

THE MAASAI PEOPLE: INITIAL INVESTIGATIONS INTO PUBLIC HEALTH
PRACTICES OF THE LOITOKITOK DISTRICT

by

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Abstract

This field experience was an initial investigation to collect a baseline for community and environmental health of the Maasai people in Loitokitok District of southern Kenya, East Africa. This international community based experience was the first of a five year program through The School for Field Studies to address the public health concerns surrounding the group ranches in the area. Individuals who participated in the first year of the project were selected from graduate schools in the United States and Kenya. The Maasai, once a nomadic pastoralist people, were forced onto community group ranches and had to take up a more sedentary agro-pastoralist lifestyle. This development has had negative impacts on the health of the people and their livestock.

In addition to the baseline surveys, healthcare facility evaluations and cultural coursework to understand the situations surrounding the Maasai were main focuses. A personal interview was conducted with the local veterinarian and district animal health and agriculture officer to learn more about the veterinary concerns faced in Loitokitok District. Data were collected using a multistage sampling for childhood immunization and morbidity history, household mortality, water and sanitation, health, food security and assets. Descriptive statistics were presented to local governmental officials, healthcare providers and community leaders to discuss their main health concerns once the data had been presented. The Maasai's cultural and financial reliance on their livestock provides an opportunity for basic management changes in water quality and food security that will improve the overall health and sustainability of the people and their livestock. The additional four years of the project will be directed by the findings of these surveys and the concerns of the Maasai in the area.

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CHAPTER 1 - Introduction

Purpose

This field study was the first of a five-year research plan to evaluate the local community and environmental health problems now facing the Maasai in southern Kenya. Reasons for the increase in health concerns for the Maasai will be discussed in the following sections. The goal was to gain an international community based field study experience, while working with community leaders and healthcare providers to identify and discuss health concerns and possible solutions.

Once background preparation and survey tools were complete, data were collected and analyzed to provide a baseline of health for the Maasai in Loitokitok District, something that was previously unavailable. This information was then presented to community leaders and local government officials to provide insight into what health areas needed addressed and to provide recommendations for further research and development. The two presentations given were separated into the following categories: demographics, nutrition, health, water and sanitation, and food security and assets. The upcoming years of research will depend on the needs assessed during this baseline of health collection for the Maasai in Loitokitok District. To fully critique and improve the survey tool for collecting baseline health and household information from the Maasai in Loitokitok, it was imperative to first understand their past history and status as Kenyans.

Arrival

The first week at the Kilimanjaro Base Camp (KBC) was spent in coursework learning about the Kenyan and Maasai history and visiting the healthcare facilities in surrounding communities. KBC is located outside of Kimana, Kenya in the Loitokitok District, which was a new district set up five months before the 2007 summer field study. There were primarily two course instructors and mentors for the study, Monica Onyango, RN, MPH, and Senewa Montet-Timayio, PhD, with a few other lecturers speaking on topics ranging from survival in the Kenyan bush and cultural etiquette to the role that the regional ecosystem and tribal cultures have in local health issues. Team members included a group of public and international health graduate

students and nurses from Arizona, Kansas, Massachusetts and Kenya. For this field study, a partnership was created between The School for Field Studies (SFS) at Boston University and the Nomadic Integrated Development Research Agency (NIDRA).

Partnering Organizations

SFS was originally an environmental field study abroad program centered on providing students field experience while working with communities to improve the environmental conservation in selected areas of several countries. After working in Kenya on the edge of the Amboseli National Park at KBC and on the National Park Site (NPS) just south of Nairobi for ten years, SFS decided to set up a program directed towards helping local communities with their public and environmental health issues as a way to give more back to the community. NIDRA, a non-profit organization in Kenya, was established in 1997 to develop strategies and programs to aid rural nomadic people groups with improving sustainable living in the face of poverty, hunger, disease, and lack of education. The main NIDRA focus in the area is on the aid of HIV/AIDS positive women and improving their health and livelihood through beadwork and small scale production of dairy products for sustainability.

Kenya

Kenya obtained independence from British rule in 1963, and as a republic has had three presidents since that time: Jomo Kenyatta, Daniel Toroitich arap Moi, and current president Mwai Kibaki. Located in East Africa and spanning the equator, some of the major factors affecting rural life include recurring drought and, during the two yearly rainy seasons, flooding. These rainy seasons occur March to April and October to December [3]. The population is approximately 40 million people, of which the median age is just under 19 years of age (2009 est.). There are 42 Kenyan ethnic groups, which include 120 sub-tribes like the Kikuyu, Kamba, Kisii, Luo, and Maasai. The Maasai represent a little over one percent of the population in Kenya. Prevalence of HIV/AIDS in Kenyan adults is reported as 7.4% [7], which is lower than observed in the Maasai communities according to local testing centers and doctors, but still the 10th highest rate for countries in the world. Other health concerns in Kenya include infectious diarrheal diseases, hepatitis A, typhoid fever, malaria, Rift Valley fever, schistosomiasis, and rabies. Half of the nation is below the poverty line (2000 est.), and many citizens are polarized

in their economic position, to either the very poor or the very wealthy. Tourism, mainly in national parks that were once Maasailand and also along the coast, encompasses 21% of foreign exchange and employs 70% of employed Maasai. [5]

Loitokitok District

Loitokitok is a new district in the Rift Valley province of Kenya that was previously a division of Kajiado District. According to Dr. Simon ole Seno, the SFS Kenya Center Director, the district is 6,006 km² and of the 150,000 people in the district, about three-fourths are Maasai. As of the 2007 study, there were four health centers, 14 medical dispensaries, 12 secondary schools, and over 100 primary schools. In adults, the Maasai in this district have a 3 - 4% literacy rate [12] compared to the 85% rate of Kenyans in general [5]. Languages used by the individuals in the area are the two official languages in Kenya, English and Kiswahili, and local languages depending on ethnic group. The main health concerns in the area according to local healthcare providers include malaria, trachoma, HIV/AIDS, rabies, yellow fever, schistosomiasis, amoebiasis, and anchylostomiasis. Local rivers and the Namalok, Isinet, and Kimana swamps provide water sources for humans, livestock, wildlife, and irrigation of crops [11].

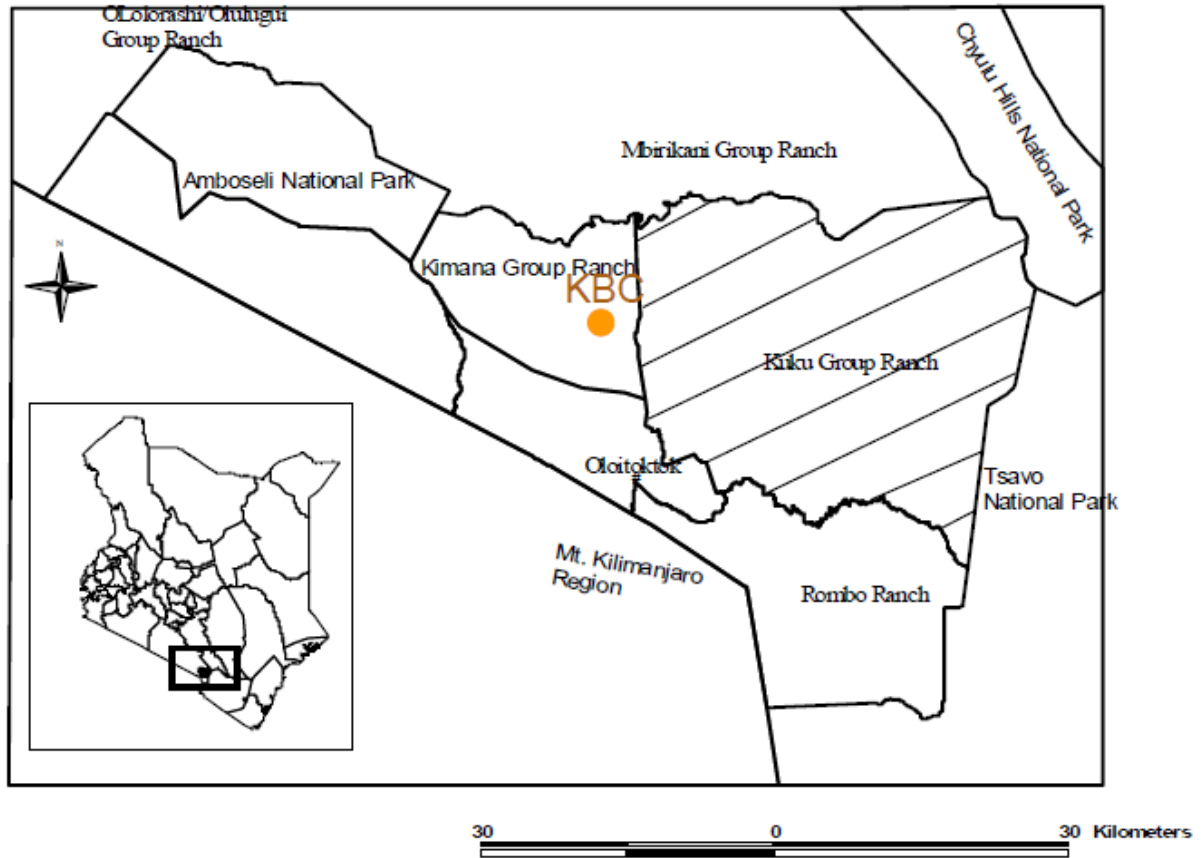


Figure 1.1 Group Ranches, Loitokitok, Kenya. *Reproduced from The School for Field Studies Lecture Material.*

Group Ranches

Of the six group ranches in Loitokitok District residing between the national parks of southern Kenya, the Kuku, Kimana, Olgulului, and Mbirikani Maasai group ranches were the main focus of this field study. The other group ranches in Loitokitok are Eselenkei and Rombo. Group ranches consist of land that has been set aside by the government for people groups to be relocated to and use for stationary agro-pastoralist subsistence on community owned and farmed land. Formed with the Land (Group Representative) Act of 1968, group ranches were originally meant to provide a means of subsistence farming in one area, to prevent overgrazing of communal lands and illegal grazing in national parks while improving economic conditions [10]. Kimana Group Ranch has created its own independent Kimana Wildlife Sanctuary to encourage tourism overflow from the nearby Amboseli National Park [2].

The Maasai People

From the beautiful beadwork and rich fabrics to the free nomadic lifestyle, the Maasai have a mysterious and enchanting presence that draws one in. However, this lifestyle is not as grand as the government would like the numerous flocks of tourists to believe. Only a few villages are open for these tourists to visit. Historically nomadic pastoralists, the Maasai have struggled to flourish in the semi-sedentary agro-pastoralist lifestyle which they have been forced to adapt. Once a people that freely roamed the arid grasslands of Kenya and Tanzania, the advent of group ranches, national parks and tourism now prevent the Maasai from grazing much of the land they traditionally occupied. As a people heavily reliant on their cattle, sheep, and goats, decreased land availability has caused overgrazing, water pollution and depletion, and increased disease among the people and their livestock.

A shift towards crop farming has occurred, which also has led to the previously mentioned issues. Due to increasing promotion of the use of irrigation, fertilizers, and pesticides on crops, improper use of water resources and resultant poor water quality are becoming a major concern in the area. Diesel from irrigation pumps leaks into water sources upstream from human collection sites, leading to contaminated sources. Pesticides are typically foreign donations that are chemicals banned in other countries, such as DDT. With all the cattle, sheep, goat, and chicken manure that the Maasai have, many do not use it for fertilizer, because the rate of growth, efficiency, and ease of using chemicals shows better return [3]. Crops are also often trampled or eaten by elephants and migrating herds of wildlife, as some land given to the Maasai to farm is in the traditional migratory patterns of herds. Around Kimana, in a 1996 survey, about 90% of farmers and 60% of herders reported conflict with wildlife; of these Maasai, only 25% of farmers and 19% of herders were compensated for the damages [4]. The Maasai have been forced to take on a lifestyle they are unfamiliar with and were not properly prepared to handle.

The manyattas, or homesteads that Maasai families live in, house between one and several related families. Each manyatta may have several houses made of a woven wood and brush framework with a mud and cattle manure mixture for the walls and a grass thatched roof. A brush fence creates the circular boma, and the houses are located in a ring around the inner side of this fence. Livestock are herded into a corral in the center of the manyatta at night to protect them from roaming predators such as lions and leopards. Because of the proximity and traditions associated with their livestock, the Maasai are exposed to problems such as trachoma

and tuberculosis. Trachoma is a disease caused by *Chlamydia trachomatis* that can lead to conjunctivitis, entropion and blindness in humans if left untreated.

CHAPTER 2 - Community Service and Experience

Healthcare Evaluations

According to the World Health Assembly, the decision-making group of the World Health Organization (WHO), Kenya needs at least 32 United States dollars (USD) per capita to make a difference in the health needs of the people; however, only three to six USD per capita are currently allotted for health in Kenya [13]. We visited the local healthcare centers, hospitals, dispensaries, and a traditional Maasai medicine herbalist to evaluate the current availability and quality of healthcare for the Maasai in Loitokitok. Most of the healthcare in these centers and dispensaries is supervised by the district public health officer (DPHO), nutritionist, and nurses. Mr. David Nyotu, the DPHO, listed childhood immunizations, health education and family planning, curative services, and malarial prevention as the main focuses. In Tanzania, which borders Loitokitok District to the south, malaria is the main cause for hospital admission in both children and adults [8]. When available, mosquito nets are provided from the Loitokitok district hospital for children less than five years of age and pregnant mothers. Education on how to properly use the nets, as well as home visits for follow up, are provided to aid in prevention.

The Boma la Tumaini, or House of Hope voluntary counseling and testing centre, is a small building in Loitokitok town funded through the Catholic Church and aimed at improving health and encouraging preventative interventions in the pastoralist people of the community. Their work includes malaria prevention and HIV/AIDS testing and prevention education, interventions for major diseases that lead to morbidity and mortality in the area, and promotion of sustainability through support of a local herbalist association. They also are supporting efforts in the community to develop alternative rites of passage strategies for girls so that they can continue to receive primary education instead of being given in marriage at a very young age.

Being a rural area, many people live out of close walking distance from the nearest healthcare facility. To better provide for this weakness in the healthcare of the area, community health workers (CHWs), volunteers who are traditionally respected individuals from the community, are given a first aid kit and are trained by community health extension workers

(CHEWs) to provide for basic needs and monitor for disease prevention and detection in their areas. Traditional birth attendants (TBAs) are women of the community that assist in at-home delivery for expecting mothers. Through the Catholic Church, during the 2007 field study, 200 Maasai TBA women were trained and given kits to provide better care. While TBAs are discouraged by the district's health centers, who contest that TBAs do not understand the importance of hygiene, TBAs are often utilized by families of the district.

One traditional medicine man in Loitokitok was visited by our team during the healthcare provider evaluations and visits. The manyatta was fairly clean compared with some visited, but the brush corral for the livestock in the middle of the manyatta was filled with manure, which resulted in a natural fly breeding area. This was not much of a problem historically, as the Maasai would only inhabit a manyatta for four to five years [1]; however, disease transmission, such as trachoma, is now becoming more of a problem for the Maasai. The medicine man explained the uses and applications of plants, tubers, and powders for everything from malaria and diabetes to stomach ache and infertility. These herbal remedies have been passed down from generation to generation of Maasai men, but only certain men act as medicine men for the communities. Because Maa is not traditionally a written language and many of the Maasai are illiterate, especially of the older generations, most information of these plants and their uses remains oral knowledge [1]. The medicine man and some of the local doctors will send patients to each other if they have not been able to help them. The doctors test the people he is treating, so that they know the methods he uses are working.

The main issue with healthcare in the area is that the centers are not well adapted to the lifestyle of the people. Government facilities are often under-stocked and under-staffed for the daily demand. Every healthcare facility that we visited mentioned a shortage of staff. The problem lies in the reality of the matter—there is not a lack of able workers by any means; however, there is a shortage of funds to employ them. There are a couple of centers that are very well built, with expensive equipment, but there are rarely patients there. The clinics were donated by private parties that did not understand the limitations of transportation to the remote clinics, or the limitations of access to electricity. One of the clinics had a wonderful surgery suite, but no electricity to utilize the services. There is a disconnect between government and privately ran facilities; in their competition with one another, they have both directed efforts to proposed rather than actual needs.

Immunization and Health Clinics

Two days were set aside during the summer field study to hold immunization and health clinics at schools in remote areas of Loitokitok District. Several stations were set up to include childhood immunizations by the nurses of the group, weight and height measurements for growth evaluation, childhood deworming, delivery of vitamin A supplements, and family planning for mothers. A doctor and nutritionist from the Loitokitok District Hospital also attended for general consultations. Three additional days were given for rest or exploration of the surrounding areas, with all other days devoted to preparation, data collection, analysis, and presentation of data during the study. The three additional days were used to visit Amboseli National Park, Tsavo West National Park, and hike to Tanzanian waterfalls after visiting Loitokitok town.

Livestock Market

Tuesdays in Loitokitok are used for the local livestock market day. Maasai from all over the area bring their livestock to Kimana town. Goats, fat-tailed sheep, Sahiwal cattle, donkeys, and the occasional pig are brought to be bartered and bargained over. Livestock from all over the district and beyond are comingled together before returning to respective herds. There is no quarantine practiced, very few animals are vaccinated, and the majority of the people wait for an outbreak to occur before utilizing the services of the local veterinarian, Dr. Lijodi. Not only are livestock comingled with other herds, but also with wildlife carrying transmissible diseases such as malignant catarrhal fever. Of the diseases in the area, the main problems, according to Dr. Lijodi are lumpy skin disease in cattle, contagious caprine pleuropneumonia in goats, and enterotoxemia in sheep. Other occasional problems include anthrax, brucellosis, foot and mouth disease, malignant catarrhal fever, Rift Valley fever, rabies, and liver flukes; the few local dairies mainly have issues with foot rot and milk fever.

With a small store-front two room business, Dr. Lijodi has a dispensary with an office in the back; all of the veterinarian's appointments are farm calls, and most of the work is consultation for livestock. Occasionally the Kenyan government will subsidize rabies vaccination for dogs, but too much time passes between vaccinations for them to be very effective. Dewormer, one of the few drugs that the Maasai have access to for their livestock, is often severely under-dosed when used [9]. Outside of the large fenced-in dusty lot that makes up the livestock market, a vendor sells Abezole (Albendazole) with an advertisement banner tied to

a tree. The bottles of dewormer have directions written in English; many Maasai do not speak English, let alone read the language.

Our visit to the livestock market also involved surveying Maasai men about livestock prices currently, three months prior, and one year prior. Average prices were collected on young, mature, female, and male animals including: cattle, sheep, goats, pigs, turkeys, and chickens (Table 2.1). Price ranges varied according to age, health and body condition of the animal. At the time of the market survey, one USD was equal to 72 Kenyan shillings.

Table 2.1 Average Kimana Livestock Market Prices (June 2007)

Item	Market Price Kenya Shillings (USD)		
	June 2007	March 2007	June 2006
Bull	25,000 (\$347)	25,000 (\$347)	18,000 (\$250)
Milking Cow	15,000 (\$208)	8,000 (\$111)	11,000 (\$153)
Pregnant Cow	18,000 (\$250)	12,000 (\$167)	12,000 (\$167)
Calf	5,000 (\$69)	6,000 (\$83)	3,000 (\$42)
Sheep	3,000 (\$42)	2,000 (\$28)	2,000 (\$28)
Lamb	1,300 (\$18)	1,200 (\$17)	1,000 (\$14)
Goat	4,000 (\$56)	4,000 (\$56)	3,500 (\$49)
Kid	1,400 (\$19)	1,100 (\$15)	900 (\$13)
Sow	8,000 (\$111)	---	7,500 (\$104)
Boar	4,000 (\$56)	---	---
Piglet	3,000 (\$42)	---	---
Turkey	5,000 (\$69)	---	---
Chicken	250 (\$3)	---	---

We also visited the town produce market to evaluate prices at the same times for 30 types of the main produce and grain staples of the Maasai in the area from various vendors (Table 2.2).

Measuring units were also established for these items, such as kilogram, liter, and piece (Appendix C, Table 0.1).

Table 2.2 Kimana Market Produce Prices

Item	Quantity	Market Price Kenya Shillings (USD)		
		June 2007	March 2007	June 2006
Beans	1 kg	30 (\$0.42)	25 (\$0.35)	20 (\$0.28)
Cabbage	2 kg	25 (\$0.35)	20 (\$0.28)	10 (\$0.14)
Carrots	1 kg	10 (\$0.14)	20 (\$0.28)	15 (\$0.21)
Cassava	1 piece	20 (\$0.28)	---	---
Coffee	1 kg	50 (\$0.69)	20 (\$0.28)	25 (\$0.35)
Cooking Bananas	1 kg	2 (\$0.03)	1 (\$0.01)	1 (\$0.01)
Corn Flour	1 kg	30 (\$0.42)	---	---
Cotton	1 kg	---	---	---
Cow Peas	1 kg	30 (\$0.42)	---	---
Eggs	1 each	7 (\$0.10)	7 (\$0.10)	7 (\$0.10)
Fish (Dried)	0.5 kg	5 (\$0.07)	5 (\$0.07)	3 (\$0.04)
Green Leaves (Sukumawiki)	0.25 kg	1 (\$0.01)	2 (\$0.03)	1 (\$0.01)
Irish Potatoes	1 kg	25 (\$0.35)	12.5 (\$0.17)	20 (\$0.28)
Maize	1 kg	8 (\$0.11)	5 (\$0.07)	15 (\$0.21)
Meat (Beef)	1 kg	180 (\$2.50)	---	---
Meat (Goat)	1 kg	190 (\$2.67)	---	---
Milk (Raw)	1 liter	20 (\$0.28)	---	---
Milk (Pasteurized)	1 liter	80 (\$1.11)	---	---
Millet	1 kg	40 (\$0.56)	---	---
Millet Flour	1 kg	50 (\$0.69)	---	---
Onions	4 pieces	5 (\$0.07)	10 (\$0.14)	10 (\$0.14)
Oranges	1 piece	5 (\$0.07)	5 (\$0.07)	5 (\$0.07)
Rice	1 kg	40 (\$0.56)	35 (\$0.49)	30 (\$0.42)

Ripe Bananas	1 each	1 (\$0.01)	1 (\$0.01)	1 (\$0.01)
Salt	0.5 kg	10 (\$0.14)	7.5 (\$0.10)	5 (\$0.07)
Sorghum	1 kg	---	---	---
Sorghum Flour	1 kg	50 (\$0.69)	---	---
Sunflower Oil	1 liter	120 (\$1.67)	---	---
Sweet Potato	0.5 kg	30 (\$0.42)	15 (\$0.21)	10 (\$0.14)
Tomatoes	0.5 kg	5 (\$0.07)	10 (\$0.14)	10 (\$0.14)

CHAPTER 3 - Surveys

Goals

The surveys that we conducted with the Maasai in Loitokitok sought to accomplish the following goals: quantification of nutritional status of children ages six to 59 months residing in households of Loitokitok District, quantification of morbidity rate in the previous two weeks, estimation of mortality rates overall and for those less than five years of age, measles vaccination status (if individuals have completion of measles vaccination, they usually have had the other immunizations), and food security for this current year compared to a “normal” year. Food security was defined as having access to an adequate food supply. A normal year was defined as a year without drought, famine, wildlife conflict, or crop damage. In addition, we collected baseline information on demographics, access to protected water sources, hygiene and sanitation practices, rubbish disposal, and literacy.

Methods

Three surveys were conducted during the summer of 2007. The household surveys were conducted with 300 Maasai families at every third household in manyattas surveyed in Loitokitok District of Kenya, East Africa. Mortality surveys were conducted with 622 Maasai families in the manyattas where the household surveys were collected, extending to collect data from the additional manyatta households not surveyed in the household surveys. Childhood surveys were conducted for 955 children from the Maasai families surveyed for the household

surveys. Every child that was from age six to 59 months as well as 60 to 115 centimeters tall at a household was included in this survey, which collected anthropometric and immunization data. The children had to meet both of these criteria to be included. The baseline information that we generated will be utilized in the future to ascertain the needs of the community and aid in the quality of life of the Maasai people of Loitokitok District.

Study Population Selection

Community health workers (CHWs) from the district were utilized as translators and guides. As they were from the area, they were trusted people that volunteered their time to promote wellness and health in the communities. There were no registries to use for sample selection, so we used a two-stage 30 x 30 multistage sampling that was devised using information from the CHWs. The first level of the sampling was random selection of the 30 areas in the four group ranches. These 30 areas were selected prior to the start of the field experience and were created using estimated population densities in Loitokitok, with each area having multiple manyattas (Appendix C, Table 0.2). The second level was selection of children at the household level, with a manyatta having one to several households. A household was defined as people that cook and eat from the same cooking pot. We surveyed at least 30 children within each area. If all 30 children were not surveyed at the first manyatta, additional manyattas were visited until all 30 childhood surveys were collected.

One CHW translator was paired with each of the seven data collection groups. These groups, designated before the start of the field experience, were driven to the selected areas and were taken to the center of each area. A direction was randomly selected by dropping a spinning pencil onto the ground and noting the direction in which the writing end pointed. Groups would then walk in the direction indicated by the pencil and would select the manyatta to the left if there were more than one in that direction. No compasses were used, and the direction was therefore reliant only on the Maasai CHWs leading each team. Sometimes several miles of rural bush land would be covered on foot. We carried two-way radios to maintain contact with drivers, and local Maasai warned survey groups and drivers if local wildlife was in the area, such as elephants and lions. Once inside the manyatta, we went to the first hut on the left and asked for the caretaker(s) of the children. If there was more than one caretaker having children in the target group, we surveyed families from every third hut for the household survey and every hut

for the mortality survey. If caretakers did not share a cooking pot (the criteria defining a household), they were considered from different households and all children satisfying the criteria in the Childhood Survey section below were included. If the survey group did not collect data from 30 children, then the process was repeated to randomly select a direction in which to proceed to the next manyatta.

Surveys

Household Survey

The household survey was a battery of baseline questions specific to demographics, health, water, sanitation, food security, and assets. As defined before, a household was identified as people that cook and eat from the same cooking pot. Residential status was qualified as either permanent (requiring residence of greater than 14 months) or internally displaced persons (IDP), mainly due to drought. An IDP is a person that has been removed from their home, but has remained in their country of residence. The full survey and notes regarding each question can be found in Appendix B.

Mortality Survey

The mortality survey was taken from each household in manyattas that were surveyed. Information collected centered on mortality incidence and cause of death within the past three months for individuals less than and greater than or equal to five years of age. Number of people in each household was cross checked by asking for total as well as number less than and greater than or equal to five years of age; this was important as discrepancies occasionally occurred. The full survey and notes regarding each question can be found in Appendix B.

Childhood Survey

The target group for the childhood survey included household children ages six to 59 months as well as 60 to 115 centimeters in height. Both criteria for age and height had to be met. Children less than 24 months or less than 85 centimeters were measured lying down for greater cooperation and accuracy for those unable to stand, while those over these parameters were measured standing using a wooden height board. Initial height was screened with a walking

stick marked with the minimum and maximum heights. Children outside of these parameters were measured and weighed for the benefit of the mother if requested.

The height board was to the 0.1 cm; however, the traumatic experience of lying down for measurement and cooperation for children to be still and straight proved difficult at times. Salter scales were used in kilograms with a detachable and washable “hanging pant” for the children. The scales went up to 25 kg and had a precision of 0.1 kg. Children had shoes and sweaters removed before weighing. The scale was hung from the height-screening walking stick between two members of the survey group. Age of the children was determined with a local calendar and using the hospital given immunization card if caretakers had them. The local calendar included major events from March 2002 to January 2007 including droughts, rainy seasons, harvest, land preparation, and elections.

Children were tested for pitting edema by applying even pressure, with the thumbs, for three full seconds on both feet. If a depression occurred on both feet, the child received a “yes” for edema. The Mid-Upper Arm Circumference (MUAC) was used as a measure for health and acute malnutrition. MUAC measurement is taken at the midpoint of the child’s bare upper arm while the arm is straight. There are four color coded sections to the tape: red is up to 11 cm, orange is 11 to 12.5 cm, white is 12.5 to 13.5 cm, and green is greater than 13.5 cm [6]. Standards for MUAC use a reference population of children in the United States from 1978 considered to be healthy by the World Health Organization (WHO). Both measles vaccination status and overall immunization status were obtained from immunization cards, the caretaker’s word, and vaccination scarring. If a yellow immunization card was not available, this was recorded in the survey. The full survey and notes regarding each question can be found in Appendix B.

CHAPTER 4 - Data Analysis and Results

For data analysis, Microsoft Excel 2003 was used for data entry, Epi InfoTM was used to determine weight for height, and SPSS 9.0 was used for the remainder of the descriptive analysis. Reference populations were taken from the WHO, the Centers for Disease Control and Prevention (CDC) National Center for Health Statistics (NCHS), and the 1999 Kenya Census. Another census was taken in 2009, but results are currently unavailable. A descriptive analysis

was done, as this is the baseline information that will be used for comparison in later studies. A total of 300 household, 622 mortality and 955 childhood surveys were collected from the 30 areas; in some instances, data were missing for particular questions from some surveys.

Demographics

Households averaged 6.38 people per household surveyed with a standard deviation of 2.38. Of these, an average of 1.62 were children under five years of age (standard deviation of 0.88). Out of the 300 households surveyed, 86.7% had a male as the head of the household and 98.1% of these males were the fathers of the children living there. In converse, 79.6% of primary caretakers for households surveyed (N=294) were female. Six percent of households reported both parents as equal caretakers. Table 4.1 shows the education status of the heads of household and primary caretakers. It is important to note that 69.0% of the heads of households and 79.6% of primary caretakers have no formal education. The level of education achieved for children was not accounted for, but 16.6% of households reported having children of school age that were not attending school.

Table 4.1 Household Adult Education Levels (N=300)

Education Level	Head of Household		Primary Caretaker	
	n	%	n	%
No Education	207	69.0	234	79.6
Primary School Dropout	40	13.3	31	10.5
Primary School Graduate	29	9.7	22	7.5
Secondary School Dropout	4	1.3	5	1.7
Secondary School Graduate	15	5.0	1	0.3
College/University Dropout	0	0.0	0	0.0
College/University Graduate	4	1.3	1	0.3
Currently in College	1	0.3	0	0.0

Food Security and Assets

The majority of income for the Maasai in Loitokitok in 2007 was from the sale of food crops or animals (Table 4.2). Of the households surveyed, 30.7% were registered for some form of relief food, but only 7.5% of children were registered for supplemental food.

Table 4.2 Main Household Income Sources for the Maasai in Loitokitok in 2007

Main Source of Income	Current Year (N=295)		Normal Year (N=300)	
	n	%	n	%
Sale of own food crops/animals	231	78.31	236	78.67
Daily labor	25	8.47	26	8.67
Salary	14	4.75	12	4.00
Petty trading	8	2.71	8	2.67
Other	8	2.71	7	2.33
Remittance	4	1.36	4	1.33
Sale of cash crops	3	1.02	4	1.33
Sale of firewood/charcoal	2	0.68	3	1.00
Sale/collection of water	0	0.00	0	0.00

The main source of food for the Maasai was home grown, followed closely by food purchased from the market or other traders (Table 4.3).

Table 4.3 Main Food Source for the Maasai (N=300)

Main Source of Food	Current Year		Normal Year	
	n	%	n	%
Home grown/own produced	172	57.33	186	62.00
Purchased from the market or other traders	125	41.67	100	33.33
Borrowed/Loaned	1	0.33	1	0.33
Relief Food	1	0.33	8	2.67
Other (mainly drink milk)	1	0.33	5	1.67

65.3% of households surveyed reported having access to land for farming, and of this access, 45.7% was community land when the survey was taken. The average acreage accessible for the Maasai with access to land in Loitokitok was 2.45 acres with a standard deviation of 2.34 acres. Acreage ranged from a quarter of an acre to 20 acres. Tables 4.4 and 4.6 provide a summary of the crop planting and livestock holdings of the Maasai for the current year and a typical normal year for all households surveyed. Table 4.5 looks at the four main crops planted

for only those households that planted in 2007. While the number of acres planted and seed planted were both captured, the acreage planted for each crop was not captured.

Table 4.4 Crop Planting Patterns and Stores for All Households (N=300)

Crop	Number of Households Who Planted this Year		Households Who Planted in a Normal Year		Stock in Store	
	n	%	n	%	n	%
Maize	148	49.3	175	58.3	69	23.0
Beans	123	41.0	146	48.7	43	14.3
Onions	26	8.7	36	12.0	1	0.3
Tomatoes	20	6.7	27	9.0	2	0.7
Green Leaves (Sukumawiki)	7	2.3	9	3.0	1	0.3
Bananas	9	3.0	8	2.7	0	0
Sweet Potatoes	5	1.7	6	2.0	1	0.3
Peppers	7	2.3	4	1.3	0	0
Sunflower Oil	5	1.7	4	1.3	1	0.3
Sorghum	4	1.3	4	1.3	1	0.3
Irish Potatoes	1	0.3	4	1.3	0	0
Cassava	4	1.3	2	0.7	0	0
Millet	1	0.3	2	0.7	0	0
Cotton	0	0	0	0	0	0

Table 4.5 Main Crops Planted for Households that Planted (N=168)

Crop	Households Who Planted Crops this Year		Households that Planted the Specific Crop this Year			
	n	%	Average Amount Planted (kg)			
Mean			Std. Dev.	Minimum	Maximum	
Maize	148	88.1	17	22.6	1	180
Beans	123	73.2	29.7	20.6	2	90
Onions	26	15.5	2.9	2.0	0.05	8
Tomatoes	20	11.9	5.8	22.2	0.05	100

Table 4.6 Household Livestock Holdings (N=300)

Animal	No. of Households with Livestock Current Year		Average No. of Animals per Household	No. of Households with Livestock Normal Year		Average No. of Animals per Household	No. of Households that Sold Animals in the Past Month	
	n	%		n	%		n	%
Cattle	220	73.3	13	225	75.0	19	96	32.0
Milking Cows	213	71.0	4	204	68.0	5	7	2.3
Goats	259	86.3	19	241	80.3	27	94	31.3
Sheep	216	72.0	15	203	67.7	19	38	12.7
Chickens	136	45.3	5	118	39.3	6	20	6.7
Turkeys	1	0.3	0	1	0.3	0	2	0.7
Pigs	1	0.3	0	0	0	0	1	0.3

Water and Sanitation

Water quality was evaluated by assessing primary source and treatment methods. The results are shown in Table 4.7. According to the data analyzed, out of the areas visited, six had no surveyed households using a protected water source. To be a protected water source, the water had to be covered with concrete so that no surface water could seep in and contaminate the water source. Enkii, Imbirikani, and Kuku are the only areas where all the sampled population had their primary water source protected. The portion of the sample that used a stagnant unprotected water source, like a well or pond, was 6.4%. The importance of this lies in the microorganisms and pathogens that can be more prevalent in unprotected and/or stagnant sources. These can be soil borne, waterborne, or contaminants from animal and human waste.

Another area of water sanitation considered was water treatment methods. Of the households using an unprotected water source, 76.7% said that they do not use any common form of treatment. Percentages for water treatment methods, including households using protected water sources, were very similar to those in Table 4.7, which only shows treatment for households not using a protected water source.

Table 4.7 Water Quality for the Maasai of Loitokitok District 2007

Primary Water Source (N=300)	n	%	Water Treatment for Households with Unprotected Water Source (N=215)		
			n	%	
Unprotected stream/river	182	60.67	No Treatment	165	76.74
Protected water source	85	28.33	Boiling	44	20.47
Other	14	4.67	Water Guard	4	1.86
Unprotected pond	11	3.67	Other	2	0.93
Unprotected well	8	2.67	Chlorination	0	0.00
			Filtering	0	0.00

Of the 300 households surveyed, 75.0% reported using the toilet in the bush (open air). Of the families that use a latrine, 15.3% use a private one. A community owned latrine encompassed the other responses. The number of people using these latrines was not captured. Relevant corresponding issues include the disease load of the people frequenting the toilet, as well as whether or not the latrines are constructed properly and if they are cleaned out at regular intervals. There is no system in place to monitor the latrines' effect on water sources, or to regulate the proximity of latrines to water sources. These factors all contribute to problems of disease transmission, with the obvious concern of too many people using the toilet.

Rubbish disposal was mainly done by burning. This was most common, 78.7%, followed by 15.7% being thrown out into the streets or bush. The remaining households reported using an open pit or burying the trash. Of the methods and resources available to the communities, burning is a good option as long as it is practiced where the fumes will have the smallest contact with the people when plastics or rubber are burned. Also, the frequency of burning plays a role, as does making sure children are not rummaging through and livestock are not consuming the rubbish.

Health Status

In the child questionnaire, individuals reported the child delivery location for 955 children, with 94.5% delivered at home compared to the remaining 5.5% being delivered at a hospital or healthcare facility. Among households surveyed, 51.5% of the reported children were males. For evaluation of immunization history, 408 of the children had immunizations cards available. For those without immunization cards, the primary caretaker's word and

immunization scarring were utilized to capture data. In the Loitokitok rural areas, 42.5% of children ages nine to 59 months were fully immunized, and 62.3% had at least the measles immunization. Nine months was used as the cut off for children considered fully immunized, as nine months is the typical age that children receive the measles vaccination. Of children ages six to nine months, 31.7% were up to date with their immunization schedule. Only 4.9% of children ages six to 59 months in the survey had received no immunizations.

For data on the 955 children aged six to 59 months, 60.3% were reported to have illness of some form in the two weeks prior to the survey. Of the 576 children with reported illness, 16.8% were reported to have had two forms of illness or symptoms, 1.6% reported three forms of illness or symptoms and 0.5% reported four forms of illness or symptoms. The following figure only summarizes the primary illness.

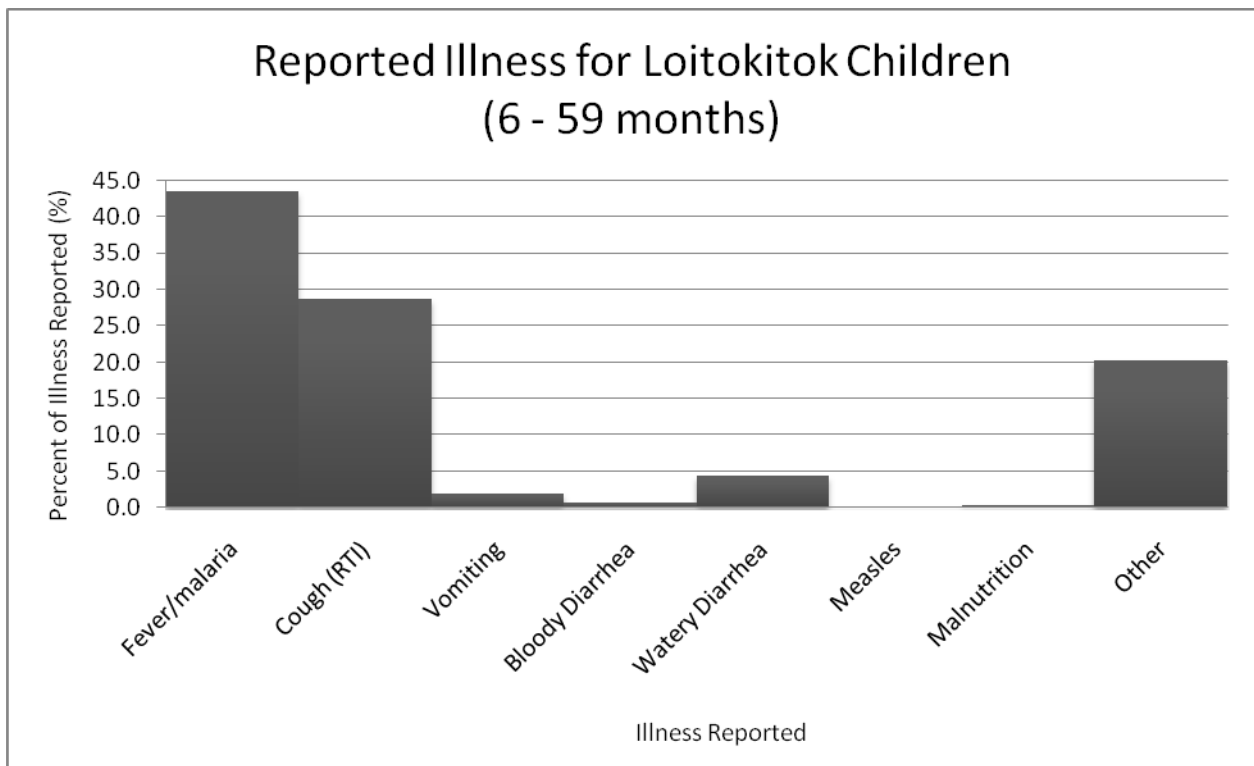


Figure 4.1 Reported Primary Illness in Children (N=576)

Table 4.8 shows the proportional morbidity incidence of children by whether the child came from a household with a protected water source and if the household treated the water intended for consumption.

Table 4.8 Childhood Proportional Morbidity Incidence by Water Source and Treatment Over a Two Week Period (N=576 childhood morbidities)

Morbidity	Morbidity Incidence								Total Cause-Specific Morbidity
	Protected Water Source				Unprotected Water Source				
	Treated (22 households)		Untreated (63 households)		Treated (50 households)		Untreated (165 households)		
	n ¹	% ²	n	%	n	%	n	%	n
Fever/Malaria	15	5.97	64	25.50	38	15.14	134	53.39	251
Cough (RTI)	7	4.24	44	26.67	32	19.39	82	49.70	165
Vomiting	0	0.00	1	9.10	5	45.45	5	45.45	11
Bloody Diarrhea	0	0.00	0	0.00	1	25.00	3	75.00	4
Watery Diarrhea	0	0.00	5	20.00	6	24.00	14	56.00	25
Measles	0	0.00	0	0.00	0	0.00	1	100.00	1
Malnutrition	0	0.00	2	100.00	0	0.00	0	0.00	2
Other	3	2.56	32	27.35	14	11.97	68	58.12	117
								Total Morbidity	576

¹ n represents the count of childhood morbidities by water source and treatment.

² % represents the cause-specific morbidities by water source and treatment over total cause-specific morbidities.

For the mortality survey, there were 33 deaths in the three months prior to survey collection, of which sixty percent were individuals five years of age and older. Mortality was assessed for the 3,854 individuals in all households where mortality surveys were collected. Of these individuals, 72.9% of individuals were five years of age or older. For the three months prior to the survey, the crude mortality for children under five years of age in the households surveyed was 1.2% and for five years and older the crude mortality was 0.7%. The most common reasons for death in children fewer than five years of age were fever/malaria, delivery complications, and unknown causes. For individuals five years of age or older, the most common reasons for mortality were fever/malaria and tuberculosis. Mortality incidence in Maasai children less than five years of age in Loitokitok District is seventy-six percent higher than the mortality incidence in individuals five years of age or older. However, the 95% confidence interval for this odds ratio spans one (0.87, 3.54), and the difference in crude mortality between age groups is therefore statistically insignificant.

Nutrition

To promote proper nutrition early in childhood development in situations where families have low access to adequate nutrition, mothers are encouraged to breast feed children until six months of age as the primary source of nutrition. In the childhood survey, introduction of solid food to children was between birth and six months of age in 96.1% of the children, and introduction of fluid other than breast milk before six months of age was reported for 96.8% of the children. This survey did not evaluate the age of weaning for children. Using the MUAC measurement, 90.8% of children were considered healthy, 7.8% were moderately malnourished and only 1.4% were severely malnourished. Wasting was based on weight for height measurements and indicates acute malnutrition, and stunting which is more indicative of chronic malnutrition was based on height for age. Evaluating wasting, 94.9% of children were considered healthy; however, by stunting standards, only 67.5% of children were in the healthy range. As mentioned before, stunting measures chronic malnutrition and 10.6% of children were considered to have severe chronic malnutrition. No children were found to have edema.

CHAPTER 5 - Discussion

The surveys conducted in 2007 left room for many sources of error. Since there were no registries for the area to provide a population to sample from, the sample population may not be a true representative of the target population of Maasai in Loitokitok District. Collection of information was started in the approximate center of the area, so households at a farther distance from the start point were less likely to be surveyed. Due to the size of the district and the sample size, some areas may not have been well represented; however, estimates of population density were taken into consideration when cluster areas were selected. As with all data collection by survey, there was the chance for misunderstanding of questions asked and mistranslation. Groups worked together going over the questionnaires in one large session with translators making sure that the questions were worded similarly and that everyone understood the meaning of each question before surveying started.

There was also the possibility of surveyors not writing down all information provided, and for individuals to answer questions untruthfully due to cultural or personal reasons. Maasai culture was taken into account when the surveys were developed and critiqued to aid in the

prevention of misinformation. Several questions relied on individuals to recall information regarding the last normal year, immunization history and nutritional history, which also could allow for recall bias. There was also the possibility of data entry errors when groups transferred hard copy results from the field into the Excel master spreadsheet. To help minimize these errors, one person entered all of the data for the surveys while a second person read the data that were entered and watched to assure data were entered correctly. The hard copies were maintained, and when the data were manually cleaned, hard copies could be referred to if any questionable data were found.

CHAPTER 6 – Recommendations

Presentations

Two presentations were given at the end of the field experience. One presentation was to the Ministry of Health and local healthcare providers. This first presentation focused on survey results that could indicate areas of necessary change in local healthcare to better address the needs of the people. The second presentation was to the stakeholders and community leaders of Loitokitok District. This was a presentation of the baseline health data and highlighted the positive and negative, results with negative areas focused on those issues that can improve by practical methods. Both presentations were followed with discussion about issues that the community felt were important, and how the data collected could be used in the future to aid in the health of the Maasai in Loitokitok. Areas not included in the survey that were important to the Maasai were also discussed as directions to consider for the future of the five year plan.

Demographics

Further research to be able to directly compare adult male and female education levels would be beneficial for evaluating association with other aspects of the surveys. Depending on results, feasibility of adult education to increase the quality of health in needed areas may be beneficial. More information is needed to see why children are not attending school, and the average age at which girls and boys each stop attending school. Encouraging government officials to promote education in this area and sensitizing the community to the importance of

education before marriage and family responsibilities were some of the main concerns discussed with both presentations.

Food Security and Assets

The focus of recommendations for food security centered on availability, accessibility, adequacy, and acceptability. Further research on differences between the sale of crops and the sale of animals as sources of income would be beneficial. In regards to food supply, reasons for purchasing food from the market—because of necessity, desire to diversify food supply, or other reason—should be studied in greater detail. Differences in how privately owned and community land are farmed should be evaluated for effect on sustainability and food supply. Further investigation is needed to understand reasons households do not store food. More detailed information is needed to evaluate the regulation of water management to prevent floods and inadequate water supply. More information is also needed to encourage government action in managing wildlife destruction of crop land or potentially reallocate land not in the path of wildlife migration patterns.

Further research is needed to evaluate the quality of livestock health and need for improving body condition, production, and disease prevention in order to benefit the health of the Maasai community. The Maasai rely on their livestock as their livelihood and measure of wealth; as means of improving the Maasai livestock are found, the increase in wealth, quantity, and quality of livestock may have a significant reflection in the health and prosperity of the people themselves. Reasons for individuals selling livestock is needed to identify potential connections to food security. Willingness of Maasai to sell cattle when conditions necessitate, such as drought or to pay for healthcare, also will aid in improving quality of life.

Water and Sanitation

Our survey data indicates that water quality issues may be important contributors to human and potentially livestock health in the region. The first recommendation that must be noted is one of utilizing the primary interests of the Maasai people to improve their quality of life. One of the CHWs made the point that the Maasai had increased burning of rubbish as an improved change in practice due to the Maasai concern for their livestock, and not wanting them to ingest the rubbish that had been discarded. The Maasai reliance on their livestock lends them

to more readily make management changes that will show a noticeable impact on their livestock rather than on themselves or their families.

This observation can be applied to other areas of sanitation, such as water source and treatment. If the Maasai people are educated about improving the quality of their water to prevent their cattle from getting sick, they might be more interested in making sure the water is clean before they use it. This will help to prevent their livestock from contracting as many diseases, but more importantly, it will help to decrease the amount of waterborne diseases that they themselves contract. Understandably, water quality for livestock does not need to be held to the same standards as water quality for people; however, implementing more water management to decrease contaminants will benefit both humans and livestock.

Improving the health of the animals will also provide an indirect source of increased health in the people, by improving value of the animal, nutritional content of the byproducts (such as milk, cheese, and eggs), and reproductive capabilities of the livestock. There are limitations to the reproduction and production of the livestock, especially with the quality and quantity of grazing resources. This is another area that needs to be addressed if the Maasai continue to have limited access to local grazing areas and as the amount of their land turning to tilled crop land increases. Basic education programs could incorporate simple methods of improving the management of the livestock, while being culturally sensitive and affordable.

The information on water sources and treatment is a good foundation for future work in determining what diseases are contracted by the Maasai and their livestock from contaminated water. Once the diseases are identified, there must be research into whether the water treatment practices, especially boiling, are beneficial in preventing the diseases in the area. This further research is the second recommendation of what needs to be done. When diseases have been identified, prevention and treatment programs can then be implemented.

Health Status

Caretakers should be taught the importance of completed immunizations for their children. The significance of follow-up immunizations could be stressed to the mother during antenatal and postnatal counseling. Care providers must have access to consistent availability of vaccines and supplies for this to occur; currently, there are times that availability is an issue. After visiting healthcare providers, proper storage of vaccines must be stressed. Cold chains

need to be inspected by the ministry on a regular basis, to include private clinics. Additional records for immunization cards should be kept on file by the provider, as caretakers did not have immunization cards for 57.3% of children, whether due to displacement, fire, or negligence. Plastic sleeves should be given to each household for protection of cards as well. Further research should be conducted on major causes of death during child delivery.

Nutrition

Recommendations included expanding Early Childhood Development programs sponsored by non-government organizations (NGOs) and the government of Kenya, by providing food to participating children as meals or take home packages. Promotion of exclusive breastfeeding through six months of age to increase nutrition and decrease disease of children should be taught. Education for expectant mothers at prenatal examinations on prenatal nutrition would be valuable, in addition to training mothers how to utilize their staple foods to increase the carbohydrate intake of their children.

CHAPTER 7 – Conclusion

My main objective in deciding upon a field experience was to find a project focused on the enhancement of quality of life and improved public health of underprivileged individuals. As a public health veterinarian, my interests gravitate towards helping individuals that rely heavily on agriculture and livestock for sustainability and management changes that can efficiently improve their circumstances. The Maasai are often an overlooked group of people that have a great need for direction as they adjust to substantial forced changes in their lifestyle and culture.

My short term focus for this study was mainly on things that are relatively easy and inexpensive to change, and outcomes which the Maasai will see as beneficial to their livestock and wealth. Most of the recommendations in the Food Security and Assets section above are my personal recommendations that were presented and discussed during the presentations in Loitokitok, as this was the particular area that I was responsible for addressing. The first recommendation in the Water and Sanitation section focusing on teaching the importance of improving water quality for the livestock which in turn will improve quality for the people is also my personal suggestion. Because of the reliance and great importance of livestock in the Maasai

culture, focusing changes to improve the quality of management for the livestock will afford greater success in overall management changes than if focus is put on just changing practices without emphasizing the impact on the livestock. The current project leader from Boston University, who was not a part of the first year of the project, disagreed with this in a follow up conversation regarding the direction of the project. He does feel that water quality should be the main focus of the project, but believes that the Maasai's cultural reliance on their livestock is not significant enough to be utilized in directing lifestyle changes.

In addition, it would be beneficial to look at shared crop land, and how it is determined what is grown and who will work the land. If there is more sense of ownership by the Maasai in the land that they are working, they may take more preventative and conservative steps to ensure longer and more successful use of the soil and water available. In areas without protected water sources, samples should be taken to determine contaminants and decide what methods of treatment are best for the areas. Training of community healthcare workers (CHWs) to educate people about treatment as well as implementing education into schools would be an inexpensive and potentially effective preventative measure. Currently lessons on hand washing, boiling water, childhood deworming and vitamins are incorporated into school curricula. Once education commences, childhood morbidity incidence should be monitored as changes are made in water treatment to see if the education and treatments are effective. For the 25% of families surveyed that use a latrine, more information is needed to look at the number of people using the latrines, what type of sanitation and monitoring, if any, is done, and the latrines' proximity to water sources.

For children not attending school, the level of education completed and what the gender differences for average completed education levels should be determined. How many households always receive relief food and supplemental food for children? What are the conditions that determine whether a family receives relief food? There are many directions that the study could go in assessing the community and environmental health of the Maasai in Loitokitok District. However, it is my opinion that water and food security are the top priorities, and will have the greatest impact on the overall health of the people and their livestock. Using the cultural and financial reliance on the livestock as a means for preventative education is an important component in the success of this endeavor. Therefore, it is also imperative to

understand the education level of the people to best formulate means of incorporating preventative medicine education into the lives of the people that the project intends to improve.

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Appendix A - Acronyms

AIDS	Acquired immunodeficiency syndrome
CDC	Centers for Disease Control and Prevention
CHW	Community health worker
CHEW	Community health extension worker
DDT	Dichlorodiphenyltrichloroethane
DPHO	District public health officer
HIV	Human immunodeficiency virus
IDP	Internally displaced person
KBC	Kilimanjaro Base Camp
MUAC	Middle upper arm circumference
NCHS	National Center for Health Statistics
NIDRA	Nomadic Integrated Development Research Agency
NGO	Non-government organization
NPS	National Park Site
SFS	The School for Field Studies, Boston University
TBA	Traditional birth attendant
USD	United States dollar
WHO	World Health Organization

Appendix B - Survey Templates

SFS/NIDRA LOITOKITOK BASELINE SURVEY

HOUSEHOLD QUESTIONNAIRE

Date: _____ **HH:** _____ **CHID:** _____ **Team:** _____
Division: _____ **Location:** _____ **Sub-location:** _____ **Ranch:** _____ **Cluster:** _____

Section 1 - Demography

1a. Is the household: Long-term residents only Displaced by drought Mixed

Fill in the table below- for one household only (resident left side, displaced right, mixed – both)

Ordinarily resident (i.e. lived in Loitokitok ≥ 14 mo)			Displaced since drought (i.e. living here < 14 mo)			Total	
Children < 5	Pop ≥ 5 yr	Total	Children < 5	Pop ≥ 5 yr	Total	< 5	≥ 5

*A household is all members of a family eating from the same pot. *INCLUDE CHILDREN < 6 MONTHS ALSO

1b: How many households are living together under the same roof? _____

1c. FILL IN TABLE IF DISPLACED BY DROUGHT ONLY:

Date of arrival (Month & Year)	Division	Location	Village

2. Head of household: (circle) 1 2 3 4 5 6 7 8

3. What is the highest level of education the head of household has completed? (circle)
 0 1 2 3 4 5 6 7

4. Who is the main caretaker of the children (relationship): (circle)
 1 2 3 4 5 6 7 _____

5. What is the highest level of education the primary caretaker has completed? (circle)
 0 1 2 3 4 5 6 7

6. How many children of school age are attending school? _____

7. How many children of school age are NOT attending school? _____

Section 2 – Health

8. What is your primary water source? (circle) 1 2 3 4 5 _____

9. Do you treat your water before drinking it? (circle) 0 1 2 3 4 5 _____
10. Where do you go to the toilet? (circle) 1 2 3 4 _____
11. Where do you dispose of your rubbish? 1 2 3 4 5 _____
12. If you or your family are sick – where do you go for treatment FIRST? (circle)
1 2 3 4 5 _____

Section 3 – Food security & Assets

13. When was the last ‘normal year’? _____
14. What is your MAIN source of food currently (if two are equal, write both numbers)?
1 2 3 4 5 _____
15. What was your MAIN source of food in a normal year (when no displacement)?
1 2 3 4 5 _____
16. What is your MAIN source of income currently?
1 2 3 4 5 6 7 8 9 _____
17. What is your MAIN source of income in a normal year (when no displacement)?
1 2 3 4 5 6 7 8 9 _____
18. Do you have access to land for farming currently? Y / N
If yes – how much land do you have access to? _____ acres
Is this land Own land Rented Gifted Community land
Other? _____
19. a. Do you plant crops in a normal year? Y / N
(If no, skip section a of table 19d below).
- b. Did you plant this year? Y / N
(If no, skip section b of table 19d below).
- c. If not, why? 1 2 3 4 5 _____

Table 19d.

Crop	a. Amount planted normal yr	b. Amount planted this yr	Amount in store
Maize			
Sorghum			
Millet			
Cassava			
Sweet potatoes			
Beans			

Crop	a. Amount planted normal yr	b. Amount planted this yr	Amount in store
Bananas			
Green leaves			
Beans			
Sunflower oil			
Cotton			
Irish potatoes			

Other:

20. a. Do you have animals in a normal year? Y / N
 (If no, skip section a of Table 20d below).
- b. Do you have animals currently? Y / N
 (If no, skip question 20c, *and* section b, *and* c of Table 20d below).
- c. If you have animals now, have you sold any animals in the last 4 weeks? Y / N
 (If no, skip section c in Table 20d below).

Table 20d. How many animals do you have currently, in a normal year, and how many have you sold in the last 4 weeks?

Animal	a. Normal Year	b. Current Year	c. Number Sold in the Last 4 weeks
Cattle			
Milking cow			
Goat			
Sheep			

Animal	a. Normal Year	b. Current Year	c. Number Sold in the Last 4 weeks
Pigs			
Turkeys			
Chickens			
Other (specify)			

21. Are you registered to receive relief food rations? Y / N From whom? _____
 How many people in the household share the ration? _____
22. Do you have any children registered to receive supplementary food? Y / N
 If yes, how many are registered? _____

SFS/NIDRA LOITOKITOK BASELINE SURVEY

Household Questionnaire – Notes

No	Question	Answers
SECTION 1 – DEMOGRAPHY		
2	Head of household	1 = Male – father 2 = Male – other family member/ adult child (i.e. 18 yrs or more) 3 = Female – Husband died due to conflict 4 = Female – Husband died due to illness 5 = Female – Husband permanently away on business (not sending money) 6 = Female – Husband permanently away on business (sending money) 7 = Female – Divorced/separated 8 = Female – Other reason (specify on back) 9 = Child headed (i.e. no other adults caring for them, < 18 years)
3	Education: Head of household	0 = No Education 1 = Primary School Dropout 2 = Primary School Graduate 3 = Secondary School Dropout 4 = Secondary School Graduate 5 = College/University Dropout 6 = College/University Graduate 7 = Other (specify on back)
4	Main caretaker	1 = Mother 2 = Father 3 = Both parents equally 4 = Grandmother 5 = Grandfather 6 = Sibling 7 = Other (specify)
5	Education: Primary caretaker	0 = No Education 1 = Primary School Dropout 2 = Primary School Graduate 3 = Secondary School Dropout 4 = Secondary School Graduate 5 = College/University Dropout 6 = College/University Graduate 7 = Other (specify on back)
SECTION 2 – HEALTH		
8	Primary Water Source	1 = Protected water source (covered with concrete – no surface water enters) 2 = Unprotected well 3 = Unprotected pond 4 = Unprotected stream/river 5 = Other (specify on back)
9	Water Treatment	0 = No treatment 1 = Boiling 2 = Filtering 3 = Water Guard 4 = Chlorination 5 = Other (specify on back)

10	Toilet	1 = Privately owned latrine 2 = Community owned latrine 3 = Bush (open air) 4 = Other (specify on back)	
11	Rubbish disposal	1 = Burnt 2 = Buried 3 = Thrown on the street/elsewhere 4 = Open pit 5 = Other (specify on back)	
12	Choice of health facility	1 = Hospital/Health Center 2 = Private clinic 3 = Traditional healer 4 = Other (specify on back)	
SECTION 3 – FOOD SECURITY			
14	Main food source & currently & in a normal year	1 = Home grown/own produced (crops/animals)	
15		2 = Purchased from the market/other traders 3 = Borrowed/loaned 4 = Relief food 5 = Other (specify on back)	
16	Main source of income – currently	1 = Sale of own food crops/animals	6 = Daily labour
17		2 = Sale of cash crops (sunflower oil, cotton) 3 = Petty trading (buying & selling items) 4 = Sale of firewood/charcoal 5 = Sale/collection of water	7 = Salary 8 = Remittance 9=Other (specify)
19	Reasons for not planting	1 = No access to land 2 = No seeds	3 = No tools 4 = Never plant 5 = Other (specify)

SFS/NIDRA LOITOKITOK BASELINE SURVEY

NOTES FOR COMPLETION OF MORTALITY SURVEY

HH no.	This number refers to the household number in the cluster.	Write 'M' followed by individual number of household e.g. M3
IDP/Res/ Mixed	How long has the family been living here? If moved since conflict, i.e. < 14 months put 0. If permanent, i.e. more than 14 months put 1. If a mixture of long term resident and IDP, put 2.	0= IDP 1= Long term resident 2= Mixed
No. <5 years	Fill in the number of children younger than five years of age living in the household the day of the survey.	Write number e.g. 4
No. ≥5 years	Fill in the number of people five years of age or older living in the household the day of the survey.	Write number e.g. 3
Total no. in household	Fill in the total number of people living in the household the day of the survey. Be sure to ask this question, don't just add the previous two columns, as this is where Senewa wants to be sure we cross-check.	Write the number e.g. 12
Child ID number	This number refers to the identification number of the child under five years old that has died in the last three months. Use multiple lines if multiple deaths.	'C' followed by individual ID number e.g. C1
Cause 1- 11*	Use the *Cause of Death code at the bottom of the Mortality Survey to define the cause of the child's death.	1= Diarrhea 2= Measles 3= Fever/Malaria 4= Cough/cold/ARI 5= Malnutrition 6= Accident 7= Unknown 8= Conflict 9= Old Age 10= Disappeared 11= Other
Person ID number	This number refers to the identification number of the person five years of age or older that has died in the last three months. Use multiple lines if multiple deaths.	'P' followed by individual ID number e.g. P3
Cause 1- 11*	Use the *Cause of Death code at the bottom of the Mortality Survey to define the cause of the person's death.	1= Diarrhea 2= Measles 3= Fever/Malaria 4= Cough/cold/ARI 5= Malnutrition 6= Accident 7= Unknown 8= Conflict 9= Old Age 10= Disappeared 11= Other
Remarks	Please include any comments that you may have regarding the specific child, person or situation, including other causes of death.	Comment if applicable.

SFS/NIDRA LOITOKITOK BASELINE SURVEY: Child Questionnaire

Date: Child	Team: III	CH ID	Division: IDP/Res	Sex (M/F)	Location: Oed	Age (mo)	Sub-location: Anthropometric			Card (0.1)	Immunizations			Morbidity (0-8)	Breast (0-2)	First Food (Days)	First Fluid (Days)	Delivery (0-2)	
							MUAC	Height (cm)	Weight (kg)		Measle (0.1)	BCG Scar (0.1)	DPT (0-3)						Polio (0-3)
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			

SFS/NIDRA LOITOKITOK BASELINE SURVEY

NOTES FOR COMPLETION OF CHILD QUESTIONNAIRE

CHILD	This number refers to the child number in the cluster.	DO NOT ENTER
HHID	This is the household number.	Enter Household Number
CHID	This is the Date - Team Number - Household ID - Child Number	Enter Manually
IDP/Res	How long has the child been living here? If permanent, i.e. more than 14 months put 1. If moved since conflict, i.e. < 14 months put 2.	0 = IDP 1 = 14 months or greater
Sex	Fill in the sex of the child.	M = Male F = Female
Edema	Apply pressure for 3 seconds (count 1,000, 2,000, 3,000). If there is pitting (depressed area) on both feet put Yes. If not put No.	0 = No 1 = Yes
Age	Write the age of the child in months. If possible use the child's health card. If the mother is not sure – use the events calendar. Also use the age calendar to calculate the months. Only include 6-59 months	Write the number e.g. 54
MUAC	Take the MUAC and record the number which appears in full.	Write number e.g. 103
Height	Take the length/height of the child (children ≤ 85 cm lying down). Record height to nearest mm. For example 109.4 cm. Only include children 65 – 115 cm.	Write number e.g. 105.3
Weight	Weigh the child and record the weight to the nearest 100 g e.g. 3.6 kg	Write the number e.g. 6.1
Card	Does the child have a yellow medical card? If no immunization information is filled out on the card disregard card, record 0, and use mothers verbal word.	0 = No Card 1 = Card
Measles	Check for measles.	0 = No Injections 1 = Yes One Injection
BCG Scar	Check to see if child has BCG vaccination scar on posterior of the left forearm.	0 = No Scar 1 = Scar
DPT	There are three injections required for total immunization.	0 = No Injections 1 = 1 Injection 2 = 2 Injections 3 = 3 Injections
Polio	There are three immunizations required for Polio vaccination but up to 4 different immunizations can occur.	0 = No Immunizations 1 = 1 Immunization 2 = 2 Immunizations 3 = 3+ Immunizations
Morbidity	Ask the caretaker if the child has been ill in the two weeks prior to the survey. If they have, write down the numbers of all the illnesses that apply. Diarrhea = 3 or more loose stools/day. A verbal declaration from the mother is acceptable. If the response is other – please write the child number on the back of the paper and write down the disease.	0 = No, Healthy 1 = fever/malaria 2 = cough (RTI) 3 = vomiting 4 = bloody diarrhea 5 = watery diarrhea 6 = measles 7 = malnutrition 8 = other (specify)

Breast	Is the child currently breastfeeding?	0 = Never breastfed 1 = Not currently breastfed, but was before 2 = Yes currently breastfed
First food	Ask the caretaker how old was the child when they were first given solid food? (anything not fluid) Write down the number followed by D = Day (1 Month = 30 days)	Number of Days
First Liquid	Ask the caretaker how old was the child when they were first given liquid other than breast milk? Write down the number followed by D = Day (1 Month = 30 days)	Number of Days
Delivery	Ask the caretaker where the child was born.	1 = Home 2 = Hospital/Health Facility 3 = Other (specify)

Appendix C - Additional Tables

Table 0.1 Crop Planting and Food Storage Conversions

CROP CONVERSIONS		FOOD STORAGE	
Crop	Amount Planted per Acre of Land (kg)	Storage Unit	Amount per Unit (kg)
Beans	30.0	1 bag	90.0
Green Leaves (Sukumawiki)	0.2	---	---
Maize	10.0	1 bag	90.0
Onion	4.0	1 net	14.0
Potatoes	200.0	1 bag	100.0
Sweet Potato	200.0	1 bag	100.0
Tomato	0.5	---	---

Table 0.2 Surveyed Areas in Loitokitok

	Geographic Locations	Survey Areas	# Teams	Team #	Day of Survey	Date
1	Ilital	3	5	1,2,3,4,5	1	6/15/2007
2	Oyarata	1	2	6,7	1	6/15/2007
3	Kuku	1	2	4,5	2	6/16/2007
4	Enkesero	1	2	2,3	2	6/16/2007
5	Marrlal	1	2	1,6,7	2	6/16/2007
6	Olkaria	2	5	3,4,5,6,7	3	6/17/2007
7	Curie	1	2	1,2	3	6/17/2007
8	Inkisanjani	3	7	All teams	4	6/18/2007
9	Elangata Ekina	2	5	1,2,3,4,5	5	6/19/2007
10	Olorika	1	2	6,7	5	6/19/2007
11	Enkii	1	2	4,5	6	6/20/2007
12	Center Oltiasika	1	2	2,3	6	6/20/2007
13	Oloile	1	3	1,6,7	6	6/20/2007
14	Enchoro	1	3	1,6,7	6	6/20/2007
15	Olgulului	1	2	1,2	7	6/21/2007
16	Imbirikani	1	2	3,4	7	6/21/2007
17	Impiron	2	3	5,6,7	7	6/21/2007
18	Enkumi	1	2	5,6	8	6/22/2007
19	Olmakau	1	3	1,4,7	8	6/22/2007
20	Olkilunyet	1	2	2,3	8	6/22/2007
21	Noomayanet	1	2	1,7	9	6/23/2007
22	Isinet	2	5	2,3,4,5,6	9	6/23/2007