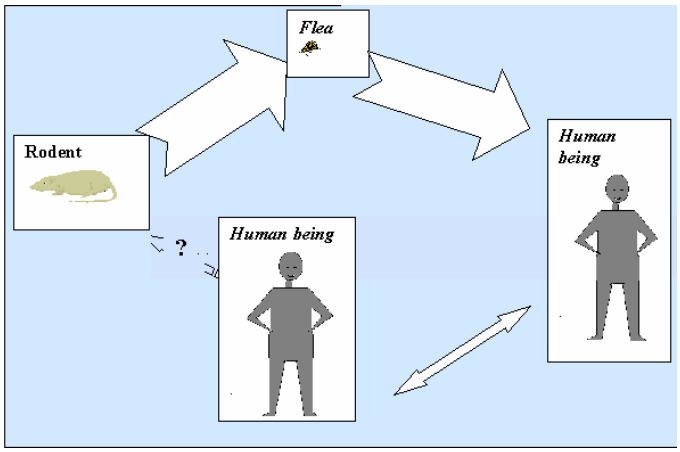
PLAGUE OUTBREAKS

(THO UYOO, ZUKPA)

THE GENDER AND AGE PERSPECTIVE IN OKORO COUNTY, NEBBI DISTRICT, UGANDA

First Edition (January, 2002)



Bringing forward the need for socio-cultural analysis and the use of locally affordable control methods

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PLAGUE

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Key Words
Plague, flea, rat, *Tho uyo*, *Zupka*, behaviour, social, culture, sex, age, Nebbi, Okoro, Uganda

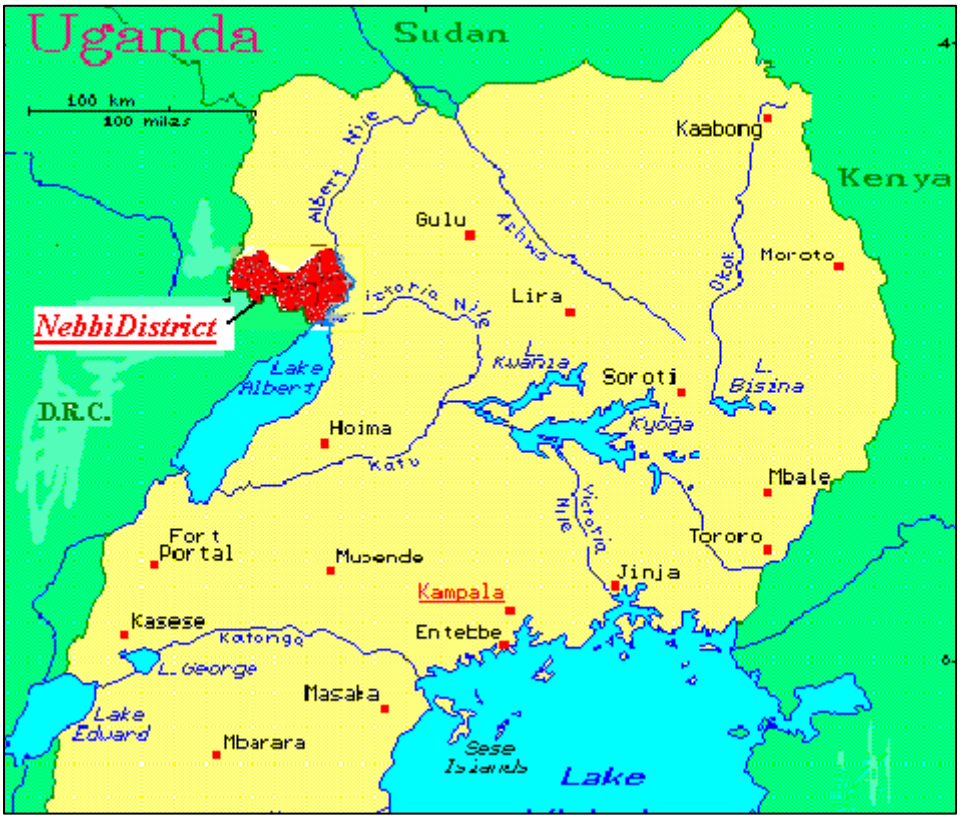
Disclaimer

All the views expressed in this book are that of the author and not of any organisation to which the author belongs nor of Nebbi district Local Government that currently employs him. The illustrations are by the author and all data used are original from primary records, which the author participated in collecting and processing.

DEDICATION

This book is dedicated to my parents, Christine Akumu and Michael Okethweng'u and the late parents of my wife, Serena Nyiwegi and John Ogwetha, all of whom made it possible for my wife and I to live and work among the people of Okoro County for 14 years and have the first hand experience of the annual sufferings these people have had and continue to have from plague. My wife (a nurse) and I have a duty to let the world know.

Figure 1UGANDA SHOWING POSITION OF NEBBI DISTRICT



Preface and Acknowledgement

When I graduated from Makerere University Medical School in June 1983 I honestly did not very much appreciate the pleasure of being a Public Health worker. While working in St. Mary's Hospital Lacor in Gulu with my now departed schoolmate and University classmate, the late Dr. Mathew Lukwiya (RIP), it was clear that we both wanted to be clinical specialists. I had a brief study in Nephrology and haemodialysis and later opened what was most likely the first haemodialysis centre in Uganda at Lacor hospital. I gained a number of other support clinical experiences like upper gastro-intestinal endoscopy etc.

I was always inspired by the commitment of Drs Pietro and Lucille Corti who had left their country, Italy, more than a quarter century before to come to a remote and poor part of Uganda and start Lacor hospital; my wife and I prayed to God to grant us the opportunity to do the same for our Country. A blessing in disguise occurred in 1987 when we had to leave Gulu because of the insurgency in Acholiland. The Bishop of Arua Catholic Diocese (that covered the whole of Northwest Uganda) asked us to start a hospital at Nyapea mission dispensary. We now thank God for having given us the straightforward courage to accept the challenge as an answer to our long time prayer.

Working to build up Nyapea and serve the people of Okoro County has changed our thoughts and lives that will never be the same again. We saw the wealth of satisfaction a health professional derives by serving the community rather than just the individual whom he/she may forget soon. We have pursued community health and enjoy having the clinical care we offer in hospital being simply part of the interaction with the same community we meet out there. In Nyapea we were able to experience what plague is, a disease that many medics only read about briefly in the school and do not think they may have to deal with; and yet it is here with us in Uganda and increasingly again occurring in many countries around the world.

I have realised that literature about plague is greatly lacking and particularly so in Uganda. We are able to tell a lot of first hand stories of our experience. These stories will die with us. Who else has tried to look at the peculiar relationship of plague with sex and age and other socio-cultural factors in the way they occur in Okoro and Nebbi district at large?

As my wife and I left Nyapea hospital at the end of year 2001, we wanted to keep those and other stories alive by beginning to write about them.

In that respect, I want to first of all thank God for having answered our prayer to offer us the opportunity to do what we had admired of the Cortis in Gulu, albeit at a smaller level. I do also thank the Cortis for having been my inspiration.

Down the years I shared a lot with my friend, the late Dr. Mathew Lukwiya. He, his family all became friends not only to my wife and I, but also to all our parents, brothers and sisters. I realised that his vision also changed like mine, from clinical to public health practice. As I sat at my laptop late in the night at the end of my birthday

(December 4th 2000) some strong uneasiness came over me. He had got infected with the Ebola virus some days before while fighting the epidemic in Gulu. On December 5th 2000 morning, I heard he had indeed died of the haemorrhagic fever. In him I lost a personal friend but also a comrade in the struggle to liberate our poor communities from the bondage of infectious diseases that are reminiscent of poverty. Dead he is, but I still greatly thank him for having courageously put his life to save others. May he inspire us that we may also obtain that courage. He continues to inspire me in my struggle against such disease like plague.

Sincere thanks go to Carol and Bob Hunter and Barbara Nelson, all of Washington DC, for having helped to arrange for the publication of this booklet.

I want to thank the people of Nyapea hospital and Okoro County at large for the wonderful time they gave us and for having worked with us to gain all this experience. May they grow stronger and may this booklet open more doors for help to control plague more seriously. I thank the staffs of Nebbi District Health Department who have given me some invaluable views about the plague situation. Notable are the former District Director of Health Services, Dr. Bernard Jawoko Ochora and the District Health Inspector, Mr. Anthony Andrionzi with whom I collaborated during control of each plague epidemic.

Drs. Jimmy Kamugisha (RIP) and Lamunu Margret are thanked for having read through the draft and all the inputs given thereafter. Dr. Kamugisha was Assistant Commissioner in-charge of the Epidemiological Surveillance Department in the Ministry of Health. Dr. Lamunu Margret is an Epidemiologist working in the ESD, Ministry of Health.

I owe a lot of thanks also to Mr. Ogen Asaf Odoi, the National Coordinator for plague control in Uganda and Dr. Imoko of the WHO's TB/Leprosy Control office in Kampala for reading through the scripts and offering very constructive critical opinions.

Not least, I want to thank my wife, Rose Margaret Orach, who is always by me and has always encouraged me to have a written memory of our encounter with plague and other experiences. I thank her for all the proofreading she did.

You will find this document both a technical a report and also something that brings out the personal thoughts that developed in the process of the experience. It particularly tries to bring out the concern about the gender and age factors in the plague disease situation and looks at possible affordable contributions that may be made by the local population in controlling and preventing plague epidemics.

It is hoped that the gender and age perspectives brought out here will stimulate thoughts and action in the minds of various policy makers and leaders; it is also expected to help health workers redirect interventions to target behaviours and circumstances that make plague a greater problem for women and children.

Acronyms

ADDHS …….Assistant District Director of Health Services
AFARD …… Agency for Accelerated Regional Development
CBOs ……Community Based Organizations
DRC ……Democratic Republic of Congo
HMIS …….Health Management Information System
Kg …….Kilogramme
OPD ……Outpatients' Department
NGOs …….Non-governmental Organizations
WHO …….World Health Organization

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1.0 INTRODUCTION

Plague is primarily a disease of wild small rodents and has been forgotten in many parts of the world including parts of Uganda but has in recent years been making a comeback in humans in various countries like Uganda, India, Congo, South Africa and other East African countries. Outbreaks have also been reported in Zimbabwe, Mozambique, Malawi, Namibia and Madagascar. ***(5)***.

The disease has been reported in Eastern Democratic Republic of Congo, formerly Zaire, for the last over 20 years. This area borders Uganda. The earliest records of plague in Uganda date back to the arrival of the pioneer missionaries in 1877 and later by Baker in 1922 ***(5)***. Hopkins (1949) ***(5)*** noted that altitude or something to do with altitude seemed to be the limiting factor in the causation of plague. The critical altitude was in the neighbourhood of 3,500 ft. Hopkins also noted the close correlation of the distribution of plague with annual rainfall. Okoro County is a continuity of the highlands bordering DRC with ethnic, social, cultural and agro-economic similarities. Although metrological records have not been possible to get, Okoro County is perceived to have the highest rainfall in West Nile.

Plague is an acute febrile infectious bacterial disease caused by the bacteria Y*ersinia pestis;* it kills rapidly if untreated. It is essentially a zoonotic disease of wild and domestic animals, mainly rodents that affects humans accidentally. Its main reservoirs are wild mammals and chief vector (in the case of bubonic plague) is the rat flea.

It is caused by infection by the bacillus Yersinia P*estis*. Though there are 11 named species in the genus Yersinia, only 3 are considered important human pathogens: Y. p*estis*, the etiologic agent of plague, and the enteropathogenic strains, Y. p*seudotuberculosis* and Y. e*nterocolitica*. Y. p*seudotuberculosis* is the closest genetic relative to Y. p*estis* (***17***).

The first recorded epidemic of plague is reported to have started in Egypt in the year AD 541 (***18***). It swept across North Africa, Europe and Central Asia with a case mortality rate of 50-60%. This report does not state how long the epidemic lasted. However, the second epidemic of plague is reported to have lasted more than 130 years, having started in 1346 (***18***) "Spreading from village to village by rats and from country to country by ship," it killed 20-30 million people, about a third of the population of Europe (***18***). It was referred to as the "black death or the great pestilence". England and the town of Loughborough experienced a number of outbreaks between 1539 and 1640 (***19***). The world experienced the third plague pandemic that began in China in 1855 and spread to "all inhabited continents" and left 12 million dead in China and India (***18***).

The United States recorded 1700 cases of plague in 50 years up to the year 2000 with type specific mortality of 14% for bubonic plague, 22% for septicaemic and 57% for the pneumonic type (***18***).

Mortality rates for plague cases before the advent of antibiotics is reported to have been as high as 69-80% (***19***).

There have been perennial outbreaks in Okoro County for perhaps close to half a century or even longer.

1.1 Clinical presentations of plague

Accounts of the earliest outbreaks of plague seem to imply that the earliest known clinical form was the bubonic plague (***18, 19***). To date there are basically three known clinical types of plague disease. These are:

- Bubonic plague which presents with enlarged, tender lymph nodes, fever, chills and prostration
- Septicaemic plague presents with fever, chills, prostration, abdominal pain, shock and bleeding into skin and other organs and
- Pneumonic plague, which presents with fever, chills, cough and difficulty breathing; rapid shock and death if not treated early.

All 3 clinical types of plague (bubonic, septicaemic and pneumonic) have been seen during each epidemic here although the predominant type varied from year to year.

The *bubonic* plague has been the most commonly occurring and easiest to recognize. It presents with a bubo or lymph gland swelling. The position of the swollen gland corresponds to the regional site of fleabite. Hence:

- An inguinal or groin swelling, for example, corresponds to a bite in the lower limb.
- Other accompanying features include:
    - Rapidly rising fever, usually around 40^{o} C or over,
    - Headache, and
    - Rapid deterioration of the general condition.

The fever rises very high within a few hours. The lymph gland swelling is typically extraordinarily tender and has a firm base with oedematous overlying skin, making it sometimes look like an orange skin (as seen in cancer of the breast – described in French as *peu d'orange*).

Sometimes it does happen that the infection spreads so fast into the blood even before a lymph gland swelling is recognized. This causes the *septicaemic* type of plague. It typically presents with:

- High fever as for bubonic plague
- Diarrhoea that is usually or typically bloody
- Vomiting (typically with blood vomitus)
- Headache

The third type, *pneumonic* plague may be a consequence of septicaemic spread or a person to person spread through droplets. The patient typically presents with:

- High fever as above

- Cough with bloody sputum
- Difficulty in breathing.
- Clinical and radiological examinations may not give any clear picture of pneumonic changes in the lung.
- Yet there is a very rapid deterioration of the general condition with patients sometimes seen dying in less than 24 or hours from onset of symptoms if not treated early enough.

1.2 Diagnosis

The diagnosis of plague is in 3 phases thus:
Suspected plague – based purely on clinical presentations and epidemiological history e.g. recent exposure to an area known to have plague or known contact with a plague case.
Presumptive diagnosis – based on laboratory staining and demonstration of the bipolar staining of the short rod ("safety pin" appearance). A Wayson stain is very good for this. Presumptive diagnosis may also be made using a combination of clinical presentation and demonstration of antibodies to Y. P*estis*. Fluorescence antibody positivity is seen as bright, intense green staining around the bacterial cell. However demonstration of the antibody alone does not indicate active disease but implies infection with the agent has taken place at a time in the past.

Staining for plague may also be done with Giemsa and Wright and Gram stains. The bacillus may also be seen as a coccobacillus but in both forms and with all stains, the bipolar staining remains characteristic.

Definitive diagnosis – this is the confirmatory test that shows the presence of the infecting agent at the time of the test. It is done in three ways:

- Culture to isolate the infecting organism.
- Direct fluorescent assay for antigens and
- Polymerase Chain Reaction (PCR)

Because plague is "forgotten" by many people around the world, most unsuspecting medical workers are likely to miss it. Due to logistic and communications problems diagnoses of plague in Nebbi district have remained mainly clinical. A high index of suspicion is important if life is to be saved, a view also expressed by the US Working Group on Civilian Biodefense (***18***).

Presumptive diagnoses have been made on a few cases during the epidemics using Wayson stain of lymph node aspirates, sputa, blood smears, and sometimes post mortem aspirations of the lung tissues. These have shown short bacilli with clear bipolar staining seen on microscopy as seen in figure 1.

Figure 2: Bipolar staining of the short rod of Yersinia pestis in a Wayson stain as seen under microscope, also referred to as the safety pin appearance

Because plague kills rapidly and because definitive diagnosis is currently difficult to come by in this environment, confirmation of a few cases has been enough to guide management of the outbreak. Again for similar reasons, a very high index of suspicion must be held and has been held by health workers in this county. In the given scenario here, the author has sometimes recommended that once you suspect it is plague, it is less costly to shoot at it with recommended antibiotics while you prove the case than to do so post-mortem. Where laboratory facilities are available for at least microscopic examination, it is advisable to start antibiotic treatment as soon as relevant specimens have been taken or as they are being taken especially if it is likely that getting the result may take some hours. Especially at the beginning of an outbreak it has been important to get positive results from specimens from at least a few or even one case to confirm the epidemic; this has usually meant taking specimens to Nyapea hospital, several kilometers away.

1.3 Treatment

Cases that report early enough, within the first few hours of symptoms, respond and recover well on treatment with either of tetracycline, chloramphenicol, co-trimoxazol, doxycycline, and, as used here in the early 1990s, to streptomycin[1]. No extraordinary dose is necessary. Tetracycline and chloramphenicol administered in adults at 500 mg every 6 hours for ten days have given good results with patients having clinical recovery within a week of treatment. Parenteral chloramphenicol was used in cases of pneumonic and septicaemic plague. Serial or follow-up lymph node aspiration has not been a routine but when done they have often stained negative for the plague bacillus by the third or fourth day of treatment. Co-trimoxazol has not been very commonly used, although it seems to give similar results in ordinary doses; it has usually been used here for prophylactic treatment of contacts. Various authors have recommended over 3 gm of tetracycline or chloramphenicol. Like the low doses used in Nyapea, the WHO (***15***) recommends a total tetracycline dose of 2g/ day for 10 days in the primary treatment of uncomplicated plague. This is to be given starting with an oral loading dose of 15 mg/Kg (not exceeding I g total) followed by 25-50 mg/kg/day. The WHO also recommends Chloramphenicol as a suitable antibiotic and refers to streptomycine as "the most effective antibiotic against Y. *pestis* and the drug of choice for the treatment of plague, particularly the pneumonic form". This could mean that since streptomycin is now not used in the first line treatment of tuberculosis, could probably be used again for the treatment of plague. The recommended dose for streptomycine is 2g/day for adults and 30 mg/kg/day for children in both cases given in 2 divided 12 hourly doses. The dose recommended by WHO for chloramphenicol is 50 mg/kg/day orally or intravenously for 10 days.

[1] Streptomycine was eventually reserved for treatment of tuberculosis

The same antibiotics (tetracycline, chloramphenicol, or one of the effective sulfonamides) have been also recommended by the WHO (***15***) for prophylaxis if the exposure has occurred in the previous 6 days i.e. still within the incubation period.

Incision and drainage of plague bubos is not recommended. First of all almost invariably the amount of pus, if present, is too small, the rest of the huge mass being mainly inflammatory oedema. Secondly, incision poses the risk of creating septicaemic plague out of a bubonic one. The author witnessed one case of incision and drainage done on a cervical bubo. The patient developed septicaemia and meningitis. Fortunately the patient recovered on treatment with chloramphenicol administered intravenously.

Avoiding incision of bubos also reduces the risk of getting medical personnel infected. For the same reason post mortem invasive examination is to be avoided on suspected plague cases unless microscopic examination of blood slides or needle aspirate from lung or other body tissues have shown no plague bacillus.

Cases of septicaemic shock have been seen in Nyapea hospital and treated with intravenous fluids and hydrocortisone.

It is advisable that once somebody has recently been in Okoro or a place known to have plague and presents with clinical pictures suspicious of the any of the 3 clinical types mentioned above, the faster you treat with recommended antibiotics the better.

Vaccination

Vaccination against plague has not been carried out here first of all because of its non-availability in the country, but also the difficulty of giving it to the general population during epizootics and enzootics and its little use during human plague outbreaks (***15***). Also, the manufacturers of the formaldehyde-killed whole bacilli vaccine are reported to have terminated its production in 1999 because "it demonstrated efficacy in preventing or ameliorating bubonic disease, but it does not prevent or ameliorate the development of primary pneumonic plague."(***18***)

1.4 Control

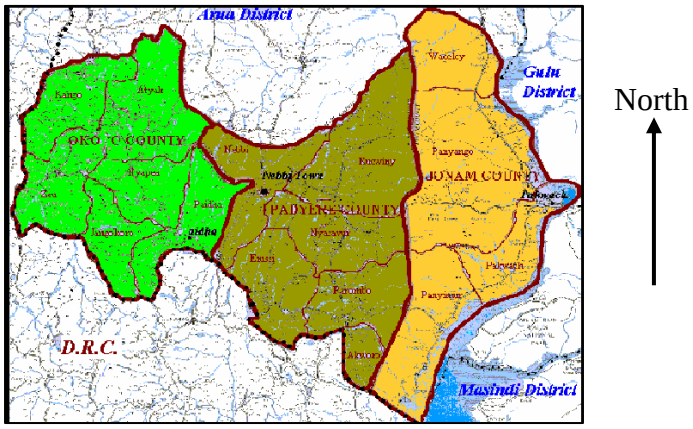
Control measures targeting rodent-flea control and proper treatment of human cases and contacts have been used. Health education on factors that influence or cause the recurrence of plague has repeatedly been carried out. There appears to be no significant, if any, effect of these interventions in reducing the incidence of plague in Okoro County so far. It appears that families in Okoro seem to be equally exposed to these cause-related factors. However, it appears that who is more likely to get the disease depends on social and cultural behaviours related to sex and age.

2.0 BACKGROUND OF NEBBI DISTRICT AND AFFECTED AREAS

2.1 Location

Nebbi district is located in North-western Uganda between 2°30' and 2°45' north of the Equator, and 30°45' and 31°10' east of the Prime Meridian. It is bordered by Arua district to the north, Gulu district to the east, Masindi district to the southeast and the Democratic Republic of Congo to the West and South. It covers a total area of 3,288 sq km (which is 1.2% of national total area) with a perimeter of 353 km (***20***) The district has three Counties, Okoro, Padyere and Jonam, from west eastwards.

Figure 3: Map of Nebbi district showing the Counties of Okoro, Padyere and Jonam from west to east.



2.2 Topography, Geology And Soils

Geological activities produced a conspicuous morphology in the district. Faulting and rifting along the western arm of the East African rift valley zone extends from Panyimur into the Jukia hills. Up arching and tilting affected the Okoro Uplands. As a result, differences in localised diastrophic forces led to a variation in relief with a marked ascend towards the Democratic Republic of Congo. Jonam County has a flat relief, Padyere is a raised plateau interrupted by hills and Okoro is generally a highland (***20***). Metamorphic rocks are widespread and sedimentary rocks predominate most parts of Jonam County along Lake Albert and Albert Nile basin. Granitic intrusion on the other hand is a common feature in Padyere and Okoro counties.

2.3 Climate, Vegetation

Nebbi district exhibits a purely tropical climate due to her location within the eastern - topographical rainfall zone. The dry and sub-humid climate is associated with orographic rainfall, and hail- and thunderstorms. Rainfall is bimodal in nature with peaks in May and October. The first, short and usually unreliable rain falls from late March - May, while the second more reliable rains fall in the July - October period. Dry spells are experienced in June - July and December - early March. Rainfall ranges from 750 – 1000 mm in Jonam County to 2000 mm in Okoro County per annum (***20***). Temperature is generally

warm except in Okoro and parts of Padyere counties. On average temperatures range between 22oC –35oC depending on the location and season. However, temperatures as low as 9^{o}C have been observed in the very early mornings during the rainy and cold seasons in Nyapea[2].

Climate and altitude explain the predominance of savannah vegetation in Nebbi district. The pattern of distribution however varies distinctly with Jonam dominated by thick dotted grassland, Padyere wooded dry and most savannah grassland, and open grassland in Okoro. Increasing population density has impacted on the original vegetation. Wooded areas are being cleared for agriculture to provide construction wood for the (temporary and semi-permanent) dwellings and fuel wood is used by 99 % of the population. High population density also means that every available land may be used for survival activities, in this case agriculture.

2.4 Population

Deriving from population projections from the 1991 census, Okoro has the highest population and population density, followed by Padyere County then Jonam County as shown in table 2. The Male: Female ratio in the 1991 census[3] was 1:1.1 for both the District and Okoro County.

Table 1*: Comparative populations and population density by counties in Nebbi district*

	Population (projection for 2001)	**Land area (Km2)**	**Population density (derived) Pop / Km2**	**Population as % of district pop.**	**County land area as % of district land area**
Nebbi district	447,900	2857.4	156.8	100.0	
Okoro	185,618	708.5	262.0	41.4	24.8
Padyere	163,667	1018.4	160.7	36.5	35.6
Jonam	98,608	909.9	108.4	22.0	31.8

For diseases where population congestion is an important factor this is important, as is the case for Okoro more than the other two counties.

2.4 Okoro County

This is the highest part of the district being continuous with the highlands of the eastern Democratic Republic of Congo. Nyapea hospital is, for example, at about 1,600 meters above sea level.

Okoro is the most agriculturally productive county in the West Nile region.

[2] Personal experience by the Researcher, resident in Nyapea, Okoro county from July1st 1987 to September 2001.
[3] 1991 population and Housing Census, District Summary Series, MoFEP, October 1992.

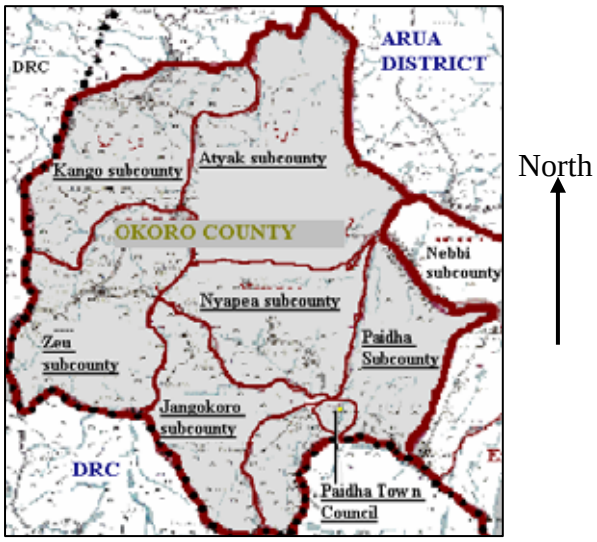
The county has 6 sub-counties and 1 town council, 36 parishes and 579 villages distributed as follows:

:

Table 2: Administrative areas in Okoro county

Level	Paidha T.C	Paidha Sub-county	Nyapea sub-county	Zeu sub-county	Atyak sub-county	Jangokoro sub-county	Kango sub-county	Total
Villages	42	82	72	128	92	75	88	579
Parishes	4	6	4	7	6	3	6	36

Figure 4 Map of Okoro County showing the six sub-counties and Paidha Town Council.



Of the three counties of Nebbi district, it is also the most disadvantaged as shown below:

- It is the most densely populated as shown above.
- Okoro County has 41.4% of the projected population for mid 2001 but it has the highest population to health facility ratio (or lowest facility to population ratio) in the district. It has had the slowest growth rate of health infrastructures in the district.

Table 3*Changes in number of public health facilities and population per facility over a period of $2^1/_2$ years in the 3 counties of Jonam, Padyere and Okoro, Nebbi district.*

County	1999/2000		2000/2001		Nov. 2001	
	No. of facilities	Pop./ facility	No. of facilities	Pop./ facility	No. of facilities	Pop. / facility
Jonam	13	7,358	14	7,044	16	6,674
Padyere	16	9,922	16	10,229	16	10,229
Okoro	15	12,002	15	12,374	15	12,374

- This has stimulated relatively greater growth of private-for-profit facilities in a county that is perceived as having the lowest household income in the district (table 4 below) - though paradoxically it has the most fertile land and the best climate for agriculture. Study (AFARD 2001) ***(9)*** has shown that these for-profit facilities are 39.6% in Okoro County, 35.1% in Padyere and 25.3% in Jonam County while not-for-profit health facilities are fewest in the highest populated county.
- It is also the only county in the district where plague is endemic with annual outbreaks or spikes.

Table 4*Population to facility ratios in the three counties of Nebbi district, mid 2001 projections.*

COUNTY	Population projection for 2001	% of district population	Percent Of for-profit health facilities (154 facilities)	Percent of not-for-profit (government + NGO /PNFP) (46 facilities)[4]	Population per for-profit health facility	Population per Not-for-profit facility (gov't + NGO)
Jonam	98,610	22.0	25.3	32.6	2528	7585
Padyere	163,667	36.5	35.1	34.8	3031	10,229
Okoro	185,610	41.4	39.6	32.6	3043	12,374
Total	447,887	100.0	100.0	100.0	2908	10,179

- Utilisation of the health facilities is lowest in Okoro compared to Jonam and Padyere Counties.

  Data for January – July 2001[5] show that new attendants at health units in Okoro were 18,029 (below 5 years) and 20,071 (above 5 years) totaling 38,100. Re-attendants were a total of 9,519. This means that for the projected mid 2001 population of 185, 618, attendance of health facility for new episodes of diseases was 0.21. If the total of visits including re-attendants is considered, the per capita use of health facilities was 0.26. While the level of health unit utilization is low for the whole of Nebbi district, it is worst in Okoro County despite having the highest population. It is likely that even the total utilization for the whole year may not reach acceptable level. A good level currently set for Uganda is at least 0.5 per capital use of health facility in a year.

[4] Okoro has one hospital, Padyere has 2 bigger hospital and Jonam has 1 HC grade IV (with theatre facility)
[5] Nebbi District Health Department

The comparative utilizations of health facilities in the 3 counties of Nebbi district were as in table 5.

Table 5*: Comparative health facility utilization in the three counties of Nebbi district. January – June 2001*

County	Population projection mid 2001	New OPD Attendants < 5 years	New OPD attendants > 5 years	Total new OPD Attendants	Total OPD re-attendants	Per capita new OPD attendance	Per capita total attendance
Okoro	185,618	18,029	20,071	38,100	9,519	0.21	0.26
Padyere	163,667	18,266	25,849	44,115	13,411	0.27	0.35
Jonam	98,608	13,624	19,068	32,692	10,737	0.33	0.44
Nebbi district	447,900	56,247	74748	130,995	47,240	0.29	0.40

This indicates that use of health facilities in Nebbi district is not only very poor but that it is even worst in Okoro County. This may be due to a number of factors including:

- The poor physical accessibility due to the mountainous terrain of the county.
- Lower formal education and literacy
- Lower personal and household income level despite the agricultural potential
- A long-term effect of culture and tradition; causing a high level of use of herbal medicine and other traditional healings and the belief in witchcraft.
- Greater population to health facility ratio (Table 2 above).
- Quality of health care needs to be studied. If lower, it could be contributing.

NB: Some local analysts have argued that because Okoro County is agriculturally the most productive and has cool and "healthier" weather, these could be contributing to a lower disease burden, hence contributing to a lower utilisation of health facilities than iin the other two districts. A household morbidity and mortality survey has not yet been carried out to confirm or rule out this theory.

- Stimulation or initiation of local initiatives for development has also been lowest in Okoro. A survey by AFARD ***(10)*** has shown that 139 (33.3%) of CBOs and NGOs in Nebbi district are found in Okoro County while 158 (37%) are in Padyere and 120 (28.8)% in Jonam County. It means that despite the higher population, internal dynamics and community organisation for development is poorer than in the rest of the district.[6]
- Nebbi district is 85% occupied by agriculture, 79% of which is only for subsistence. Okoro produces the greatest amount of food in Nebbi district. Other than local consumption, most of the food is sold cheaply on local markets because of poor access to good market, hence no good income to improve on the living standards of the population.
- Besides, it takes long to sell the food. In the meantime, the food is stored in the houses or around the houses, thus attracting rats. Moving around the homes one sees no separate food storage facility, especially in form of granaries.
- Eventually, due to poor access to other better economic activities, all or most of the food is sold, leaving the household very poor and unable to feed itself well.

[6] Compare to the population differences between the counties

- The little money got from cheap sale of food is largely controlled by the man and is spent on school fees, drinking and other expenditures decided on by the man heading the family.
- There is much more practice of traditional medicine and belief in witchcraft than in the other counties.

It is clear that an educated society has greater access to information including health information, a better healthcare-seeking habit, and better health practices. Low literacy rate is known to be associated with high Infant Mortality Rates, high general population mortality, and generally poor health indicators.

Data on county-specific literacy rate was not obtainable in the district at the time of this writing. School enrolment per se is not a good indicator of literacy. However it is hoped that it may help by some proxy to give a an idea to what the level of literacy may be across the district. Primary school enrolment for male and female pupils in year 2000 was as follows:

Table 6*: Primary school enrolment by sex and by county in Nebbi district in 2000*

County	**Primary School Enrolment in Nebbi district, year 2000**[7]			**Male: Female ratio of enrolment**	**School going age (6-13 yrs) population projection for year 2000**[8]			**Total enrolment as % of total school-age population**		
	Males	**Females**	**Total**		Male	Female	Total	Male	Female	Total
Jonam	19,204	16,022	35,226	1.20	10,368	9,981	20,349	185	160	173
Padyere	31,105	23,551	54,656	1.32	17,680	16,886	34,566	176	139	158
Okoro	25,852	19,181	45,033	1.35	21,202	20,524	41,726	123	93.5	108
Nebbi district	76,161	58,754	134,195	1.30	49,250	47,391	96,641	154.6	124.0	139

The enrolment rate (for school-going age-group) appears to be in excess. This false impression is created by the fact that there is age-specific retardation in education with a big majority of those enrolling to primary schools being already beyond the expected age of 6-13 years. The lower figures for Okoro simply mean a worst situation, i.e., other than a big fraction being over 13 years, overall per capita enrolment is much lower than in other counties.

[7] Education Department, Nebbi district.
[8] Planning Unit, Nebbi district, 1997.

3.0 HISTORY OF PLAGUE IN NEBBI DISTRICT

3.1 Distribution and types of cases

For much of the late 20th century, till about 4 years ago when cases started getting reported from Arua district, plague in the West Nile region was only reported from Okoro County; meanwhile, Nebbi district was the only district reporting plague in Uganda. In the last 6 – 8 years the most affected sub-counties of Nebbi district have been Nyapea, Kango, Zeu and to a less extent Jangokoro. Atyak and Paidha sub-counties and Paidha town council have also had cases but a lot fewer and not in 1998 and 2000. The sub-county of Logiri, Vura County in Arua district, which borders Okoro County of Nebbi district, started reporting cases of plague in 1998.

Concluding from oral history or descriptions in the area, what is typically bubonic plague has occurred in Okoro County of Nebbi district for at least over 40 years. As a medical student, this writer first witnessed and participated in the control of one of the outbreaks in the rainy season of July – September 1982 in Jangokoro sub-county in which a number of people died. In that year a few cases were also reported in Nyapea, Paidha sub-counties, all in Okoro County and at Goli in Nebbi sub-county in Padyere County. Neither the health units in the county nor the district health department archives have those past records, probably due to poor record systems at the time. The affected communities and health workers who participated in the control remember the outbreaks. It is recalled by many indigenous people in Paidha sub-county, Paidha Town Council and in Nyapea that at some moment in the 1970s and 1980s the disease was so common in the Oyeyo parish of Nyapea sub-county that it was popularly referred to at that time in those areas as "*Tho Oyeyo*", meaning " Oyeyo disease". The first local name used for the disease and is still popularly known now is "*Zukpa*", a Lendu word for plague. This word became popular because in the old days almost all epidemics used to start among the Lendu tribe in Congo (now the Democratic Republic of Congo). In Nebbi district the disease is now locally and popularly called "*Tho uyoo*". "*Tho*" means death or something that causes death and "*uyoo*" means rat in Alur language; "*Tho uyoo*", therefore means disease or death of rats.

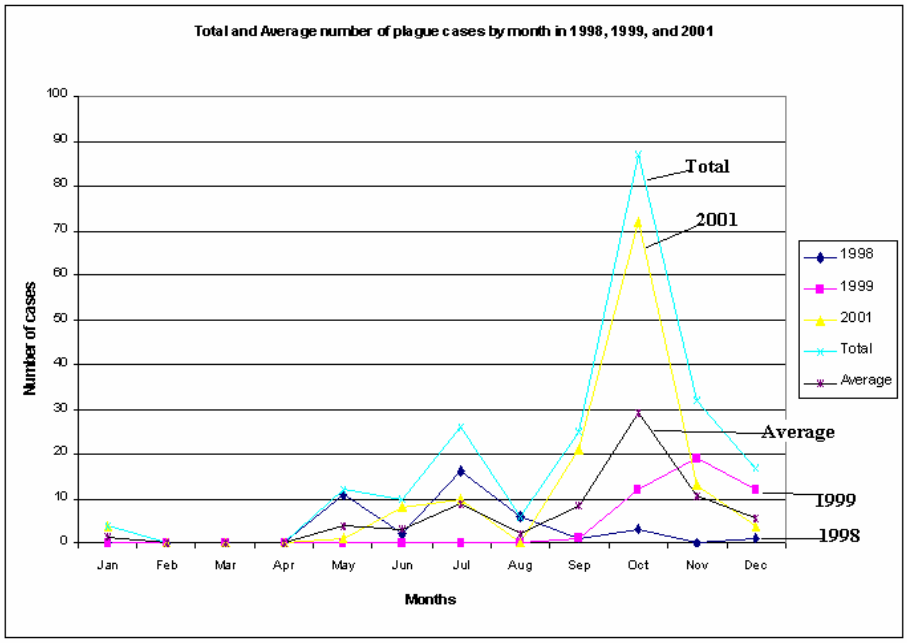
The author has personally managed several annual epidemics of this disease in the county for the last 14 years. The first contact with epidemic of plague was in fact in the rainy season of August 1976 when the writer came head on with and was detained at a road block mounted as quarantine against "*Zukpa*" near the Akara and Otha hills in the then Zaire (now the Democratic Republic of Congo) on his way to Rethi hospital. People who reached that checkpoint from within affected area were to be detained for 7 days in a newly mudded hut to be monitored for features of plague. Epidemics are known to have spread from one side to the other of the Uganda – DRC border.

3.2 The periodicity of plague as seen in the Okoro

Except for the epidemic of the year 2000 which started on the very last day of October and continued to about mid December, apparently all previous epidemics of plague in

Okoro have mostly occurred during the cold rainy season from June to October and faded off toward the end of the year. The first and smaller peak is in July then the second and biggest being in October.

Figure 5: Distribution Of 221 Cases Of Plague Registered In Nebbi District (1998, 2000, And 2001) by Months of occurrence



Plague is almost endemic here. A few cases are usually seen across the year but real outbreaks usually occur during the rainy months of August to November. Official threshold for declaring plague outbreak still remains detection of one case.

The neighbouring Padyere County reported a few cases of plague in the highland sub-counties of Erussi and Nebbi (Jupangira parish) in the past. These areas have been without reports of the disease for at least 4 years now. Other low lying parts of Padyere and the Jonam counties have not reported any cases of plague in the last 14 years of the researcher's experience here and there are no records seen to suggest previous reports except secondary infections in pupils of Nebbi primary school in 1994 that followed one of the pupils having got infected during a visit to Paidha; 6 pupils fell ill and at 2 died.

Apart from primary (usually bubonic) cases, most pneumonic and septicaemic cases have typically followed history of contact with a known or suspected case, having been to a funeral of suspected plague victim, having attended other public gatherings like traditional dances, markets in area of epidemic etc.

Plague epidemics tend to occur in Okoro at the same time as in neighbouring Democratic Republic of Congo. A number of epidemics have started in Congo then spread into Uganda. All parts of Okoro county have at one time or the other been affected by plague epidemics but the most commonly or more seriously affected in recent years have been the sub-counties of Nyapea, Jangokoro, Kango and Zeu.

3.3 Recognition of epidemics by the community

A number of factors have repeatedly affected early reporting of the disease. It is common among Africans including the Alur tribe that when death occurs it "must have a predisposition related to bad omen or witch-craft". This is worse if inexplicable deaths occur one after another within a village or specified area, as is often the case with epidemics like plague. When rats die without being poisoned and are found on the compound or in the house it is frequently considered "dropped" by a wizard or witch. Even when one believes a disease was caused by a germ still some people may ask why the bacteria chose to attack this particular person or family if not disadvantaged by some act of witchcraft applied on the person or family by someone malicious. During the epidemic of 1993 when many people died in Pagei parish, it was thought some of the younger men who were the first to die had failed to pay heavy debts owed to a Muganda[9] business accomplice. The Muganda was thought to have sent "*Kifaro*", an ill-doing spirit "to sweep the village" in reprisal. The suspicion of *Kifaro* is stronger where an epidemic of septicaemic or pneumonic plague strikes for the first time, as was the case in parts of Kango sub-county in 2001. *Kifaro* is thought to "split" the person up, thus causing bleeding.

It is easier to recognise bubonic plague, as it is the commonest form. Occurrence of septicaemic and pneumonic plague often becomes difficult to detect by the community until when some people have died.

Fear gripped people in late 2000 when occurrence of septicaemic and pneumonic plague coincided with the *Ebola* haemorrhagic fever epidemic in Gulu. Among other symptoms, a person suffering from *Ebola* fever also vomits blood, coughs out blood and has bloody diarrhoea. It is indeed very important to quickly confirm that it is plague and not *Ebola* as this part of Uganda borders the Democratic Republic of Congo.

3.5 Number of plague cases in Okoro County (Health sub-district)

Cases reported on the routine Health Management Information System (HMIS) forms to the District health department give figures of over 200 to 600 every year since 1994. There is a lot of over diagnosis as the disease causes panic. The health team from Nyapea hospital and the Environmental health staff has tried to verify cases from the villages. Sometimes this has meant following up cases reported by the health facility staff.

A total of 220 were reported to and followed up by the office of the Assistant District Director of Health Services, ADDHS, for Okoro County in 1998, 2000 and 2001 in collaboration with the District Health Department. Field staff followed up cases reported by health units in the periods stated for verification.

3.6 Distribution of plague by sub-counties

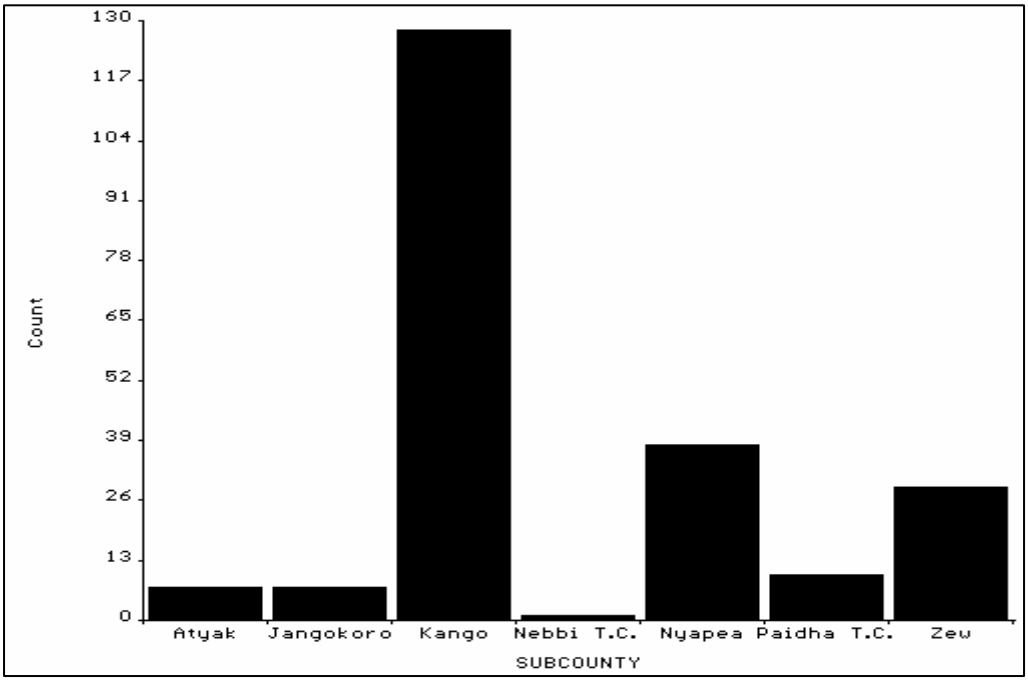
[9] Muganda is the singular form referring to someone from the Baganda tribe in central Uganda

Distribution of these cases were as follows:

Table 7*: Distribution of total plague cases in Nebbi district (mainly Okoro County) by sub-county in 1998, 2000 and 2001.*

Sub-county	Number of cases	Percent
Atyak	7	3.2
Jangokoro	7	3.2
Kango	128	58.2
Nyapea	38	17.3
Paidha T.C.	29	13.2
Zew	10	4.5
Nebbi T. C.	1	0.5
Total	**220**	**100**

Figure 6: Total Plague cases by sub-county for 1998, 2000 and 2001.



In 1998 the majority of cases were from Nyapea sub-county followed by Kango, then Jangokoro, Atyak and finally Zeu in that reducing order as shown in table 2:

In the year 2000 epidemic, Kango sub-county led in number of cases followed by Nyapea, Zeu and finally Atyak and Jangokoro lowest with only one case each.

Table 8*: Distribution of reported and verified cases of plague by sub-county and by year (1998, 1999 and 2001)*

Sub-county	1998		2000		2001		Total	
	Cases	%	Cases	%	Cases	%	Cases	%
Atyak	3	7.1	1	2.3	3	2.6	7	3.2
Jangokoro	6	14.3	1	2.3	0	0	7	3.2
Kango	14	33.3	20	46.5	94	70.7	128	58.2
Nyapea	18	42.9	15	32.6	5	3.8	38	17.3
Zeu	1	2.4	7	16.3	21	15.0	29	13.2
Paidha T. C.	0	0	0	0	10	7.5	10	4.5
Nebbi T.C	0	0	0	0	1	0.8	1	0.5
	42	100	44	100	134	100	220	100

3.7 Clinical types of plague

The clinical types seen were, in general, predominantly bubonic (table 10). However, the more lethal pneumonic and septicaemic types were more common in 1998.

Table 9*: Clinical types of plague seen in Okoro County*

Clinical type	Total	1998	2000	2001
Bubonic	55.9%	21.4%	56.8%	66.9%
Pneumonic	23.2%	57.1%	4.5%	18.0%
Septicaemic	20.9%	21.4%	38.6%	15.0%
Total	100.0%	100.0%	100.0%	100.0%

3.8 Mortality Rate

There was no good record for status of cases in 1998 but records for year 2000 indicate a death rate of 31.8% and for cases in 2001, the death rate was 22.6%. See sex and age related mortality rates in chapter 4.

4.0 FACTORS THAT PREDISPOSE HUMANS TO INFECTION WITH PLAGUE

4.1 The Rodent-Flea-Human connection

Plague is primarily a disease of wild rodents. Humans are primarily infected by accident when they are bitten by infected fleas or by direct contact with infected animals. Secondary plague infections require either contamination with secretions from an infected person e.g. sweat, saliva, vomitus, diarrhoea etc… or by droplets from such body fluids.

When domestic rodents go to the bush and mix with the wild ones, they may get infected through bites by fleas from the wild rodents. Domestic rodents return to houses with infected fleas on them.

Fleas continue to spread the infection among the rodents. In suitable conditions, fleas multiply in the home. Fleas may bite humans. The most important transmitter of plague bacillus to man is the X*enopsylla cheopis* ***(5,6,8)*** flea although X. *brazilliensis* and X. *astia* have also been shown to be efficient vectors. Man may also occasionally be infected by bites from wild rodent fleas e.g. D*iamanus montanus* (observed in Western USA) especially when handling dead animals ***(8)***. Plague cases following contacts with domestic cats have also been reported in the USA (***18***). The following factors cause increase in the fleabite rate or their motility:

- When the rodent host dies and become cold the fleas on it jump in search of new worm bodies and sources of food (blood).
- A rise in temperature, especially sharp one, causes desiccation in the flea ***(8)*** and it tries to suck in blood to contain effect of the heat. and becomes cold.
- Another factor that causes fleas to become wild and bite humans is multiplication of the plague bacilli in the throat, blocking passage of food to the stomach. The flea cannot swallow food. It becomes hungry and bites anything in attempt to feed. In the process it is able to spit out infected saliva into the blood of the victim.

4.2 Poor home and environmental sanitation

Increased contact with fleas or the risk thereof, increases the risk of contracting primary infections from rodents or other animals. Increased population of rats infested with fleas in the house increases flea population. Fleas thrive well in dusty and dark areas. The outbreak of plague in the town of Loughborough in 1631 was reported to have affected only “small tenements in remote places being inhabited by poor people (***19***).” The condition conducive to occurrence of plague in this situation could have been poor sanitation and other behaviours associated with poverty.

Figure 7: Very poor sanitation in and around a house used by a destitute old man.

A house like this one is good habitat for both rodents and fleas. Living in it in a plague endemic area greatly increases the risk of being bitten by fleas that may be infected by plague. This old male destitute lived in this house in a hot climate not conducive for plague. He would have been at a great risk of plague if this were in Okoro County. The compound provides uncontrolled traffic for rodents in and out of the house.

Photo by the author

The larvae of fleas feed on organic debris in the host's nests or domicile ***(8)***; this in many species is supplemented by partially digested blood from the alimentary canal of the adult flea ***(8)***. A number of temporary houses in Okoro are smeared with cow dung. This is organic matter that flea larvae can feed on[10] as it becomes dusty as humans move over it in the house. Because feeding on infected rats infects fleas, anything that attracts flea-infested rats into the house helps to increase the population of infected fleas. Rats are commonly attracted into the house by food. Having food stored in the house attracts rats, which may be infested with fleas that may be infected with the plague bacilli. Rats may also be more where food is cooked. In a study of environmental factors contributing to causation of plague epidemics in Okoro in 1994, Ogwal ***(3)*** reported that 88.6% of case households and 78.9% of controls stored food in the sleeping houses. 97.7% of cases and 98.3% of controls had temporary houses built of mud and wattle with easy traffic of rodents. Yet again 9.1% and 9.7% respectively stored food in both the sleeping house and granary. So, these factors of home / environmental sanitation applied about equally to both study groups, hence no statistical correlation was observed between these factors and the occurrence or no occurrence of the disease in Okoro.

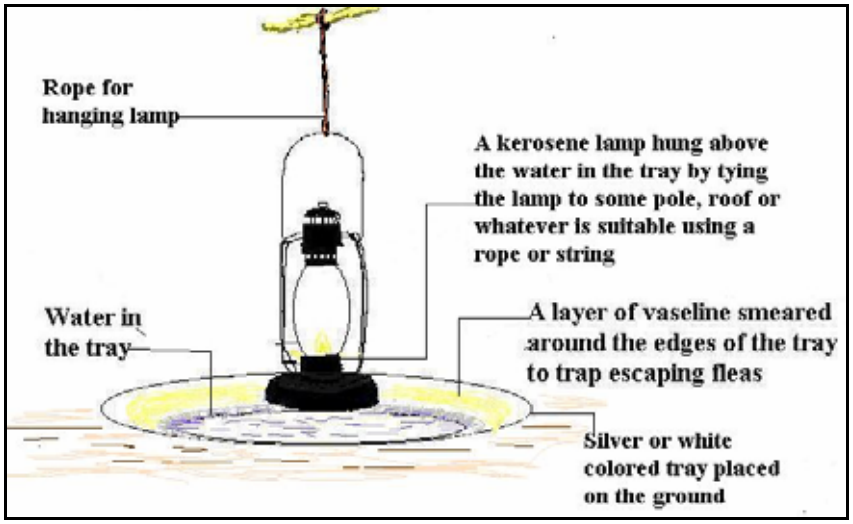
Fleas are attracted by the warmth of the body of the host, which they reach by crawling or jumping. Fleas may jump up to several inches above the ground. Archie Hunter ***(7)*** described fleas as "Champion high-jumpers of the insect world". Jumping heights of 6 inches and lengths of one foot have been reported ***(8)*** while mention of jumps up to 1 foot high and about 3 feet in length by some flea species has been made[11]. The important thing to note is that they seem to jump significantly high in search of hosts. Sleeping high above the ground in a flea-infested house may, therefore, reduce the risk of fleabites while sleeping on a mat / mattress placed on the floor could increase the risk. The longer one is exposed to infected fleas, for example in an infested house, the greater the infection risk.

[10] Prof. Kilonzo; personal communication at the first national conference on plague, Jinja - Uganda 1995.
[11] Ogen Asaf Odoi – Ecologist, Uganda Virus Research Institute and National Coordinator for Plague Surveillance (Personal communication).

4.3 Climate

Fleas, including plague infected ones, multiply more or live longer during cold seasons thus increasing the risk of transferring infection. In fact, fleas kept at temperatures below 23^{o} C will live as long as six months or more ***(8)***, although plague infection tends to shorten their lives. But even infected *X. cheopis* have been shown to survive well over a month when kept below 15^{o}C ***(8)***. This author has observed temperatures of even 9^{o}C in very early hours of the morning or late hours of the night in the rainy cold seasons in Okoro, especially Nyapea sub-county. Most of the plague epidemics here have been observed during the rainy cold seasons. During rainy cold seasons the houses, especially the floors are very cold and many family members make some fire to worm the house. People who sleep on the floor, those who do not have adequate cover against cold would feel the cold more and sleep near fire. Considering the attraction of fleas by the warmth of the body by the hosts, it may be possible that those sleeping near fire are warmer and attract fleas more easily. Professor Kilonzo of Sokoine University of Agriculture and Technology has designed a system of trapping fleas in houses for the purpose of flea indexing[12]**.** The technique involves the use of a lamp placed in a tray partially filled with water. The light and warmth from the lamp attract fleas.

Figure 8: The Kilonzo technique of trapping fleas



A number of these flea traps are placed in a corresponding number of houses in a village and may be replicated in other villages. The exercise in a given village is carried for 3 consecutive nights. The total flea index is got from the total number of fleas trapped over the 3 nights divided by the total number of traps used in the period. A total flea index of 1.5 is critical and needs urgent action to prevent epizootic and epidemic. Usually flea typing is done from the total trapped. Specie –specific indexing is then calculated. Since X. *cheopis* is the best in transmitting plague its index of only 0.5 is critical.

[12] This technique was presented to the first national conference on plague in Jiinja, Uganda, by Prof. Kilonzo, in 1995 and later taught to Environmental Health staff in Okoro County in 1997 by the National Coordinator for plague control at Nyapea hospital.

Other factors seem to cause attraction of the flea to the female. But from the mechanism of action of the "Kilonzo flea trap" described above this author feels there may be a possibility of additional attraction by light and warmth from fire made in the house. It would be interesting to find out the frequency of use of fire in the house in cold seasons, and the links between sleeping near the fire and occurrence of plague and its sex and age distribution.[13]

4.4 Culture

In Okoro dead bodies of all females are taken and buried by the paternal relatives. Transfers of such bodies increase the risk of contamination with body fluids. To reduce the risk of secondary infection a body of a plague victim must be buried quickly with least contact with the living. The Alur are very sentimental and generally embrace the dead body of their dead loved one. Big crowds gather for the burials and funerals.

To sight an example, in 1993 a woman who died of plague in Apiku village, Pagei Parish, Zeu sub-county had her body collected and buried by her relatives in Atyak sub-county. Subsequently 4 other immediate relatives got infected and died.

4.5 Other risky Social habits

It has for long been the Alur tradition that once a person died, elders gathered and slept at the home of the burial for 3 days in the case of a male and 4 days in the case of a female dead one. On the 3rd or 4th day, as the case may be a mini funeral right is organized during which the grave is smeared with black soil. Then a big funeral that attracts very many people waits for the time the family has enough resources, usually after harvests at the end of the year or beginning of the following year. Any of these gatherings increases the risk of many more people either getting bitten by fleas or having secondary infections.

In 1995, I went to Agiermach mission health center for a clinical out-reach. I found two patients had been admitted with bubonic plague and one had died that day. The health center was in Kango sub-county but the cases had come from one family in neighbouring Atyak sub-county. The following afternoon, the together with other staffs from Nyapea hospital I visited the home of the deceased and found many people gathered to pay respect to the dead one – who had already been buried anyway. We, among other things advised that the people needed to take prophylactic treatment and stop gathering in the home to avoid more people getting infected. We highlighted the unsanitary situation in the home that most likely was the cause of increased flea and rodent population and plague and the need and ways of working for rodent-flea control. The crowd was clearly annoyed by my remarks and indicated that I had shown no respect for the culture of paying respect for the dead for the 3 or 4 days despite the fact that I was from the same ethnic background. I was also considered to have implicitly insulted the people as being dirty in their homes. The anger of the crowd forced me to drive in reverse at high speed

[13] Common knowledge here is that it is mainly the women and children who sleep on the floor or near fire.

along a narrow tortuous path heavily lined by tall maize (cone) plants. Three days later the people from that village sent a message calling me back to help them because two more people had indeed got the infection and died. They now heeded to the advice to clean and smear the houses, clear the compounds and insecticide spraying of houses by the Health Assistant.

Yet another hard way to learn! Unfortunately the same such communities carry the attitude forward year after year. - *(*Story by the author*)*

Similar secondary infections may occur during other gatherings including the *Agwara, Adungu, Ndara* and other traditional dances.

5.0 SEX AND AGE GROUP RELATIONSHIP TO PLAGUE IN OKORO

The author's personal 14 years of experience in managing plague in Okoro suggest a lot of correlation of plague causation with environmental factors, sex and age in the area. The year1993 had one of the biggest epidemics of plague in Okoro during which 643 cases and a mortality of 8.1% were reported ***(1).*** Reviewing cases admitted to Nyapea hospital from the 1993 epidemic, this investigator ***(2)*** noted that the cases ratio of male: female was 1:1.2. Also, 50.8% of cases were 20 years of age or less.

Of the total 219 cases that Okoro Health Sub-district managed to verify with the help of Nyapea hospital in the years or period reported here and whose sexes were recorded:

- 59.8% were female
- 40.2% were males

Although the Nyapea hospital review of the year1993 cases showed a male: female ratio of only 1:1.2, while the total recorded for the three years above together gives a male: female ratio of 1:1.5, females have clearly been the majority of cases in the individual epidemics of 1998, 2000 and 2001.

In the 1998 epidemic in which 42 cases of plague were reported in Okoro and verified by Nyapea hospital, 76.2% were female while in the 2000 epidemic 67.4% were female. In 2001 females were 53% of reported cases.

5.2 Age-group distribution of cases

The age group distribution shows that cases of plague in Okoro county have generally been very young with almost half the total number being below age of 20 as shown by table 10 (only cases where age was obtainable).

Table 10*: Age groups of verified plague cases in Okoro in 1998, 2000 and 2001.*

Age group	Number of cases	Percent
0-19	127	57.7
20-39	68	30.9
40-59	16	7.3
60-79	7	3.2
Not recorded	2	20.9
Total	**220**	**100.0**

5.3 Relationship between age and sex in plague case distribution

In the Okoro epidemics, it appears that while most cases were generally young, male cases are even younger. This suggests that the older males are probably less exposed to the factors that predispose females in general and the young males to getting plague. Although this difference may be explained by the simple demographic pattern of being fewer older people in the district, the 1991 census did suggest that the pyramid for males

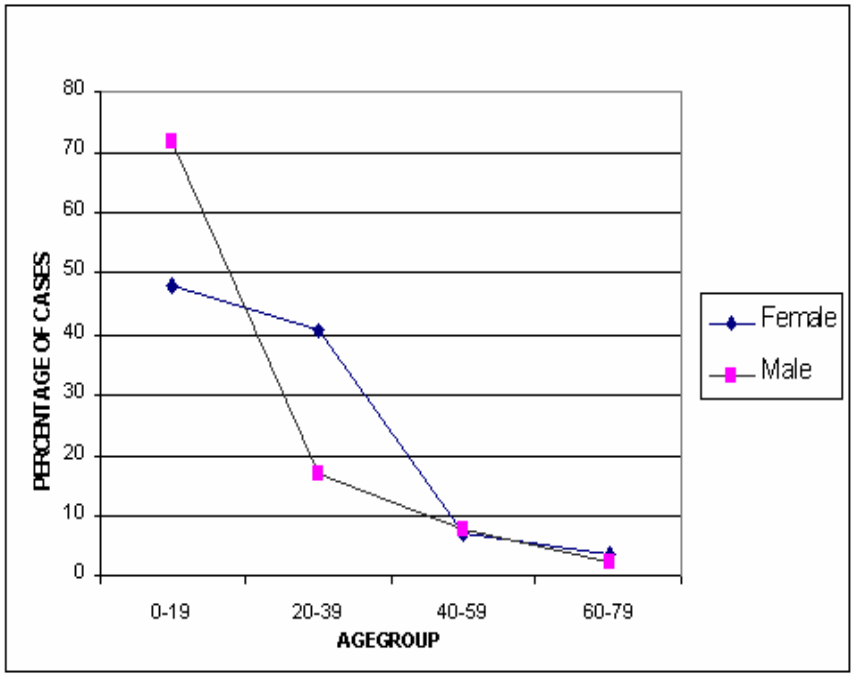
and female are similar within the age group 0-40. Any major difference in incidence of disease within this age bracket most likely is, therefore, due to other factors.

In the 1998 epidemic[14], 33.3% of all cases in the county were 20 years and below while a cumulative 88.1% were within the active ages of 40 years and below. This may also reflect the overall demographic pyramid. However, majority of male cases were very young while females were a bit more spread in age up to 40 years. Female cases were 25% aged 20 years and below, a total of 50% were 30 year or below while a cumulative total of 81% were 40 years or below. In contrast, 60% of male cases were aged just 20 years or below and a cumulative total of 80% were only 30 years and below.

Very similar relationships with age have been observed in the epidemic of 2000 in the same county. 55.2% of female cases were aged 20 or below and 72.4% were just 30years or below. A cumulative total of 89.6% were only aged 40 or less. Again by contrast up to 78.6% of male cases were only aged 20 years or less and the cumulative figure for age 30 or less was 85.7% for males. Those aged 40 year or less were up to 92.8%. It would appear that generally females are more infected than males. It also appears that when males are infected, the risk is more among the younger group than it is for older ones.

The 133 cases verified for year 2001 have also been predominantly female (Female = 53% and Male 47%. They have been 48.7% below 20 years of age and 66.7% below 30 years.

Figure 9: Sex-Specific Percent distribution of plague cases by age group in Nebbi district (total for 1998, 2000 and 2001)



[14] Recodes in the Office of the Assistant District Director of Health Services for Okoro HSD. (un-published).

Table 11*: Age group of plague cases reported in 2001 in Okoro County*

Age group (years)	Number of cases	Percent
0-19	86	64.7%
20-39	34	25.6%
40-59	8	6%
60-79	3	2.3%
Unknown	2	1.5%

5.4 Relationship of clinical types of plague to sex and age of patients

In 1998, there were 26 cases of the pneumonic, most dangerous, type of plague; 73.1% of these were in women. 55.5% of female pneumonic plague cases were aged 30 years or below while the few males who got this severe disease were100% 30 years or below. In the year 2000, pneumonic plague was only 4.7% but the second deadly septicaemic type was 39.5%. Again 64.7% of these septicaemic cases were female.

This sort of distribution with female predominance was with all clinical types

Table 12*: Distribution of the clinical types of plague by sex of cases in Okoro County, 1998, 2000 and 2001*

Sex	Clinical Types of plague disease			Total
	Bubonic	Pneumonic	Septicaemic	
Female	**69** 55.6%	**30** 58,8%	**32** 69.6%	**131** 59.8%
Male	**53** 43.4%	**21** 41.2%	**14** 30.4%	**88** 40.2%
	122 100%	**51** 100%	**46** 100%	**219** 100%

Because of the small numbers dealt with, almost all these figures may statistically not be significant. However the real statistical significance lies in the consistence of the observed trend or pattern.

It, therefore, appears that in plague epidemics in Okoro County so far, females provide a large majority of cases and in general, the younger (both male and female) tend to provide the majority of cases. The very young ages of cases is particularly so with males. Although weighting for sex specific and age specific weighting has not been done in this analysis, it appears that the likelihood of getting plague is greater in females. This likelihood appears to reduce with increasing age especially in males. The two categories, females and the young, also appear to be more exposed to direct transmissions that result into severer forms of disease (pneumonic and septicaemic). Implicitly there is or are factor(s) that put females in general and the younger people at greater risk of getting

infected by plague in Okoro county or cause them to develop the severer forms of the disease. The sex and age group differences suggest that these factors may be in some way related to conditions, behaviours or practices that differ in relation to sex and age group of the people.

The following story from the researcher's experience confirms, for example, that some married couples do sleep in separate houses with the wife sleeping in the kitchen. It, however, does not say how common this is. The researcher has encountered this quite a number of time:

A man is brought into the outpatients' clinic of Nyapea hospital very ill and not able to give a good history of his illness. The doctor asks the wife who has accompanied him to tell the history of the illness. Then the wife starts, "I got up in the morning and made fire, then warmed water for bathing. But I waited for him in vain to get out. He normally comes out very early in the morning to prepare for the field. I called him in vain but he did not answer. I then called the neighbours who helped me break the door. We found him unable to sit, not talking well etc……" Then the doctor wonders where the wife had slept in order to be locked out by the man and asks, "Where had you and him slept?" The patient's wife answers, "He slept in 'his' house and I slept in the kitchen"

A Uganda Red Cross Action Team member participating in social mobilization as part of the control of the outbreak confirmed having made similar observation on October 18th 2000.

"In a family with a big main house and a small kitchen we were told the man slept alone in the big house while the woman and the children slept together in the small kitchen." Reported a Uganda Red Cross Action Team member in Nebbi in November 2001.

The author has not found previous documentation of this sex and age group predilection to getting infected with plague or to develop its more severe forms. In Uganda in particular, literature on plague is greatly lacking.

5.5 Plague Mortality and its relationship to sex and age

Overall, the mortality rate for the total period was 33.6%. In the 1993 epidemic the mortality rate was only 7%; but this was probably because the cases were predominantly bubonic.

5.5.1 Sex-specific mortality rate

While female and the young were more commonly affected, available data suggest that in the Okoro case, sex specific plague mortality appear to be about the same for both sexes (table 13. and figure 9).

Table 13*: Sex specific mortality rates of plague cases in Okoro - total for year 2000 and 2001*

Sex group	Total for 2000 –2001	2000	2001
Female	24.2%	27.6%	22.9%
Male	25.6%	40.0%	22.6%
Total	24.7%	31.8%	22.6%

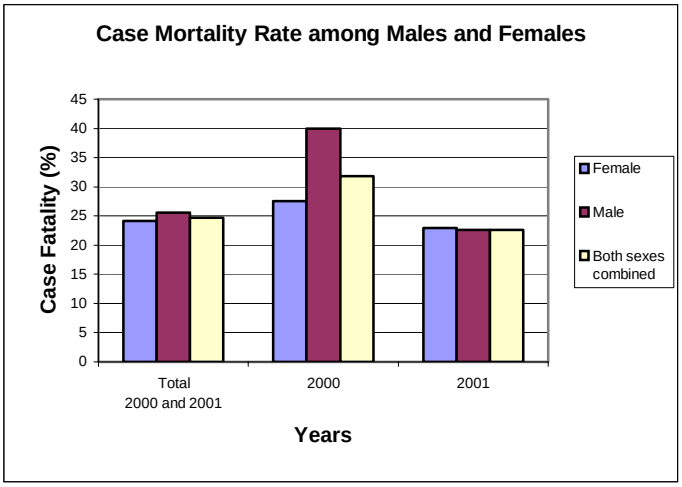


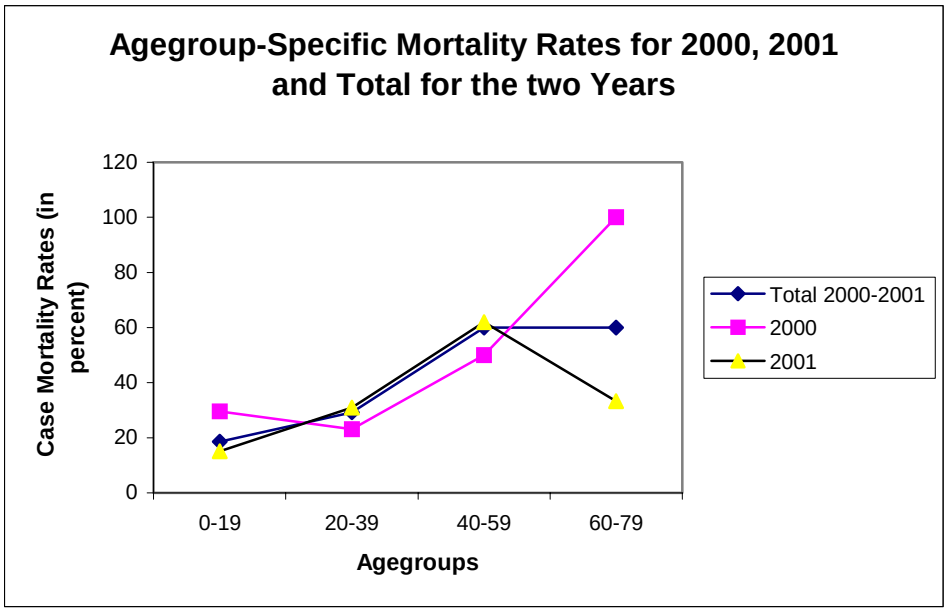
Figure 10: Case mortality by sex group

The risk of getting plague infection may be greater in females than in males, but the risk of dying from it once infected has no sexual boundaries. However case mortality rate seems to rise with increasing age

5.5.2 Age group-specific mortality rate

The available figures on status or mortality are only for years 2000 and 2001 and are too small when split by age groups. However they seem to imply a higher mortality rate for the older age group.

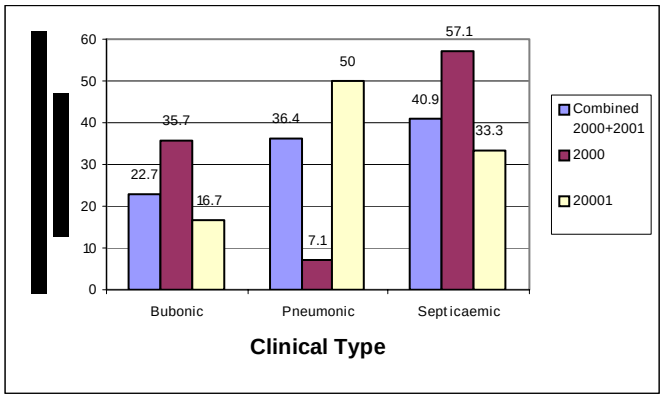
Figure 11: Age group–specific Case Mortality Rates for year 2000, 2001 and Total for the two Years



5.5.3Clinical-type Specific Mortality Rate

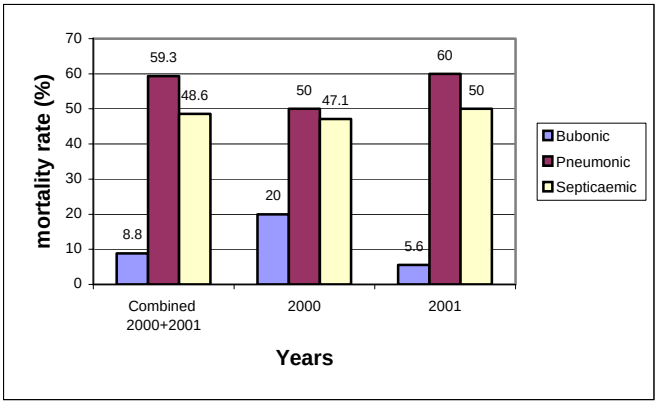
Even though bubonic cases were the majority, the pneumonic and septicaemic cases have contributed to the greatest mortality (figure 10).

Figure 12: Contribution to overall plague mortality by the different clinical types



Pneumonic plague contributed to only 7.1% of the overall plague mortality in year 2000. This was purely because the pneumonic cases were few, being only 4.5% of all cases (table 9). The case-type specific mortality (i.e mortality rate among either pneumonic or septicaemic or bubonic cases) shows that the pneumonic type has been the most fatal followed by septicaemic and bubonic being the lowest in fatality as shown by figure 11.

Figure 13: Clinical-type-Specific Case Mortality Rate



The mortality rates for bubonic and pneumonic cases here have been similar to the US cases (***18***) but fatality among septicaemic cases have been higher in Nebbi district (Uganda). One probable reason for this is that it is more difficult for the community to suspect and report septicaemic plague, confusing it with malaria, witchcraft etc. while the bubonic type is relatively easier to recognize and the pneumonic type causes difficulty in breathing that propels them to report for treatment relatively earlier.

5.6 Control and Prevention

5.6.1 Control of the frequent epidemics in Nebbi district

Once a reported suspected plague epidemic has been investigated and the health department is convinced that there is a plague outbreak, the control has always included:

- Rodent-flea control by having houses in affected villages smeared then sprayed with the rapidly killing insecticide, Fendona, which has rapid flea killing effect and long residual effect, rat live trapping, and clearing of bushes around homes to reduce traffic of rodents in and out of houses. However, the main emphasis has been on flea control rather than rodent control. Acute or rapid killing rodenticides have been cheaply available on the local market but the population has been discouraged from rushing for it as a first choice to avoid worsening or exacerbating epidemics. If rodents infested with "blocked" or plague infected fleas die, the fleas will then look for alternative hosts. Indeed, Dr. Norman G. Gratz recommends, "During plague outbreaks, immediate control of flea vectors should precede any measures against rodent hosts."***(13)***

- Treatment is provided free to plague cases and prophylaxis given to immediate relatives or households.

- Cases are isolated with only one attendant allowed per case. Complete quarantine has proved impossible to reinforce.

- Early reporting is preached and the majority of the community in Okoro is able to suspect plague even though reporting is rarely prompt enough especially at the beginning of epidemics. The first reporting has usually and unfortunately been after human death has already occurred.

Health education about home and environmental sanitation has been provided both during and between epidemics.

Each health environmental staff in Okoro County has been trained in simple flea indexing technique using the Kilonzo technique as shown in figure 7 for the purpose of surveillance and proactive flea control but this has more often not worked. A family that struggles to get kerosene for lighting the house may not want to "waste fuel" to light it "just for fleas" when it is time to sleep!

Despite the apparently clear association of the disease with home and environmental sanitation, rats, etc., most homes are still most of the time having all the factors that make presence of rats and fleas in homes or houses greatly possible. The response therefore remains emergency "fire brigade" type involving the above control methods, usually when human plague has started and more often than not when death has occurred. The

insecticide, Fendona, currently costs over 60,000 Uganda shillings per litre. This is too expensive for the rural household to afford.

5.6.2 Constraints to control and prevention

- Some of these have already been mentioned above including the difficulty in sustaining the Kilonzo technique for continuous flea indexing. This leaves the earliest warning sign being reports of rodent deaths. As seen earlier, the first report is often of human case or even death.

- When somebody with a clean home and surrounding environment gets infected with plague during a visit to other infested homes, it sends a wrong message to the rest of the rural community that " even the one with clean compound has got it. This thing is not because we have a dirty compound or home". It is true that homes with such poor sanitation are not only in Okoro or Nebbi district but in most rural Ugandan or African homes. However once the other factors like climate, the appropriate rodents etc exist, then the sanitation becomes a central factor in the prevention. It however needs to have not just one clean home in a village.

- In the past the people of Alur used granaries to store food outside the living house. The spread of theft where whole granaries were carried away with food, or animals were pulled eventually led to the death of granaries. Food is now largely stored in the same house where people sleep. People know that keeping food or animals in the same house with people is bad; but they also fear that keeping them even in another house puts then at the risk of being robbed. This has made compliance with health education on this matter very difficult.

- The Alur culture is that when somebody dies people must gather and sleep in the home of the deceased for the 3 or 4 days. This came from the long time belief that the spirit of the dead hangs around for those few days. If people do not gather it means they have left that person "alone" or ignored or left in the cold and such the spirit of such a person is feared to later affect people by causing ill-health or affect crop production if not appeased.

- Another equally importance hindrance comes from difficulty in communication. Any suspected case of plague must be reported to the health workers immediately and by the fastest means it is should reach the office of the District Director of Health Services (DDHS) within 24 hours. More often than not this is not done. At the beginning of the epidemic cases are often reported late to health facilities. Health facilities write reports that are sent through anybody moving toward the district headquarters. In the epidemic that started in mid September 2001, for example, the first information reached the DDHS two weeks after the death of the first case. Not only do health workers in the lower health units lack radio calls and the now common mobile phones but also, there is no phone network reaching over 90% the plague prone areas.

- Sometimes local political leaders (Local Council at village or parish levels) take the initiatives to send reports. But these reports are sent only through and to the political channel. Such reports first reach the district political leaders who then inform the health department. It is a good step but the information often delays as it first goes up then is brought down to the technocrats.

- Also, many health workers are "comfortable" as long as they are able to manage the cases without death. However, reports are sent more quickly once a person dies.

5.6.3 Risks to health workers

Pneumonic plague is the most infectious form of the disease. However, there has been no big problem with secondary infection of health workers during the 20 years the author has worked in this district. One Environmental Health staff with whom the author went to a village entered a house infested with fleas. He was bitten by fleas and got bubonic plague.

Even when treating pneumonic plague, health facilities have not been able to get a facemask and gloves for everybody. Patients were isolated but from those separate rooms they were handled like any other patients. This was conditioned by the difficulty of the small private-not-for-profit hospital to provide all the needed protection for long durations. Health workers were also not put on routine prophylaxis when handling plague cases. Health workers have argued that in situation of an epidemic with many cases expected probably over weeks, it was difficult to know for how long the health workers would need to keep on "prophylaxis". It was considered more practical or logical for the health workers treating the pneumonic plague patients to watch out for the earliest suspicion of plague, even just a fever, and start on treatment.

So why have unprotected health workers not got infected?

The author has considered that:

- Probably secondary infection requires more intimate contacts with the patients and probably exposure for some yet undefined "long time" that may be a number of hours or more frequent than the exposure the health workers get. Culturally, the Alur people stay close to their sick loved ones for long or check on them frequently in any given hour. They also share rooms with the sick at home to "keep watch" over the illness in the night.

- The author has also thought that probably there is something to do with quantity of sputum produced. It might be that cases in Nebbi produce less sputa than those in other countries. It might also be that the bacteria load in sputa of our patients is much lower than those in other countries. If these are so, it might be something to

do with strains of the bacteria. Could it be related to racial differences affecting response to the disease? These need to be investigated.[15]

6.0 OTHER EXPERIENCES OF PLAGUE ASSOCIATION WITH ENVIRONMENT AND POOR SANITATION

Although the link between poor environmental sanitation, presence of wild rodents infected with plague, presences of domestic rodents infested with fleas has long been recognized as being important in the causation of domestic plague, Tom Ogwal's (1994) retrospective case control study observed no association between chances of getting plague and environmental factors such as different methods of food storage, methods of refuse disposal, types of housing, cleanliness of houses, number of people per household etc. ***(3)***. He, instead, noted that both cases and controls had very poor home sanitation exposing them to the same risk of coming into contact with rats and fleas. He did not observe, for example the association between chances of getting plague infection and closeness of fields to houses. Ogwal also didn't observe an association between sex or age and chances of getting infected with plague in Okoro.

It is known that during rainy seasons in most rural areas here grass overgrows around homes and traffic of rodents between houses and the bush or fields increases. Again during rainy seasons a number of crops like groundnuts, potatoes etc. that attract rodents are planted and grow around homes. Towards the end of the rainy season such and other crops are harvested and stored in houses. These and other exposures applied to both cases and controls in the Ogwal study almost equally. The study, therefore, implies that in a situation where everybody was at equal high risk due to poor home and environmental sanitation, additional factors may have determined who was at a greater risk.

A. J. Shepherd et al (1983) ***(6)*** reported during an epidemic in Eastern Cape Province of South Africa which correlated with that observed in Coega in March 1982, that flea numbers were at their lowest in February and had been declining since October 1981. The data suggested a decline in flea number with rising temperatures and humidity and decreasing rainfall. Epidemics of plague in Okoro County have, in almost all cases, been associated by retrospective reports of rodent deaths in affected homes.

- [15] The author is planning to carry out a study that involves follow-up of such cases and see, within limited resources, if I can get some idea.

7.0 RETHINKING PLAGUE CONTROL AND PREVENTION

7.1 Rethinking the approach to control

Epidemics of plague have occurred in this area for many years and controlled as described earlier. The epidemics have not only continued but appear to be increasingly involving warmer parts or warmer seasons and may become a bigger problem. Routine or integrated prevention and control measures have not helped to make a significant achievement. Plague being a deadly disease, there is need for a project approach that will concentrate attention onto it. This project approach can no longer be well accommodated directly in the office of the District Health Department alone. It requires a multisectoral approach that includes the private sector. Besides, current funding possibility and mechanism in Uganda makes it difficult to concentrate funding for real "assault" onto the disease. The case calls for a focused or specific approach.

The causation or better still, the predisposition to getting plague disease, its persistence in the area is all intricately multifactoral. The Ogwal study has observed no correlation between these known factors and a family having had a plague case. Perhaps a study that will look at cases and controls at individual levels, rather than households, may give better light. Finding out what appear to put particular groups (e.g.) at greater risk of the infection and death from the disease could lead to design of better preventive and control measures even if some of the other factors may not be easily changed. Not only control may become easier, but also incidences may drop and perhaps epidemics become less frequent.

Women and children clearly appear to be the greatest victims of plague in Okoro. These are, by all standards, already marginalized groups. It is important that they are protected and saved out of factors that make or put them at greater risks to getting the deadly infectious disease.

Massive simultaneous flea-rodent control will definitely halt the disease. But plague is known to recur even after many years if certain conditions occur e.g. change in population behaviours that are conducive.

It is expected that if critical behaviour changes are achieved they will have effect in not only preventing or reducing the incidence of plague but even of other diseases, for example, respiratory infection.

The apparent association with age and sex imply that the risky behaviours are also related to these two factors.

This author has not found any literature on this apparent predilection to plague infection by sex or age group and especially where all groups seem to have equal exposure to bad home and environmental sanitation. This study may stimulate more thorough longitudinal case-control studies to get further and perhaps better answers.

Literature on plague in Uganda is particularly lacking.

New observations and ideas about factors influencing occurrence of plague may emerge during the study.

7.2 Currents steps taken

A research aimed at establishing an early warning system for plague epidemic prevention and control has already been designed ***(12)***.

This author is already working to propose a project that is expected to go a step further in preventing or reducing the likelihood of occurrence of human plague infection. The proposal is on one hand for an intervention against factors that appear to cause greater incidence of plague in the county and possibly have effect in reducing incidences of plague in the most commonly affected parishes. It also includes a study to establish the magnitude of these factors that are perceived to predispose female and children to plague infection before and after the above interventions.

The project is being proposed to:

- Determine the prevalence according to sex and age of socio-cultural exposure factors that are suspected to increase risk of plague infection in Okoro County, Nebbi district.

- Determine if the incidence of plague disease can indeed be significantly reduced if interventions are directed at these suspected risk factors

- Use lessons learnt for design of better future plague control and prevention measures in Okoro and probably other areas.

7.3 Appropriate technologies

7.3.1 Affordable insecticides

The use of expensive insecticides like fendona mentioned above is not sustainable in poor community where the disease edges on being endemic. There is need to work on cheaper and more sustainable sources or means of flea control for the long term.

7.3.1.1 The neem tree

It has been mentioned that the neem plant (A*zadirachta indica*) has multiple insecticidal effects (***14, 16***). A local study on this will be useful. It will probably be worthwhile encouraging the population to plant many neem trees and use the seeds / kernels or the

leaves / bark as insecticide bases to sprinkle in fleas infested houses. The seeds or kernels are said to be more potent than any other part of the neem plant[16].

7.3.1.2 The tobacco leaves and seeds

The author has seen some Alur families crushing tobacco leaves and /or seeds (said to be more effective) then mix in water and sprinkle to kill fleas. CARE International (USA) has introduced into the West Nile region of Uganda the use of a mixture of tobacco (leaves and / or seeds), pepper and soap as pesticide for agricultural purpose. The mixture is left to ferment for five days before use. It has reportedly been found to kill a number of crop pests but not yet tried on fleas in this district.[17] Dr. Hans and Bindanda (***16***) recommend putting some tobacco leaves in chickens' nests "especially when they are heavily attacked by fleas". If studied and found effective in this area this could become another more affordable, more accessible, easy to use and sustainable method of flea control. It is worth encouraging the community to use this substance and find alternative use for it that may help reduce its consumption through smoking.

7.2.1.3 *Tephrosia vogelli* (locally called "*uber*" or "*ober*[18]" by the Alur)

For many years (at least over 60 years) leaves of this plant have been traditionally harvested in various places in Alur-land during the dry seasons when water levels in streams and creeks are low, then crushed in big quantities and used to poison fish. To-date this is still reportedly carried out in remote villages. It can be used as an insecticide by crushing 1 kg of fresh leaves and putting into 10 litres of water (***16***).

7.2.1.4 The use of ashes and smoke

Among the Alur, ashes are sprinkled to stop the brown ants from getting into the house. Indeed when they reach the ash, cold or hot, they retreat. Ashes are also sprinkled sometimes to kill or chase fleas from chicken nests where it has been laying the eggs. When fleas infest a goat shed, the dung are gathered and burnt at one place within the shed and usually fleas disappear. George Kermundu Adubango[19] who grew up at Panyimur, a sub-county on the shores of lake Albert said, "When we were young, people who did not have mosquitoe nets burnt the faeces of goats in the house and this chased away mosquitoes". These seem to suggest that there are a number of plants in this district or possibly the whole country that have insecticidal effects. The smoke from the goat dung may simply be from unabsorbed remnants of plants eaten by the goats and concentrated in the faeces. The ashes from the kitchen similarly are from plants.

[16] Ogen Asaf Odoi (Personal Communication). He is the National Coordinator for the Control of plague in Uganda.
[17] Nebbi District Extension Coordinator (Mr. Richard Okethweng'u) – a personal communication.
[18] Same name is used by the Alur tribe for mosquitoes
[19] Goerge Kermundu Adubang'o – personal communication

7.2.1.6 The Acholi use a creeping plant locally called onunu to remove fleas from where a chicken has been hatching. Plenty of the plant is laid onto the infested area and fleas get onto it. After hours or a night the plant is pulled out. This is repeated until *all* fleas are removed.

This method is unlikely to remove all fleas but definitely reduces the population in the house. However it has the disadvantage of simply transferring them somewhere else within the same home from where they can still cause plague if they are infected with it. The person pulling them out also has greater exposure to the fleabites.

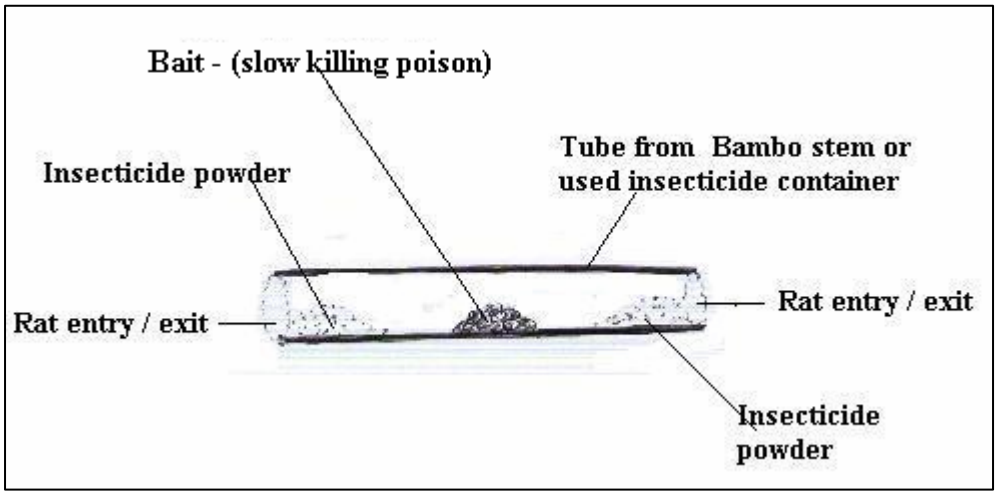
7.2.2 *Ceth Kong'o* Flea trap

When cassava is fermented and distilled to produce alcohol (called "*kong'o*" by the tribes of the Lwo ethnic origin), the residue is a sticky substance. Among the Acholi in northern Uganda, this residue, called *cet kon'go* (meaning the remnant or residue or faeces of alcohol) or *ceth kong'o* in Alur, is heavily sprinkled, while still in semi liquid form, onto the area infested by fleas – usually a previous place for a chicken nest. As the fleas jump off they land onto the *ceth kong'o* and get stuck. These later dry up with all the arrested fleas and are swept out.

7.3.3 Kilonzo's technique of Simultaneous Rodent-flea control

The Kilonzo technique for simultaneous rodent-flea control needs promotion. The Technique involves the use of tubes like bamboo stem, spent insecticide canisters etc. into which bait is put centrally and insecticide powder is put at either ends. There are, therefore, many designs for it based on the same principle and mechanism of work.

Figure 14: The Kilonzo technique of Simultaneous Rodent-Flea Control



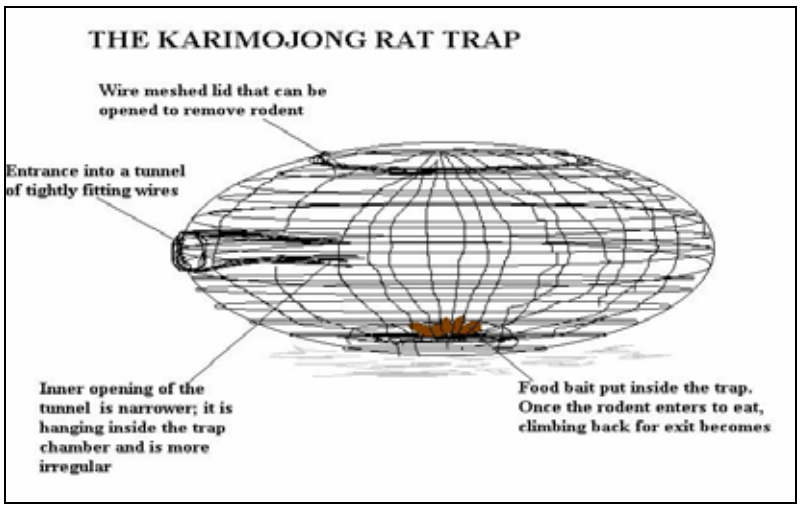
Rodents pass through the powder and pick it onto the fur, then go to eat the bait and again come out through another heap of powder. It works as a one-stop killer for both the

rodent and fleas. It is similar to the Halt boxes or bait-boxes used in the United States ***(13)***.

7.3.4 The Karimojong rat trap

This kind of trap does not help in the killing of fleas left inside the residence of the rodents in the ground or roof. However it allows the trapped rodent to remain alive and worm for the fleas to keep onto it. The trapped rodent is then lifted live and put onto fire to roast off the fleas before being thrown into a pit for burial. The traps (figure 8) are made from simple binding wires and are easy to make.

Figure 15: The Karimojong rat trap



7.3.5 Water-Storming rat holes

Heavy sprinkling of water on the floor before sweeping the un-concreted house has been encouraged as this helps to keep the dust down but also helps to "drawn" the fleas. Fleas thrive well in dusty areas.

It is reported[20] that many years back the Acholi also used water to kill fleas from the chicken's breading place. One went to water stream and got a mouthful of water then came and sprayed this onto the floor. The walking to the river and the whole exercise was repeated until the house was considered to be wet enough for all fleas or many enough of them had drowned. It had to be water collected directly from the river, stream or pond but not that already stored in the house. There is probably no scientific basis for the trouble involved but what is important is that they also used water to either drawn the fleas or get them stuck into little particles of mud balls.

[20] Verbal report by Mr. Otto James, an Acholi in Gulu town, northern Uganda.

The author observed in early 2001 that in one home in Nyapea where pigs had been reared before there were so many fleas that no one dared walk on the compound. After two heavy rainfalls in March 2001, the compound was free of fleas.

It may, therefore, probably be a good thing as well to encourage households to pour "big" amounts of water down into rodent holes; it may probably serve the same purpose down there where fleas from the rodents' bodies may be at their highest concentrations. It is an area that may also need some study.

7.3.5 Heat-Storming or "roasting" of fleas

The Alur (personal experience)[21] have for many years practiced the roasting of the area where a chicken has just completed hatching its eggs from. During the time the chicken is sitting on the eggs, it is common for fleas to multiply in the area. Practical experience shows that the "roasting" usually helps to at least reduce the number to levels that appear not to cause sleepless nights to the families. The procedure is commonly also followed by smearing of the house floor and wall because burning alone is followed by re-multiplying of the fleas. Some households pour hot ashes from the cooking place onto infested area. It is not clear if it is only the heat of the ashes that kill the fleas or the ashes have some insecticidal effects. Households in plague prone areas could be encouraged to routinely "roast" their houses, especially where food is stored, chicken and other animal sleeping places or hidden places at least monthly. This may help to keep the flea indices low. Like the water storm technique proposed above, the author has not got literature on this and some study as well may be useful.

Various combinations of the different methods and other prevention measures, such as those related to sanitation etc, can definitely help to prevent plague epidemics at a lower cost.

7.4 The need for a new approach to social mobilization

7.4.1 Changing the attitude of the community to care and develop initiatives to protect their health.

Despite the annual occurrence of deaths due to plague, the kind of story as told of the Atyak village (page 19) keeps getting renewed. In 1994 I found myself under the same big tree addressing people in Oyeko village in Jupadindu parish, Jangokoro sub-county during a plague outbreak. This was 13 years after I had stood under the same tree, addressing people of the same village on the same matter and the village was just as bushy, if not worse this time. But this was not just the second outbreak in 13 years. During this particular outbreak the health staff advised the community in that parish to close all rodent holes in the house and smear the houses both inside and outside from the floors to the complete wall in order to close all cracks in the walls and cover hiding fleas. The majority just smeared the floors only and the parish chief agreed with them. A good number simply did not smear at all. To speed up the control activity, health workers had

[21] The author is a member of the Alur tribe

to spray houses with insecticides irrespective of whether the first step to reduce flea population with smearing had been done or not. A few families in the parish even collected their belongings, closed their houses and crossed into the then Zaire (now DRC) for about two weeks fear of being forced to smear their houses.

In the Alur culture the role of digging around or slashing the grass to keep the home clean is mainly the man's. In most of those homes with unsanitary conditions the male head is physically fit. He is probably poor and spending his time looking for survival; no, more often than not he spends the lots of "free" time drinking the local brews[22].

The role of smearing the house is, in the Alur tradition, that of the wife. In those houses that are dirty, dusty etc. quite often the woman is physically fit and despite all the health education, she does not have the self-compulsion to try to keep the house clean. Personal experience tells that if you ask, in all cases they know that the home is not clean and that this can cause disease.

During every outbreak of plague the general desire and expectation of the people is for mass distribution of prophylactic drug therapy. Most of the population is happy to see health workers and volunteers like the Red Cross members spray their houses but are not willing to help in the spraying[23] even when these volunteers are tired. Some demand payment from the volunteers in order to "help" spray their own houses.

So, what is it that will improve the attitude of the people towards home and environmental sanitation and other preventive measures? Hopefully the following will help:

- Changing the society by gradual "generation replacement method". Health education should be designed to deliberately target the young ones in school to take advantage of the high enrolment due to the Universal Primary Education. These new generations will hopefully grow up to use their new outlook to take over responsibilities in the homes. To do this,
    - Curriculum for orienting all school health teachers in the plague-affected districts should include teachings on plague and other locally important epidemics.
    - The plague –affected districts should deliberately include the teaching on plague and home and environmental sanitation on the curriculum of all schools.
- Health education strategy should also deliberately target traditional healers and identify some of them to carry out profession of the new "faith". Opportunities can be given to them to have talk shows on the local FM radio station.

7.4.2 Strengthening the community leaders to be good examples

Enforcing health by-laws has been difficult essentially because those to enforce the by-laws themselves have poor sanitation in their homes. Currently the Okoro health sub-

[22] Personal observation
[23] Reported by the Uganda Red Cross Volunteers during the 2001 outbreak and many other village volunteers before.

district organizes annual home and environmental competition. Such competitions could have a component specifically among the community leaders e.g. the local council members. Not only should best performing leaders be rewarded but also poor performers mentioned to the community. In this way good performers will courageously mobilize and also enforce the by-law while poor performers struggle to score better the next time.

7.4 Community Change Agents

Creating and working through some sort of "change agents" in the communities comprised of mainly the people most affected by plague due to their own social behaviours. These are the female and the young. Some men will need to be included though because they very much influence some of the conditions under which women and children live in the homes. Health personnel need to empower these people with information and health education techniques.

8.0 CONCLUSION

Plague has been around in Nebbi district of Uganda for over half a century. It is popularly called here *Tho uyoo* (in Alur) or *Zupka* in the language of the minority Kebu tribe.

Due to a number of social factors or traditional practices, women and the young in general are more exposed to getting the infection. Indeed, they form the majority of cases seen.

It is important that the rights of these women and children to health are defended. Some of these are related to effects of male dominance and conscious oppression of the female and children under the guise of cultural respect for the man in the house. The factors and their magnitudes need to be better understood. Interventions for plague prevention and control need not just target rodents and fleas; they need to target those behavious that disadvantage the female and children as well.

Pre-outbreak prevention measures, mainly targeting fleas and rodents need to be economically affordable and sustainable. There are a number of ways the people of the Lwo ethnic group, of which the Alur in Nebbi district are a part, use to control fleas. These are cheap and popular to the communities. These methods will need to be studied and where possible improved upon and promoted. In the meantime, the author encourages the use of these methods for they are harmless to the community. In any case, they by-pass the problems of probable environmental destruction caused by commercially produced chemicals.

A lot of work still remains to change or improve on the attitude of the general population about caring for one's own health even amidst poverty. A lot also remains to improve on the attitude of the community, traditional and household leaders.

Seeing people die annually due to a disease that related largely to poor sanitation is embarrassing. It is a sign of the intricacy that is centred by poverty at both macro and micro levels. But it disheartening to see people die yearly from this disease.

Once again, it is hoped that this book will contribute something in creating awareness about this suffering and pull the attention of everybody to contribute to the prevention and control of human plague disease in Uganda, Nebbi district, Okoro County.

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