggested good personal hygiene, such as regular bathing, and improving sanitation. 3.6% said only injections can eradicate the disease.1.8% said only God knows and another 1.8% said only the doctor knows. However, 30.9% said they do not know.

4.7 Yaws Surveillance:

Four of the seven subdistricts have disease control officers who are in charge of the management of the Yaws Control Program in the subdistricts. They also cover the adjacent health centers without scheduled officers.

Clinical registers for yaws were present and records were up to date. There was no standard case definition for yaws. Diagnosis was based on experience. There are no laboratory facilities to confirm diagnosis. The possibility of misdiagnosis is always very high. Records of yaws cases were recorded in the yaws surveillance forms. The forms are submitted to the district office in the first week of very month. There were sometimes delays in the submission of the forms to the district officer from all the subdistricts. Nil returns are submitted although not always. Some of the demographic information such as age and addresses were missing. Treatment protocols were available.

A total of 64 communities reported yaws cases in 1998. These communities are the outreach points the disease control officers visit in the district. The total number of reported yaws cases in 1998 was 644. Thus yaws incidence in the Assin district is 349 per 100,000

CHAPTER 5

5.0 DISCUSSION AND CONCLUSIONS

5.1 Prevalence of Yaws

Before the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) mass penicillin treatment campaign between 1955 and 1965, the prevalence of yaws in Ghana was as high as 10%-15% and it was brought down to less than 0.5% in some parts of the country. In the last mass campaign in 1981 the prevalence was further reduced to 0.062%

The prevalence of yaws in the Assin District from the study is over 15%. This high prevalence rate was the same as it was eighteen years ago in Ghana before the WHO-UNICEF mass campaign. This shows that yaws, which was once recognized as a controlled disease, has once again resurged in the Assin District.

5.2 Age and Sex Distribution of Yaws.

Males are more infected than females. The peak age at which yaws is more prevalent was in the age group 4-14 years. This age group constitutes the greatest potential danger to the community, as true outdoors contact starts at that age. They are mainly responsible for the dissemination of the disease within the village and from one house to another. (Saxena,V.B. and Praasad, B.G., 1964) This means in any control program this age group has to be targeted.

Although, there was a virtual absence of late complication of yaws among the children in the study, the high prevalence of yaws among them place them at risk. This is because it is not known whether or not the devastating late lesions will follow this relatively mild form of early

disease if it is left untreated. However, it has been suggested that where disease is widespread (hyperendemic) it is likely that superinfection in the " sensitized " host may precipitates the late sequelae (Antal, G.M and Causse, 1985).

Because of the above uncertainty, and the district situated in an hyperendemic zone, there is the need for a more aggressive control program in order to prevent the crippling complications of late yaws in the future in these children.

5.3 Education and Yaws

Forty-eight per cent (48%) of the positive yaws cases are school children whilst the remaining 52% do not attend school. Both school going children and non-school going children have almost an equal risk of being infected with yaws.)

Non of these children with the hyperkeratoses of the sole go to school. They explained that due to the painful and disabling character of the lesions they have to drop out of school. Walking was noticed to be very difficult for them. They walk on their toes or on their inner or outer sides of their feet.

Education in the rural areas seems to have very minimal influence on who gets infected with yaws, and also, there appears to be few social-class distinctions among patients with yaws.

5.4 Medical Seeking Behaviors

Reasons given for not seeking medical treatment vary. (1) These include the inability to take early decision to send the sick child to the clinic, (2) waiting for the health authorities to come to the community during their outreach programs. and (3) lack of money

Many parents delay in seeking medical treatment for their children because most of the children with lesions are asymptomatic and do not complain of pains. They may only seek treatment when the children start having pains. This usually happens after the lesions have become secondarily infected with other bacteria.

The activities of quack doctors and the practice of self-medication is wide spread in the rural communities, especially in the remote communities where they occupy and operate fully in the vacuum created by the absence of the general health services. The patients are given the false impression of having been treated after they have been given an injection of suspected quality and dosage and he may therefore not seek appropriate treatment from the general health service. They pay between C1000 to C5000 for the services rendered by the "quack doctors" In some cases, payment for the services rendered are credited and payment effected later. This arrangement seems to be more convenient to the rural community in view of the prevailing high level of poverty. This same amount could also pay for the services rendered at the health centers. But they generally complained of lack of money for transport to the health centers. Others complained that they seek treatment from the quack doctors because they can not afford the high cost of medical care at the health centers.

In order to make yaws treatment readily available to all, the disease control unit should create more outreach points especially in remote communities. Areas that hitherto have been classified as inaccessible have to be included in their outreach program

5.5 Yaws Control Program

No positive case was detected among the above 15 years old. The low prevalence of active infectious yaws among the above 15 years old was also observed in earlier surveys and it was suggested that they may have benefits from partial immunity to yaws resulting from infections acquired during their childhood before the earlier yaws campaigns were conducted.(Agadzi, et al.,1983)

Looking at history of yaws in Ghana it will be right to treat all persons living in the endemic areas as either a latent case, thus sero-postive, or as a contact. This is very important since latent yaws cases and long time close contacts of active yaws cases are the source of infection. If left untreated, they will adversely affect any control program.

For successful control program, the WHO recommendation to treat all people in the endemic communities based on prevalence has to be implemented. The WHO recommends that where the prevalence of clinically active cases is over 10%, total mass treatment is given. Where the prevalence is 5%-10%, patients and their contacts receive full does and juvenile mass treatment is carried out, i.e., all children are given doses according to age. Where the prevalence is under 5%, patients, as well as household and other obvious contacts, should be given the full recommended doses.(selective mass treatment) (WHO,1982)

Since the prevalence of yaws in the Assin District is more than 15% total mass treatment is recommended.

5.6 Health Education

There is generally inadequate knowledge about the disease. Some of the practices and attitude of the people of the community will make implementation of any control program difficult. There is therefore the need to intensify health education on yaws and the practice of good personal and environmental hygiene in the communities should be promoted.

The general improvement of socio-economic conditions in the endemic communities should be given earnest consideration if any headway is to be made in any future yaws eradication program.

5.7 Surveillance of Yaws

There is the need for adequate surveillance of the population on yaws. The method of collection and reporting of cases need to be improved. The recent formation of village disease surveillance volunteers could be integrated into the yaws surveillance unit. These volunteers should report all suspected cases to the sub-district officer who will constitute a team that will treat both the patient and the contacts.

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Abstract

Background : Yaws has been endemic in Ghana for generations and it affects mainly the rural community. Various efforts to control this disease have had mixed successes. After each mass campaign the incidence drops only to increase again after some few years.

Reports from the office of the National Yaws Control Program indicate that the number of reported cases of yaws from the districts is increasing since the last campaign ended in 1983. Unfortunately, no any reliable data on the extent of the disease is available. This has made planning of a control program difficult. This study was undertaken to study the prevalence of the disease in the Assin District, which is situated in one of the endemic regions of Ghana.

The study was limited to 196 children under 15 years of age resident in 28 communities. The prevalence was 15.8%. Before the WHO/UNICEF mass campaign in the 1950s and1960s the prevalence of yaws in Ghana was between 10%-15%. This shows there is a real increase in the prevalence of yaws in the Assin District. As in previous studies in Ghana and elsewhere no late yaws was seen. Efforts should be made to improve the socio- economic life of the people in the rural areas and again surveillance on yaws has to be strengthened if yaws is to be regarded as a disease of low public health importance.

Appendix 1

Checklist for clinical manifestation of yaws:

a. A papilloma on the face or extremities, usually the leg, that has persisted for several weeks or months, and which are painless unless secondarily infected.

b. A frambesial [raspberry] lesion which may or may not have undergone ulceration[ulceropapiloma]

c. Papillomata occurring in successive crops accompanied by periostitis of the long bones [saber shin] and fingers [polydactylitis]

d. Painful papillomata and hyperkeratoses on the palms and toes.

e. Lymphadenopathy

Table 1

Some prevalent communicable diseases (1994-1997) in Assin District

DISEASE	1994	1995	1996	1997
YAWS	2301	1025	643	592
LEPROSY	37	40	50	43
SCHISTOSOMIASIS	531	581	486	32
GUINEA W	154	103	107	12
ONCHOCERCIASIS	1145	645	487	348
AIDS	96	42	91	88

SAMPLING OF THE COMMUNITIES

Number	Community	Projected Population	Cumulative Population	Selected Community
1	Damekyik	333		
2	Akwapimf	49	382	
3	Nyamebe	7	389	
4	Assin Apa	286	675	
5	Kayensere	77	752	
6	Asuboi	50	802	
7	Asratoase	179	981	
8	Paulkrom	12	993	
9	Nsonyam	27	1020	
10	Akumano	149	1069	
11	Amangokr	27	1195	
12	Ayeyaho	40	1235	
13	Betwease	111	1346	
14	Awankwa	33	1379	
15	Kwaku Ap	94	1473	
16	Nnipa Hia	95	1568	
17	Fa Asem	95	1663	
18	Kruwa	1289	2952	
19	Domeabra	15	2967	
20	Kwa Ady	12	2979	
21	Hasowodz	10	2989	
22	Bebianeh	21	3010	
23	Ohia Ma	49	3059	
24	Yerebi Ah	13	3133	
25	Mesere N	12	3145	
26	Ayeiwe	15	3160	
27	Benyadzif	9	3169	
28	Afreadjei	7	3176	
29	Nyame Ye	7	3183	
30	Nyame Be	598	3781	
31	Mianu	49	3830	
32	Kotobabi	320	4150	
33	Duafo	39	4189	
34	Assin Nse	90	4279	
35	Ayiase	564	4843	
36	Ehasowob	7	4850	
37	Ankomakr	25	4875	
38	Kofi Nyak	18	4893	
39	Yeyebiah	31	4924	
40	Nyamebe	37	4961	
41	Dwaben	167	5128	
42	Hagya	33	5161	
43	Beposo	72	5233	
44	Maradan	10	5243	
45	Saman	129	5372	
46	Meniwase	10	5382	
47	Afaw	93	5475	
48	Enyihhha	9	5484	
49	Ebedania	57	5541	
50	Nyamitabi	1	5542	
51	Kyinagya	27	5569	
52	Akrampa	55	5624	
53	Assin Ku	725	6349	
54	Assin Odu	722	7071	6079
55	Kyinaso	828	7899	
56	Domeabra	338	8237	
57	Odanko	9	8246	
58	Nyamebe	15	8261	
59	Boafo Ne	21	8282	
60	Asantekro	27	8309	
61	Jakai	2100	10409	
62	Fante Nya	2205	12614	11928
63	Waonkoe	79	12693	
64	Asuokyiri	109	12802	
65	Aben	349	13151	
66	Kwafini	66	13217	
67	Asuoanim	18	13235	
68	Anafokro	34	13269	
69	Nkran	924	14193	
70	Kyekyewe	742	14935	
71	Wuankosy	115	15050	
72	Nyamebe	7	15057	
73	Abotare	117	15174	
74	Akyasan	76	15250	
75	Papa Kojo	9	15259	
76	Asopeakro	30	15289	
77	Ehanso W	36	15325	
78	Mmofra M	40	15365	
79	Nyamebe	10	15375	
80	Pra Bonno	16	15391	
81	Mibuameh	21	15412	
82	Osamkro	9	15421	
83	Abankrakr	48	15469	
84	Kumangy	9	15478	
85	Obranyiwi	15	15493	
86	Alata	34	15527	
87	Mensaku	10	15537	
88	Yawden	3	15540	
89	Hasowodz	10	15550	
90	Fanyame	16	15566	
91	Mangoase	3	15569	
92	Labadi As	366	15935	
93	Atia Laba	200	16135	
94	Kwadwo A	259	16393	
95	Assin Anyi	121	16514	
96	Assin Okyi	1544	18058	

Number	Community	Projected Population	Cumulative Population	Selected Community
97	Tabiri	721	18779	18237
98	Adzenkyi	51	18830	
99	Kwasiabu	10	18840	
100	Merehwe	16	18856	
101	Faniako T	39	18895	
102	Atia 1	6	18901	
103	Atia 2	7	18908	
104	Dontua Ek	6	18914	
105	Dontua Ek	7	18921	
106	Kwabena	28	18949	
107	Osei Kofi	9	18958	
108	Kwame Br	4	18962	
109	Atobiase	673	19635	
110	Assin Akyi	1836	21471	
111	Kwaku Do	147	21618	
112	Framase	108	21726	
113	Sowodade	40	21766	
114	Nyamebe	142	21908	
115	Benyade	84	21992	
116	Kwame N	10	22002	
117	Kwabena	16	22018	
118	Asuoso At	9	22027	
119	Yaa Amin	4	22031	
120	Onipa Ye	6	22037	
121	Akwai	33	22070	
122	Subinso	1349	23419	
123	Bosomad	1770	25189	24316
124	Gyae Nku	18	25207	
125	Meyewod	24	25231	
126	Nkansa S	13	25244	
127	Nyamebe	12	25256	
128	Asomdwe	4	25260	
129	Obinyim	12	25272	
130	Besedruas	24	25296	
131	Twen Nya	10	25306	
132	Ehia Ma N	10	25316	
133	Tumfokro	993	26309	
134	Abease	368	26677	
135	Ahuma Ku	1	26678	
136	Amoaben	1298	27976	
137	Line-ho	91	28067	
138	Afful	103	28170	
139	Membaso	368	28538	
140	Nyamebe	3	28541	
141	Domeabra	22	28563	
142	Nkateaso	96	28659	
143	Koforidua	306	28965	
144	Dosi	268	29233	
145	Kwasama	7	29240	
146	Gyinabod	261	29501	
147	Edwaaso	75	29576	
148	Nyaminti	48	29624	
149	Mensakro	102	29726	
150	Brisco Ca	129	29855	
151	Kwaomoa	109	29964	
152	Anihanye	79	30043	
153	Obuoso	22	30065	
154	Nyamebe	91	30156	
155	Seidukro	200	30356	
156	Hosowodz	178	30534	30395
157	Nana Bed	57	30591	
158	Nyamebe	21	30612	
159	Kwasi Ofo	78	30690	
160	Antobama	75	30765	
161	Appeahen	39	30804	
162	Menka Hw	118	30922	
163	Krokoso	111	31033	
164	Nyamebe	73	31106	
165	Botwekro	16	31122	
166	Anntesea	19	31141	
167	Ohia Ye Y	10	31151	
168	Tifakrom	27	31178	
169	Homaho	1079	32257	
170	Akoyem	323	32580	
171	Domeabra	776	33356	
172	Yaw Boa	477	33833	
173	Asare	61	33894	
174	Nkranfom	266	34160	
175	Ntiaku	15	34175	
176	Yaw Mens	50	34225	
177	Osamkro	27	34252	
178	Fante 1	184	34436	
179	Huruna	97	34533	
180	Ntiaku 1	48	34581	
181	Apeakrom	90	34671	
182	Kofi Ewusi	46	34717	
183	Ngresi	3181	37898	36474
184	Asamanke	3329	41227	
185	Yerebi Ah	148	41375	
186	Asempaye	48	41423	
187	Fante 1	160	41583	
188	Nkyensed	34	41617	
189	Asaman	129	41746	
190	Homaho J	145	41891	
191	Adom Wo	69	41960	
192	Kwaku Nk	21	41981	

Number	Community	Projected Population	Cumulative Population	Selected Community
194	Antse Am	19	42007	
195	Akweiteyk	16	42023	
196	Broniayebi	4	42027	
197	Nyakomas	7	42034	
198	Mpentima	13	42047	
199	Nyamebe	79	42126	
200	Kofi Maka	10	42136	
201	Krawora	9	42145	
202	Adadente	1029	43174	42553
203	Homaho	619	43793	
204	Teikrom	103	43896	
205	Fete	40	43936	
206	Awudie	15	43951	
207	Kwasinya	90	44041	
208	Otiabakro	43	44084	
209	Kwame A	173	44257	
210	Otami	25	44282	
211	Yaw Donk	36	44318	
212	Ogbodjor	70	44388	
213	Ohiama N	7	44395	
214	Kabule	12	44407	
215	Alfred	18	44425	
216	Tetteh Ab	13	44438	
217	Tetteh Os	16	44454	
218	Alhasan	127	44581	
219	Kofi Ghan	7	44588	
220	Odarley	15	44603	
221	Kwao Asa	16	44619	
222	Tei Yuma	25	44644	
223	Tei Kofi	78	44722	
224	Mr. Dickso	13	44735	
225	Amoatey	49	44784	
226	Oko	16	44800	
227	Opanim A	123	44923	
228	Kwasi Okl	25	44948	
229	Okoso	54	45002	
230	Kofi Donk	15	45017	
231	Manso	2657	47674	
232	Sesekor	484	48158	
233	Kwaku Mir	209	48367	
234	Kwao Asa	16	48383	
235	Bankyiase	495	48878	48632
236	Tanokrom	25	48903	
237	Domeabra	4	48907	
238	Hasowodz	31	48938	
239	Mereyebia	10	48949	
240	Yerebre M	10	48958	
241	Kofi Dowu	45	49003	
242	Kwabena	57	49060	
243	Okubekor	13	49073	
244	Kwese An	42	49115	
245	Assin But	91	49206	
246	Annyibre	3239	52445	
247	Bremawo	29	52474	
248	Senseam	6	52480	
249	Akenkakro	13	52493	
250	Yare Yaya	9	52502	
251	Nyamebe	39	52541	
252	Obrakyere	6	52547	
253	Mmofrafa	22	52569	
254	Adom Firn	15	52584	
255	Pillar 3	37	52621	
256	Dugbatey	4	52625	
257	Assin Kye	453	53078	
258	Nyamebe	42	53120	
259	Yaw Damf	10	53130	
260	Aboa Onyi	10	53140	
261	Kwasi Bad	25	53165	
262	Assin And	2331	55505	54711
263	Anasekro	776	56281	
264	Jenhete	574	56855	
265	Kwame A	24	56879	
266	Kwasi Bou	30	56909	
267	Opanin Ko	25	56934	
268	AntwiKro	52	56986	
269	Kwasi Yeb	9	56995	
270	Kwami Nk	10	57005	
271	Opanin Se	10	57015	
272	Anan	4	57019	
273	Kwadjo A	22	57041	
274	Nana Nkyi	91	57132	
275	Mame Sof	7	57139	
276	Amanyo	15	57154	
277	Mama Nk	10	57164	
278	Mama Nk	6	57170	
279	Ahuntem	19	57189	
280	Kwabena	7	57196	
281	Osofo And	3	57199	
282	Kwame A	28	57227	
283	Kwadjo K	24	57251	
284	Yaw Ampi	18	57269	
285	Kwame A	18	57287	
286	Kwame D	16	57303	
287	Nyamebe	76	57379	

Number	Community	Projected Population	Cumulative Population	Selected Community
288	Yaw Badu	12	57391	
289	Besease	1097	58488	
290	Dadeeso	466	58954	
291	Kojo Ofori	27	58981	
292	Nyamebe	145	59126	
293	Akenkase	224	59350	
294	Nnipa Hia	130	59480	
295	Nkuban	265	59745	
296	Tabil	18	59763	
297	Opanyi Ab	10	59773	
298	Bafikrom	36	59809	
299	Kofi Appia	50	59859	
300	Kwabena	39	59898	
301	Kwansa	81	59979	
302	Akroma	15	59994	
303	Hwewobra	12	60006	
304	Munku	48	60054	
305	Dompim	4464	64518	60790
306	Kwaku Gy	26	67544	66869
307	Alata	70	67614	
308	Dwenaa n	30	67644	
309	Anobikro	36	67680	
310	Nketiakro	16	67696	
311	Kwaku Tu	46	67742	
312	Kofi Boye	18	67760	
313	Panin Me	67	67827	
314	Kwame A	31	67858	
315	Otomfo	30	67888	
316	Yakubu	16	67904	
317	Nyamebe	72	67976	
318	Domeabra	33	68009	
319	Ohioantwi	12	68021	
320	Kwame M	91	68112	
321	Kontompe	19	68131	
322	Adeyepen	19	68150	
323	Obimpe	49	68199	
324	Dwen Wo	18	68217	
325	Srowodof	13	68230	
326	Nnipa Beb	16	68246	
327	Entiyeden	42	68288	
328	Nyame ye	46	68334	
329	Ade Ne W	22	68356	
330	Mante Ma	9	68365	
331	Onikyi	1	68366	
332	Nsoakyi	9	68375	
333	Wadoroho	200	68575	
334	Boafo Ne	6	68581	
335	Quano	30	68611	
336	Nyame Nk	7	68618	
337	Kwadjo D	6	68624	
338	Dwedaam	16	68640	
339	Damanko	9	68649	
340	Woso Bey	751	69400	
341	Ohia Aso	15	69415	
342	Kwadwovi	25	69440	
343	Obimpe	13	69453	
344	Yaw Osei	7	69460	
345	Woarekes	2198	71658	
346	Benyadi	314	71972	
347	Mahame	19	71991	
348	Siaka	30	72021	
349	Yaw Mens	39	72060	
350	Kamu	50	72110	
351	Agyaake	126	72236	
352	Panin Abo	34	72270	
353	Sre Nyam	16	72286	
354	Miawanih	22	72308	
355	Kramofokr	12	72320	
356	Kyewoko	18	72338	
357	Edumaso	9	72347	
358	Ehanso	42	72389	
359	Kwame Nt	21	72410	
360	Kwadjo N	21	72431	
361	Kofi Abam	30	72461	
362	Obra Toto	13	72474	
363	Adiembra	2569	75043	72948
364	Assin Nya	2648	77691	
365	Dwen Nda	10	77701	
366	Obrenu	27	77728	
367	Domeabra	21	77749	
368	Adze Ye	31	77780	
369	Nyirewo	13	77793	
370	Bakodi	10	77803	
371	Awiehia	13	77816	
372	Atwema	22	77838	
373	Kwatagye	21	77859	
374	Barima R	9	77868	
375	Nyetina	87	77955	
376	Kofi Ayiah	34	77989	
377	Nyeteaho	9	77998	
378	Kwadede	31	78029	
379	Egyapapa	13	78042	
380	Nyamebe	33	78075	
381	Akwesi K	9	78084	
382	Manho Nt	7	78091	
383	Domeabra	13	78104	

Number	Community	Projected Population	Cumulative Population	Selected Community
384	Kokadwen	1	78105	
385	Yere be h	19	78124	
386	Kwame A	3	78127	
387	Bob Fori	1	78128	
388	Beyeden	9	78137	
389	Nyamekye	4	78141	
390	Arhin	6	78147	
391	Kafodidi	6	78153	
392	Sunkwa	12	78165	
393	Kwataa	885	79050	79027
394	Mr Mensa	10	79060	
395	Edubiase	1807	80867	
396	Yanny	6	80873	
397	Domenas	1076	81949	
398	Foso Odu	958	82907	
399	Atonsu	746	83653	
400	Admaho	153	83806	
401	Railway	85	83891	
402	Dickson	10	83901	
403	Nyame Na	50	83951	
404	Nyamebe	58	84009	
405	Hyiama K	15	84024	
406	Nenyina A	12	84036	
407	Afranse	12	84048	
408	Asomdwe	18	84066	
409	Kromokro	39	84105	
410	Kodobena	37	84142	
411	Down Bel	46	84188	
412	Woyenaw	21	84209	
413	Yewode	25	84234	
414	Tawiakro	15	84249	
415	Nyame Ati	21	84270	
416	Yeyebiah	9	84279	
417	Ankase	61	84340	
418	Ahogye	46	84386	
419	Kojo Amo	18	84404	
420	Appiahkro	12	84416	
421	Yaw Owu	21	84437	
422	Obrani W	7	84444	
423	Mmofra M	12	84456	
424	Oboho	37	84493	
425	Worekese	2213	86706	85106
426	Kwaemu	13	86719	
427	Kotokum	15	86734	
428	Kwame Y	89	86823	
429	Ohiamank	16	86839	
430	Akon	9	86848	
431	Mantem N	7	86855	
432	Agyafi	12	86867	
433	Dampong	21	86888	
434	Darkokro	10	86898	
435	Nuanua	306	87204	
436	Agrafi	163	87367	
437	Domeabre	30	87397	
438	Nsuogya	31	87428	
439	Tokukrom	57	87485	
440	Gyampo	15	87500	
441	Kwadjo A	45	87545	
442	Asafonae	190	87735	
443	Tutuda	15	87750	
444	Amega	18	87768	
445	Dzigbodi	61	87829	
446	Nyamebe	48	87877	
447	Agyapong	28	87905	
448	Basare	15	87920	
449	Adowu	15	87935	
450	Aveikrom	19	87954	
451	Segbezi	15	87969	
452	Asubong 1	136	88105	
453	Wuduwud	73	88178	
454	Mampong	131	88309	
455	Krobo	82	88391	
456	Osofo Joh	21	88412	
457	Preton	67	88479	
458	Dunkwa A	28	88507	
459	Akwadaa	33	88540	
460	Nkwata	58	88598	
461	Nyame Ye	109	88707	
462	Domeabra	12	88719	
463	Shiaka	81	88800	
464	Dwen Nda	28	88828	
465	Kyenkye	30	88858	
466	Nyame Ye	9	88867	
467	Woye Adz	10	88877	
468	Mempese	25	88902	
469	Bogyawi	19	88921	
470	Nyamebe	94	89015	
471	Aboanidu	4	89019	
472	Modenmo	9	89028	
473	Dunkwa	91	89119	
474	Betenko	172	89291	
475	Mankatakr	417	89708	
476	Railway	153	89861	
477	Ongua	2262	92123	91185
478	Nyamebe	123	92246	
479	Nsaba	117	92363	

Number	Community	Projected Population	Cumulative Population	Selected Community
480	Bene Ben	136	92499	
481	Aboabo C	486	92985	
482	Kaasim	67	93052	
483	Gia Gia	767	93819	
484	Anka	395	94214	
485	Obkofo	27	94241	
486	Akropong	3501	97742	97264
487	Endwa	1420	99162	
488	Obakofo	15	99177	
489	Obakofo	36	99213	
490	Nyatehi	82	99295	
491	Atta	100	99395	
492	Kojo Bani	466	99861	
493	Kobina Ku	100	99961	
494	Antoabasa	894	100855	
495	Asififikuro	241	101096	
496	Obra Ye K	63	101159	
497	Obra Ye K	61	101220	
498	Hasowodz	24	101244	
499	Yeyeyebi	72	101316	
500	Domiabra	39	101355	
501	Bediadua	742	102097	
502	Obosu	135	102232	
503	Assiful	40	102272	
504	Ahyiresu	329	102601	
505	Awaoso	1380	103981	103343
506	Subumkuro	299	104280	
507	Kyeikurom	182	104462	
508	Agave	472	104934	
509	Subreso	324	105258	
510	Antwi Kwasi	284	105542	
511	Asaman	520	106062	
512	Kwofie (Dw	19	106081	
513	Kojo Akofie	9	106090	
514	Yaw Duodu	9	106099	
515	Nkanso	25	106124	
516	Kuminanta	139	106263	
517	Owaaso	111	106374	
518	Domeabra	124	106498	
519	Kojo Worak	33	106531	
520	Dunya	4	106535	
521	Ibrahim Kw	9	106544	
522	teacher Aka	25	106569	
523	Akwanhyia	381	106950	
524	Agormeda	85	107035	
525	Anum	127	107162	
526	Seidukurom	50	107212	
527	Togeborkur	78	107290	
528	Acquah Kro	46	107336	
529	Aamoa Kur	136	107472	
530	Kumadanta	57	107529	
531	Owaaso	170	107699	
532	Prabonso	211	107910	
533	Forson Kur	27	107937	
534	Mankata Ku	48	107985	
535	Aboaboso	291	108276	
536	Agege Kuro	33	108309	
537	Aboabonso	36	108345	
538	Nnyeduam	335	108680	
539	Kassim	556	109699	109422
540	Wawasi	611	110310	
541	Ohene Kwa	61	110371	
542	Sukumanh	10	110381	
543	Anwenso K	76	110450	
544	Anwieso Ya	37	110487	
545	Waw Ohen	19	110506	
546	Nyamebeky	42	110548	
547	Anwienso K	21	110569	
548	Akonfodi	3616	114185	
549	Bereku	5664	119849	115501
550	Anwienso	16	119865	
551	Anwienso	22	119887	
552	Anwienso K	33	119920	
553	Anwienso K	43	119963	
554	Anwienso	19	119982	
555	Ahobrese D	30	120012	
556	Anwiwso N	36	120048	
557	Anwienso K	45	120093	
558	Domeabra	39	120132	
559	Adieso Kwa	46	120178	
560	Senkyiem	1969	122147	121580
561	Kyereboana	1114	122235	
562	Surroundin	88	122235	
563	Panford Kur	209	122444	
564	Assin Swed	202	122646	
565	Kwaku seid	18	122664	
566	Anumkroa	75	122739	
567	Kwakubi Ku	10	122749	
568	Sofedar Kur	10	122759	
569	Buadu Kuro	13	122772	
570	Kwaku Ban	12	122784	
571	Sakyikrom	28	122812	
572	Kwakukrom	19	122831	
573	Bowohomo	12	122843	
574	Domeabra	25	122868	
575	Awienso	1015	123883	

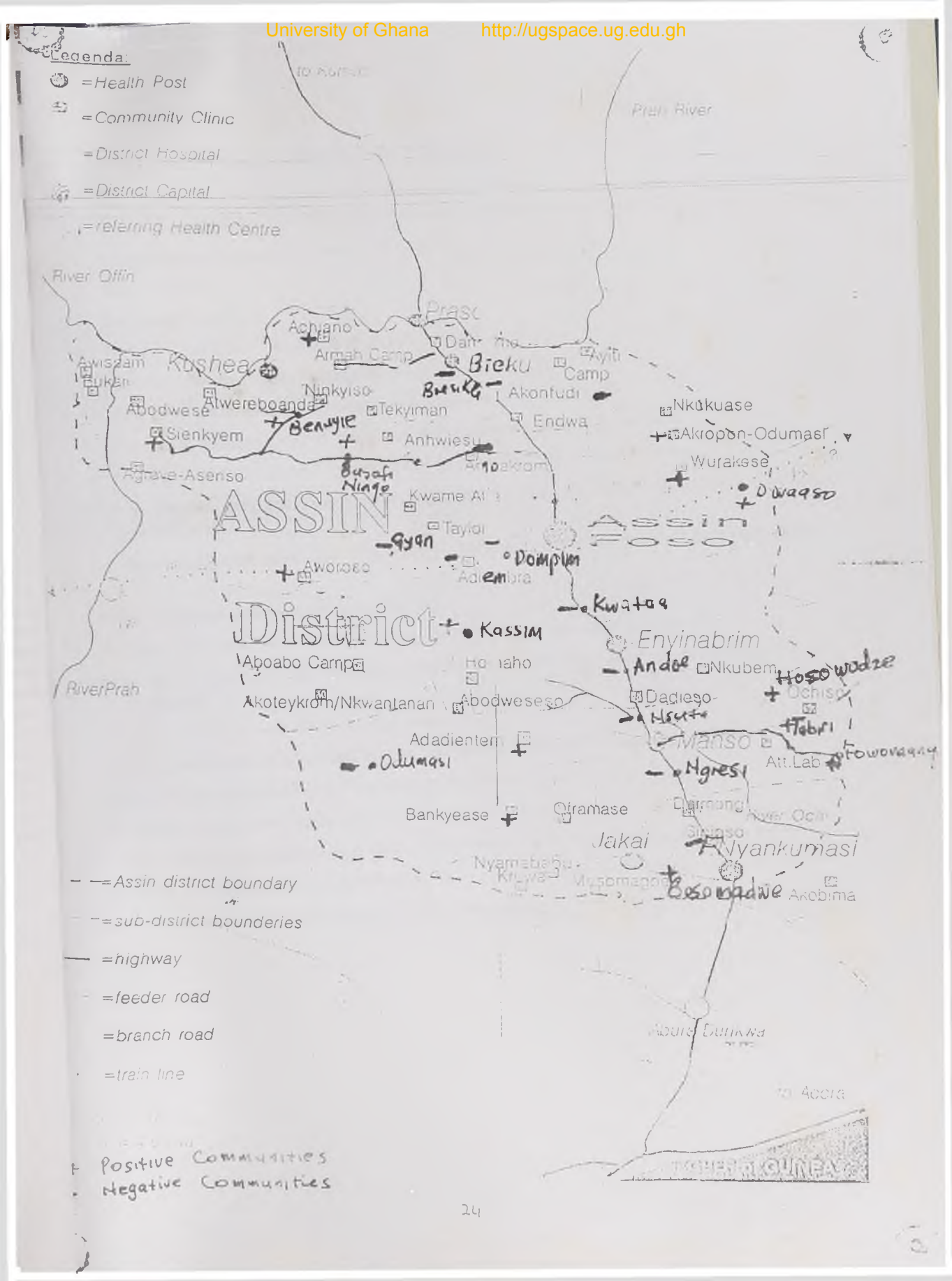
Number	Community	Projected Population	Cumulative Population	Selected Community
576	Awienso Ko	40	123923	
577	Awienso K	103	124026	
578	Awienso K	25	124051	
579	Awienso Bo	13	124064	
580	Ninkyiso	139	124203	
581	Nyame Nna	54	124257	
582	Mpeasem N	70	124327	
583	Awienso K	13	124340	
584	Awienso Ni	33	124373	
585	Koa Nkyi B	60	124433	
586	Kofi Nnyi	67	124500	
587	Kofikrom M	6	124506	
588	Kofikrom O	15	124521	
589	Kofikrom A	31	124552	
590	Kofikrom D	9	124561	
591	Kofikrom Y	9	124570	
592	Kofikrom ga	33	124603	
593	Awienso Ko	4	124607	
594	Awienso Ab	21	124628	
595	Kofi Nkyi C	33	124661	
596	Abotare tett	22	124683	
597	Abotare Kof	10	124694	
598	Bawere Koj	15	124709	
599	Sukumaho	40	124749	
600	Basofi Ning	576	125325	
601	Ahwiansu N	102	125427	
602	Corner Boy	289	125716	
603	Ninkyinso N	576	126292	
604	Basofi Ning	1809	128101	127659
605	Twianka	321	128320	
606	Issifu Atitso	13	128333	
607	Dansame	2407	130740	
608	Asempana	1701	132441	
609	Akua Birag	21	132462	
610	Teacher A	63	132525	
611	Yereye Biah	108	132633	
612	Kwame Bo	27	132660	
613	Kwame Mo	40	132700	
614	Kojo Nyark	60	132760	
615	Nsia Krom	46	132760	
616	Kwame Nto	1	132761	
617	Kwasi Oti	69	132830	
618	Yaa Atsu	9	132839	
619	Kwasi Agyei	6	132845	
620	Kwase Yeb	4	132849	
621	Kofi Boahe	13	132862	
622	Takyikrom	67	132929	
623	Kofi Oboso	70	132999	
624	Kwasi Amo	55	133054	
625	Kwabena A	54	133108	
626	Sowoda De	274	133382	
627	Kwabena A	10	133392	
628	Kojo Esson	13	133405	
629	Nar Kojo	34	133439	
630	Amoakrom	999	134438	133738
631	Aponsie	293	134731	
632	Subenso	197	134924	
633	Sankomans	250	135174	
634	Ekoroso	49	135223	
635	Obuahu	18	135241	
636	Akodaye M	181	135422	
637	Powodee	208	135630	
638	Boniaye Kr	87	135717	
639	37	54	135771	
640	Yaw Kwans	18	135789	
641	Kwaku tent	27	135816	
642	Kwaku Ko	21	135837	
643	Agrave	3	135840	
644	Pebeebi ten	16	135856	
645	Pakampa N	76	135932	
646	Bedaneagy	21	135953	
647	Old Aponse	91	136044	
648	subinso No.	117	136161	
649	Sibinso No	10	136171	
650	Subinso No	66	136237	
651	Bedaneagy	15	136252	
652	Fumso	18	136270	
653	Mbofra Mf	12	136282	
654	Budua	15	136297	
655	Manise Ma	12	136309	
656	Mehu Ntam	15	136324	
657	Nom Nava	85	136409	
658	Nyamebek	30	136439	
659	Simpa Fom	12	136451	
660	Ketukoaa	24	136475	
661	Nyamebeky	22	136497	
662	fa Wani Hw	39	136536	
663	Kwabena K	27	136563	
664	Maame Tse	40	136603	
665	Opanin K	34	136637	
666	Opanin Kw	9	136646	
667	Djato Grush	19	136665	
668	tei Larwe	7	136672	
669	Praso	2944	139616	
670	Fawomany	296	139912	139817
671	Nyamebeky	126	140038	

Number	Community	Projected Population	Cumulative Population	Selected Community
672	Dampon	96	140134	
673	Kushie	2311	142445	
674	Yenney	9	142454	
675	Fante Kojo	10	142464	
676	Yaw Joshu	19	142483	
677	Adam Nana	33	142566	
678	Name ye A	19	142585	
679	Papa Akap	15	142600	
680	Kofi takyi	28	142628	
681	San Wo Ho	13	142641	
682	Papa Abrah	76	142717	
683	Korsikurom	10	142727	
684	Kwashi	21	142748	
685	Nyamebeky	24	142772	
686	Mpraseo	200	142972	
687	Ena Wani	96	143068	
688	Agyaben	12	143080	
689	Kwame Eku	82	143162	
690	Mathias Lav	7	143169	
691	Apraw Agya	46	143215	
692	Kwasi Raph	15	143230	
693	Yaw Kuma	10	143230	
694	Kojo Dugba	72	143302	
695	Kronko	4	143306	
696	Kronko	31	143337	
697	Kwasi Sam	42	143379	
698	Francis Sall	12	143391	
699	Sunkwa	97	143488	
700	Dwaaso Co	1438	144926	145896
701	Worakese	540	145466	
702	Amonkro	399	145865	
703	Adeemra	427	146292	
704	Akoto	69	146361	
705	Mesre Ny	60	146421	
706	Donkor O	60	146481	
707	Asuusu	82	146563	
708	Annum	94	146657	
709	Oguan	52	146709	
710	Kwanya	27	146736	
711	Bonkagyes	22	146758	
712	Nyamebeky	24	146782	
713	Kwanyina	94	146876	
714	Abomenaso	78	146954	
715	Kwasi Adu	357	147311	
716	Dwedaama	91	147402	
717	Branhoso	87	147489	
718	Kwaeem	80	147569	
719	Benyadi	87	147656	
720	Abonhwew	64	147720	
721	Nyamebeky	18	147738	
722	Kwanpii	73	147811	
723	Apiaso	9	147820	
724	Nkwantama	13	147833	
725	Akutuase	12	147845	
726	Alata	13	147858	
727	Asem 'Assa	35	147893	
728	Odumase C	1078	148971	
729	Yaw Asare	30	149001	
730	Nyamebeky	18	149019	
731	Nyamekye	84	149103	
732	Babakrowa	0	150000	
733	Nkukuase	897	150000	
734	New takora	495	150495	
735	Kwasi	359	150854	
736	Bekapa No.	76	150930	
737	Nyankomas	57	150987	
738	Subenso	52	151039	
739	Kodadwen	292	151331	
740	Carpenter	24	151355	
741	Akwasi Bor	75	151430	
742	Otopa	28	151458	
743	Mensa	61	151519	
744	Adama	27	151546	
745	Dwemansa	88	151634	
746	Asare Kwak	39	151673	
747	Bunyanso	78	151751	
748	Akyirem	34	151785	
749	Bre Na Ya	25	151810	
750	Domeabra	40	151810	
751	Paa Pora	78	151888	
752	Benuyie	109	151997	151975
753	Amnkanim	141	152138	
754	Sikakrom	97	152235	
755	Ghana Ca	298	152533	
756	Gold Coas	136	152669	
757	Aworoso	700	153369	
758	Asibrem	274	153643	
759	Kwasi Addi	39	153682	
760	Adompere	45	153727	
761	Gyampom	40	153767	
762	Amatope	78	153845	
763	Kano	111	153956	
764	Bakie	81	154037	
765	Sabina	555	154592	
766	Agrave	209	154801	
767	Ayiteykro	138	154939	

Number	Community	Projected Population	Cumulative Population	Selected Community
768	Atenten	480	155419	
769	Kwasi Botw	3	155422	
770	Yereye Biah	10	155432	
771	Nnnuaso	792	156224	
772	Brofoyedru	1229	157453	
773	Bresiaku	4182	161635	158054
774	Brenan	580	162215	
775	Aframkrom	97	162312	
776	Ohema	7	162319	
777	Oninkyemw	7	162326	
778	Tarta Nkw	155	162481	
779	Yeyebiah	82	162563	
780	Tsitsihwe	21	162584	
781	Yerepemso	15	162599	
782	topre	22	162621	
783	Ampeh Kro	34	162655	
784	Kwasi Donk	25	162680	
785	Kwame Bot	25	162689	
786	Nyaame Ye	9	162689	
787	Wuragya	33	162722	
788	Ntoforo	3	162725	
789	Domeabra	10	162735	
790	Asamama	42	162777	
791	Nyamebeky	1	162778	
792	Afum	10	162788	
793	Ahodwo (A	50	162838	
794	Praho Larte	48	162886	
795	Yaw Buabin	25	162911	
796	Ahodwo	67	162978	
797	Ahurem	73	163051	
798	Domeabra	188	163239	
799	Panyin san	16	163255	
800	Asante Kro	1	163256	
801	Bosompre	6	163262	
802	Ofori Kojokr	9	163271	
803	Adu kwasik	15	163286	
804	Opanyin A	16	163302	
805	Gomoa	12	163314	
806	Adasi	3	163317	
807	Somkurom	16	163333	
808	Akyiano	1314	164647	164133
809	Nichisco	881	165528	
810	Atofroso	178	165706	
811	Aboaboso	272	165978	
812	Armah cam	212	166190	
813	Kwaku way	37	166227	
814	Nichisco (Ni	36	166263	
815	Abasi edwa	43	166306	
816	Abasi terreh	42	166348	
817	Abasi Tei N	45	166393	
818	Kwabena A	164	166557	
819	Obuobi	18	166575	
820	Kwawo Ku	15	166590	
821	Kwame Ad	12	166606	
822	Kwame Baa	9	166615	
823	Quaque	111	166726	
824	Agya Ataa	25	166751	
825	Kwadwo Kr	15	166766	
826	Teye Mens	7	166773	
827	Kafodifi	52	166825	
828	Nyamebeky	15	166840	
829	Abasi	106	166846	
830	Abasi Narh	22	166868	
831	Domeabra	64	166932	
832	Mmofra Mfa	18	166950	
833	Mempa Ase	3	166953	
834	Canaan	37	166990	
835	Nsuta	3226	170216	170212

SELECTED COMMUNITIES

	Community	Projected Population	Cumulative Population	Sampling Interval	Status
54	Assin Odumase	722	7071	6079	Negative
62	Fante Nyakomasi	2205	12614	11928	Negative
97	Tabiri	721	18779	18237	Positive
123	Bosomadwe	1770	25189	24316	Positive
156	Hosowodze	178	30534	30395	Positive
183	Ngresi	3181	37898	36474	Negative
202	Adadentem	1029	43174	42553	Positive
235	Bankyiase	495	48878	48632	Positive
262	Assin Andoe	2331	55505	54711	Negative
305	Dompim	4464	64518	60790	Negative
306	Kwaku Gyan	26	67544	66869	Negative
363	Adiembra	2569	75043	72948	Negative
393	Kwataa	885	79050	79027	Negative
425	Worekese	2213	86706	85106	Positve
477	Ongua	2262	92123	91185	Negative
486	Akropong	3501	97742	97264	Positive
505	Aworoso	1380	103981	103343	Positive
539	Kassim	556	109699	109422	Positive
549	Bereku	5664	119849	115501	Negative
560	Senkyiem	1969	122147	121580	Positive
604	Basofi Ningo	1809	128101	127659	Positive
630	Amoakrom	999	134438	133738	Negative
670	Fawomanye	296	139912	139817	Positve
700	Dwaaso Cocoa Stati	1438	144926	145896	Positve
752	Benuyie	109	151997	151975	Positive
773	Bresiaku	4182	161635	158054	Negative
808	Akyiano	1314	164647	164133	Positve
835	Nsuta	3226	170216	170212	Negative



QUESTIONNAIRE: RESURGENCE OF YAWS

1. Name of community----------
1. ID number----------
2. Sex F/ M
3. Do you go to school Yes/ No
4. If yes a) KG b) Primary c) JSS d) SSS
5. Number of people in the household----------
6. Number of children under 15 years ----------
7. Number of children under 15 years clinically positive (yaws)----------
8. Number of children under 15 years clinically negative (yaws)----------
9. Site of lesions on under 15 years clinically positive (yaws) a) Face b) Upper limb c) Lower limb d) Trunk

12 Stage of lesions a) Infectious yaws b) Hyperkeratoses c) Sole d) Palm e) Late yaws (site)---

13 Have you had treatment for yaws Yes/ No

14 If yes, when were you treated----------

15 If yes, where were you treated- a) health center b) drug store c) self-medication d) traditional

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16 IF yes, what type of treatment did you received? a) injection b) capsules c) herbs

17 Name the injection----------

18 Name the capsules (tablets)----------

19 How did you get infected with yaws----------

20 What do you think about the treatment?----------

21 How do you improve the health of the people----------