THESIS

CHOP FAYNE: NUTRITIONAL REALITIES IN CAMEROON AND INTERVENTIONS IN THE NORTHWEST PROVINCE

Submitted by

Kathryn R. Reinsma

Food Science and Human Nutrition

In partial fulfillment of the requirements

For the Degree of Master of Science

Colorado State University

Fort Collins, Colorado

Spring 2008

ABSTRACT OF THESIS

CHOP FAYNE: NUTRITIONAL REALITIES IN CAMEROON AND INTERVENTIONS IN THE NORTHWEST PROVINCE

This paper illustrates the socio-cultural, economic, political, and health environment and work experiences of a Peace Corps Master's International Student in Cameroon, Africa, from October 2005 to November 2007. This paper is not written with the intention of giving a complete synopsis of the social, economic, and nutrition situation of this sub-Saharan country, but merely to provide a snapshot of the current circumstances, summary of the nutrition interventions and public health projects attempted, and lessons learned. In order to provide the context in which this paper was written, the first chapter will begin with an explanation of the Peace Corps Master's International coordinated program, a brief history of Cameroon, and a broad overview of the current political, social, economic, and environmental situation. The second chapter will summarize the nutrition status of Cameroonians regarding diet, mother and child nutrition, non-communicable diseases, and people living with HIV/AIDS (hereafter referred to as PLWHA). The third chapter will focus on the various nutrition interventions attempted among mothers of young children, people with diabetes, and PLWHA in the Northwest Province. The final chapter will pertain to the rehabilitation of the water project, the main work project throughout the two years.

Kathryn R. Reinsma
Food Science and Human Nutrition Department
Colorado State University
Fort Collins, CO 80523
Spring 2008

DEDICATION

Dedicated to my Cameroonian friends and 'family' who fed me, challenged me, encouraged me, inspired me, cared for me, and changed me. Your lives and stories will always remain with me and are being shared across the world. You are not forgotten.

Saudade

TABLE OF CONTENTS

Chop Fayne: Nutritional Realities in Cameroon and Interventions in the Northwest Province

INTRODUCTION

This paper illustrates the socio-cultural, economic, political, and health environment and work experiences of a Peace Corps Master's International Student in Cameroon, Africa, from October 2005 to November 2007. This paper is not written with the intention of giving a complete synopsis of the social, economic, and nutrition situation of this sub-Saharan country, but merely to provide a snapshot of the current circumstances, summary of the nutrition interventions and public health projects attempted, and lessons learned. In order to provide the context in which this paper was written, the first chapter will begin with an explanation of the Peace Corps Master's International coordinated program, a brief history of Cameroon, and a broad overview of the current political, social, economic, and environmental situation. The second chapter will summarize the nutrition status of Cameroonians regarding diet, mother and child nutrition, non-communicable diseases, and people living with HIV/AIDS (hereafter referred to as PLWHA). The third chapter will focus on the various nutrition interventions attempted among mothers of young children, people with diabetes, and PLWHA in the Northwest Province. The final chapter will pertain to the rehabilitation of the water project, the main work project throughout the two years.

CHAPTER I

BACKGROUND

1.1 Peace Corps Master's International Program

The Peace Corps Master's International (MI) coordinated program was first established in 1987 to address the first goal of Peace Corps: to help interested host countries in meeting their need for trained men and women. Prospective students apply simultaneously to both the Peace Corps and the participating graduate school of the student's choice. This program was introduced to the Food Science and Human Nutrition Department at Colorado State University in the Fall of 2004. CSU graduate students complete one year of graduate course work, serve as a Peace Corps Volunteer for two years, and then return to graduate school to finish coursework, share experiences with faculty and students, and present a professional paper. This program gives students the unique opportunity to apply theory to practice and implement their own ideas while living overseas. I was the first graduate student from CSU's Food and Human Nutrition Department to participate in this program and attended CSU from August 2004-August 2005 and served in Bafut, Northwest Province, Cameroon, Africa, as a Community Health Peace Corps Volunteer from October 2005-November 2007 and returned to CSU to complete my Master's degree in January 2008.

1.2 Cameroon History

Ever since Hannon, the Carthaginian, in the fifth century journeyed to Mount Cameroon, the tallest mountain in West Africa, the country's fortunes and health issues have been subject to numerous fluctuations. Cameroon received its name from Rio dos Cameros (River of Prawns) when in 1472 sailors from Fernando Po entered the Wouri

Estuary and were amazed by the abundance of shrimp in the river. Over the next two centuries, coastal Cameroon became an important port of call for the Dutch, Portuguese and British slave traders. However, it was not until the mid-19th century that a permanent European settlement was formed. The first was established by British missionaries in protest to the slave trade. In 1884 the British influence was curtailed when the Germans signed a treaty with the well-organized chiefdoms of Douala and in the central Bamelieke Plateau. For the local inhabitants the agreement meant little more than a shift from one form of colonial exploitation to another. In 1918, at the beginning of the First World War, the French and the British expelled the Germans and took possession of and partitioned the colony. The eastern part, about 80% of the land, became a French colony, while the western part became a British colony (Fitzpatrick, 2002).

1.3 Cameroon Government

Cameroon was not impervious to the wave of nationalism that grew throughout Africa after World War II. Self-government was granted to French Cameroon in 1958 and independence in 1960. Ahmadou Ahidjo became president of the newly independent state and held this position until resigning in 1982. In October 1961, the southern section of British-mandated Cameroon (the area around what is currently Bamenda, Northwest Province) voted to join the newly independent Cameroon Republic while the northern portion voted to join Nigeria. During the 1970's, Ahidjo strove to promote nationalism and a sense of Cameroonian identity. As a result of these efforts, the government supported a referendum in 1972 that overwhelmingly approved the dissolution of the British-French federal structure in favor of a unitary United Republic of Cameroon—a decision that is still bitterly resented in Anglophone Cameroon to this day.

In 1982, Ahidjo's hand-picked successor, Paul Biya, came to power. Biya has managed to cling to power for 25 years, grudgingly allowing multiparty elections two times during his tenure. He is known for spending more time in France than Cameroon and leaving his country in its customary state of uneasy stability and political stagnation. In 1998 and 1999 the international anticorruption organization, Transparency International gave Cameroon the dubious distinction of being the world's most corrupt country (Fitzpatrick, 2002). Since then it continues to be listed among the 20 most corrupt countries in the world. Corruption affects every aspect of daily life in Cameroon, from dealing with petty government officials to access to medical care and treatment.

1.4 Cameroon People

As long ago as 8000 BC, the area that is now Cameroon was a meeting point of cultures. In the south, the original inhabitants were various ethno-linguistic groups of short stature, commonly known as 'Pygmies'. Although large communities of 'Pygmies" still remain in the East Province, about 2000 years ago this group of people were replaced by the Bantu peoples moving southeast from present-day Nigeria and the Sahel region. In the extreme North, near Lake Chad, are the Sao people, who migrated from the Nile Valley around the 8th or 9th century. Another important migration occurred in the early 15th century when the Fulani moved eastwards from Senegal. By the late 16th century this group dominated most of north central Cameroon (Fitzpatrick, 2002) and continues to dominate the region today.

1.5 Cameroon Languages

In his book, *Gun, Germs, and Steel,* Jared Diamond writes,

> The Niger-Congo language family is distributed all over West Africa

> and most of sub-equatorial Africa. All Niger-Congo languages of subequatorial Africa belong to a single language subgroup termed Bantu. The most distinctive Bantu languages, and the non-Bantu Niger-Congo languages most closely related to Bantu languages, are packed into a tiny area in Cameroon and adjacent eastern Nigeria. Evidently, the Niger-Congo language family arose in West Africa; the Bantu branch at the east end of the range in Cameroon and Nigeria and then spread out of that homeland over most of subequatorial Africa (pgs 384-385).

This explains why today Cameroon could be classified as the "crossroads of West Africa." With a population of approximately 16 million people, it is a mosaic of some 300 ethnic groups and 239 tribal languages. Officially, Cameroon is a bilingual country, but in reality that translates into the two provinces that were British, the Northwest and Southwest, as Pidgin-English speaking and the remaining 8 provinces that were French, the South, East, Central, Littoral, West, Adamoua, North, and Extreme North Province as French-speaking.

1.6 Cameroon Economy

The World Bank classifies Cameroon as a lower middle-income country. Agriculture, primarily subsistence farming, is the mainstay of Cameroon's economy. It provides a living for 80% of the population and accounts for about one-third of the gross domestic product and for more than half of all export earnings. Cameroon is one of the few net food exporters in Africa. Cocoa and coffee are the main cash crops. Other exports

include timber, aluminum, cotton, natural rubber, bananas, peanuts, tobacco, and tea. While Cameroon is currently self-sufficient in food production because of its rich volcanic soils, there is growing concern that this trend is not sustainable.

As in all African countries, income disparities are wide. Corruption is endemic and is reported to be on the increase as the economy develops. The state is still the biggest employer of labor. Privatization efforts underway in Cameroon are making significant improvements in services to the general population. The national electric company, the national rail service, and the mobile telephone industry have all been privatized in the last couple of years (Peace Corps, 2004).

Prior to 1985, per capita GNP was one of the highest in sub-Saharan Africa largely due to plentiful natural resources such as oil, cocoa, and coffee. When these markets collapsed and prices plunged, Cameroon's economy went into freefall. It has never really recovered and the added affects of the devaluation of the currency in 1994 are still being felt by many Cameroonians today.

During the years 1995-2000 there was renewed growth in GDP due to structural and institutional reforms. In 2001-2005 it dipped as construction was completed on the Chad-Cameroon oil pipeline and subsequent rapid decline in oil production. A slight economic rebound was observed in 2006 as a result of higher agricultural production and higher oil production following the discovery of new fields. Although an estimated 40% of the population lives below the poverty line, Cameroon has one of West Africa's higher annual per capita income levels (World Bank: Country Brief, March 2007).

1.7 Cameroon Environment

Cameroon is an elongated, triangular country found at the juncture of West and equatorial Africa. It extends from the Gulf of Guinea to Lake Chad and is a land of physical, climatic, and cultural contrast. Cameroon as been nick-named "Africa in miniature" because of all its geographic variations—from desert to rain forest to grassland plateau to mountains to tropical beaches. Dense forest and heavy rainfall prevail in the south while a vast grassland plateau covers the north. The western provinces feature a mountain range with steep slopes including the highest mountain in West Africa, and a prolonged rainy season (Peace Corps, 2004).

CHAPTER II

NUTRITION AND CAMEROON

2.1 Diet

The aforementioned socio-cultural, economic, and environmental diversity have a profound influence on the variations in diet and nutrition throughout the country. The Northern parts of Cameroon, comprised of the Extreme North, North, and Adamoua provinces, are dry and have limited food crops. This area of the country is predominately Islam and the Muslims are herdsmen, thus beef, fresh milk, and yogurt are plentiful. The only crops that can be grown are millet, groundnuts, tomatoes, and onions. In comparison, the West/Southwest/Northwest are the humid highlands region of the country and the most conducive to growing a variety of food crops such as maize, cassava/maniac, ground nuts, beans, carrots, green beans, cabbage, bananas, mangos, papaya, but little beef and milk. Much of this food is transported to the East/South/Central provinces where cash crops like tobacco are grown, but few foodstuffs.

2.2 Maternal and Child Nutrition

The subsequent data and tables representing the current status of mother and child nutrition come from the 2004 Cameroon Demographic and Health Survey (Enquête Démographique et de Santé - EDSC III) a nationally representative survey of 10,462 households, conducted by National Institute of Statistics (NIS), in collaboration with

Ministry of Planning, Development Programming and Regional Development (MINPLAPDAT), Yaoundé, Cameroon.

Of the 8,097 children age 0-59 months that were part of the study, a sub sample (50 percent) of children was measured to provide anthropometric data. Of the 3,705 children who were measured, there were 3,156 children whose mothers were interviewed. All nutritional analyses in the following statistics include these 3,156 children. Nutritional data collected on these children include height, weight, age, breastfeeding history, and feeding patterns. Information was also collected on the prevalence of diarrhea and acute respiratory infection (ARI) in the two weeks prior to the survey and on relevant socio-demographic characteristics. For comparison, when available, data are presented from Demographic and Health Surveys conducted in other sub-Saharan countries.

Infectious diseases such as acute respiratory infections, diarrhea, and malaria account for the greatest proportion of infant and under-five mortality. The infant mortality rate (under-one rate) is a commonly used measure of infant health and is a sensitive indicator of the socioeconomic conditions of a country. Cameroon's under-one mortality rate (74 deaths per 1,000 births) indicates that 7 percent of children born in Cameroon will die before their first birthday. This rate is in the lower range of all the sub-Saharan countries surveyed.

The under-five mortality rate is another informative indicator of infant and child survival. Cameroon's under-five mortality rate (144 deaths per 1,000 births) indicates that 14 percent of children born in Cameroon will die before their fifth birthday. This rate is also near the lower end of the range of sub-Saharan countries surveyed.

According to the Cameroon Demographic and Health Study conducted in 2004, malnutrition, as defined by the U.S. National Center for Health Statistics (NCHS), the Centers for Disease Control and Prevention (CDC), and the World Health Organization (WHO), is one of the most important health and welfare problems among infants and young children in Cameroon. The researchers' state:

> Malnutrition is a result of both inadequate food intake and illness. Inadequate food intake is a consequence of insufficient food available at the household level, improper feeding practices, or both. Improper feeding practices include both the quality and quantity of foods offered to young children as well as the timing of their introduction. Poor sanitation puts young children at increased risk of illness, in particular diarrheal disease, which adversely affects their nutritional status. Both inadequate food intake and poor environmental sanitation reflect underlying social and economic conditions.

It is well known that malnutrition not only has significant health consequences, the most serious of which is an increased risk of death, but also cognitive development and economic consequences. The accumulate effects of long-term malnutrition may be evident in adulthood causing reduction in work productivity, workplace absenteeism, and overall reduction in a person's lifetime earning potential and ability to contribute to the national economy.

From a public health and policy prospective, it is important to differentiate between stunting, wasting, and underweight. *Stunted* growth is usually the result of chronic malnutrition and can be due to causes such as inadequate intake of food over a long period and may be exacerbated by chronic illness. On the other hand, *wasting* is the

result of acute malnutrition due to a recent failure to receive adequate nutrition and may be affected by acute illness, especially diarrhea. An *underweight* child may suffer from chronic or acute malnutrition or a combination of both.

In Cameroon, thirty-two percent of children ages 0-59 months are chronically malnourished. In other words, they are too short for their age, or *stunted (*height-for-age Z-score that is below -2 SD based on the WHO/CDC/NCHS reference population). The proportion of children who are stunted is 16 times the level expected in a healthy, well-nourished population.

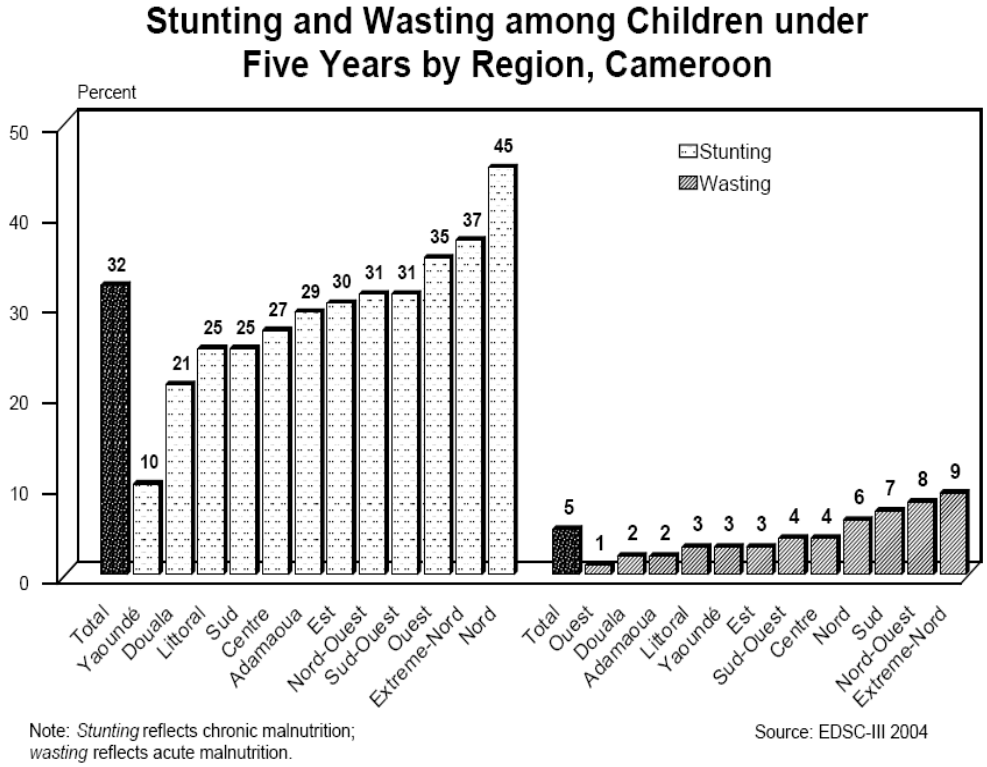
Acute malnutrition, manifested by *wasting (*weight-for-height Z-score that is below -2 SD based on the WHO/CDC/NCHS reference population) results in a child being too thin for his or her height. It affects 5 percent of children, which is 2.5 times the level expected in a healthy population.

Nineteen percent of children under five years are *underweight (*weight-for-age Z-score that is below -2 SD based on the WHO/CDC/NCHS reference population) for their age. This is 9.5 times the level expected in a healthy, well-nourished population.

Five percent of children under five are *overweight (*weight-for-height Z-score that is above +2 SD based on the WHO/CDC/NCHS reference population). This is 2.5 times of what you expect in a healthy, well-nourished population.

In Cameroon, stunting ranges from 10 to 45 percent among children in the 12 regions. Stunting rates are lowest in Yaoundé (10 percent) and highest in Nord region (45 percent). Wasting ranges from 1 to 9 percent among children in the 12 regions. Wasting rates are the lowest in West region (1 percent) and highest in Extreme-Nord region (9 percent)

Figure 2.1



From the above statistics it is obvious that more children in Cameroon suffer from chronic malnutrition as compared to acute malnutrition and this is highest in the Northern region of the country. The children that suffer from acute malnutrition live in the Extreme North and Northwest region of the country.

In another study examining the household and community socioeconomic and environmental determinants of child nutritional status in Cameroon, researchers documented similar findings as they found Northern Cameroon to have the lowest weight-for-age (underweight) Z scores, followed by the Center/South/East region (Pongue *et al*, 2006). As written earlier, this is mostly likely because Northern Cameroon is a region with dry climate, limited food crops and limited access to health care. The

situation in the Center/South/East may prevail because of overwhelmingly low access to food and health care in the East province, which should be distinguished from the South and Center provinces which have better access to varied food and health services.

It is important to note that maternal education has an inverse relationship with stunting and wasting in Cameroon. As the level of maternal education increases, the level of stunting and wasting decreases. Maternal education is related to knowledge of good child care practices and to household wealth. In Cameroon, 28 percent of the mothers of children under five years of age have never attended school, while 42 percent have some primary education and 30 percent have a secondary or higher education. There are variations in school attendance, especially between urban and rural areas. In the rural areas, 76 percent of the mothers have never attended school, 60 percent have attended primary school, and 30 percent have gone to secondary school or higher. Only 1 percent of mothers in Yaoundé/Douala compared to 76 percent of the mothers from rural areas have never attended school. Mothers in Yaoundé (70 percent) and Douala (65 percent) have the highest percentage of receiving at least a secondary school education compared to less than 40 percent in the rest of Cameroon's regions (EDSC III, 2004).

The above information is helpful for any health or development worker working to combat malnutrition in Cameroon. He or she must tailor his or her interventions to the region of the country. For example, in the Northwest Province, the rate of acute nutrition is relatively high (8%), while the rate of chronic malnutrition is relatively moderate (31%). This may indicate that at certain times of the year children are not eating enough food. A health worker could work with mothers of young children to help them store food so that there is a variety of food available throughout the year. However, regardless

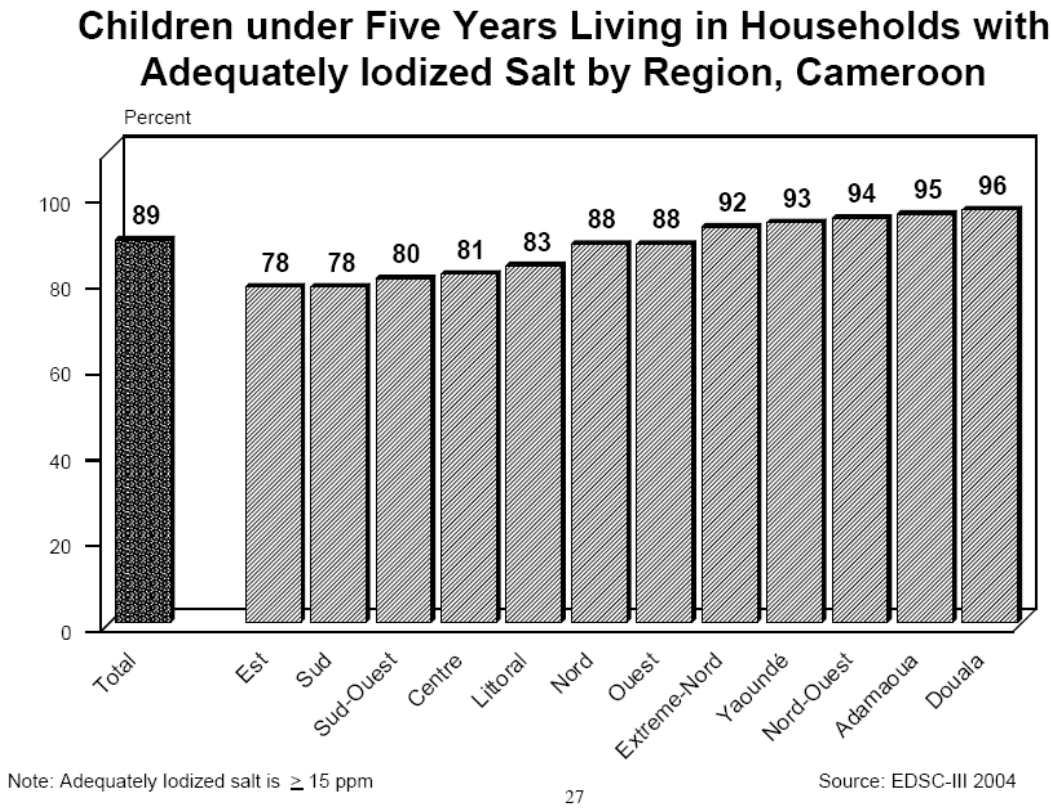
of where the health worker is doing his or her interventions and working to combat either chronic or acute malnutrition, he/she should not only focus on food intake but also the factors that are affecting the nutritional status such as socioeconomic status, regional food available, chronic illnesses, inaccessible medical care, and poor sanitation.

The findings of the 2004 EDSC III suggest that the nutritional status of children in Cameroon has declined since the previous two EDSC surveys. Compared with 1991, chronic undernutrition rates (stunting) increased in 1998 and 2004 by 6 and 15 percentage points, respectively. Compared with 1991, there has not been much change in the rate of acute malnutrition (wasting). The rates of underweight went up from 16 percent in 1991 to 22 percent in 1998 and then declined to 20 percent in 2004. The increase in stunting and underweight between 1991 and 1998 can partly be explained by the economic situation in Cameroon during that time. During this time period the market for natural resources such as oil, cocoa, and coffee collapsed sending Cameroon's economy into freefall. Added to this was a devaluation in currency in 1994 that caused the GNI per capita (in US $) to drop from 960 in 1991, 660 in 1995 and at its lowest at 610 in 2000 (World Bank Group, 2002). When last estimated for 2004 there were signs of growth as GNI projected to improve to 890, but this is still not at pre-market fallout levels.

Just as there is variation in Cameroonian's diet based on region, there is also variation for nutritional supplementation. Iodine deficiency is known to cause goiter, cretinism (a severe form of neurological defect), spontaneous abortion, premature birth, infertility, stillbirth, and increased child mortality. One of the most serious consequences to child development is mental retardation caused by iodine deficiency disorder (IDD),

which puts at stake social investments in health and education. IDD is the single most common cause of preventable mental retardation and brain damage in the world. It decreases the production of hormones vital to growth and development. Children with IDD can grow up stunted, apathetic, mentally retarded, and incapable of normal movement, speech, or hearing. IDD in pregnant women may cause miscarriage, stillbirth, and mental retardation in infants. The fortification of salt or oil with iodine is the most common tool to prevent IDD. In Cameroon, 89 percent of children under five years live in a household that uses salt containing an adequate level of iodine (> 15 parts per million [ppm]). Use of iodized salt is lowest in the East region (78 percent) and is highest in Douala (96 percent).

Figure 2.2



Globally, vitamin A deficiency (VAD) is the leading cause of childhood blindness. The damage to vision (xerophthalmia) is only one of the harmful outcomes of VAD. Vitamin A is crucial for rapid growth and recovery from illness or infection. Children who are vitamin A deficient have reduced immunity and are less likely to recuperate from common childhood illnesses, such as diarrhea, ARI, and measles, and are twice as likely to die as children who are not vitamin A deficient. Vitamin A deficiency (VAD) is common in dry environments where fresh fruits and vegetables are not readily available.

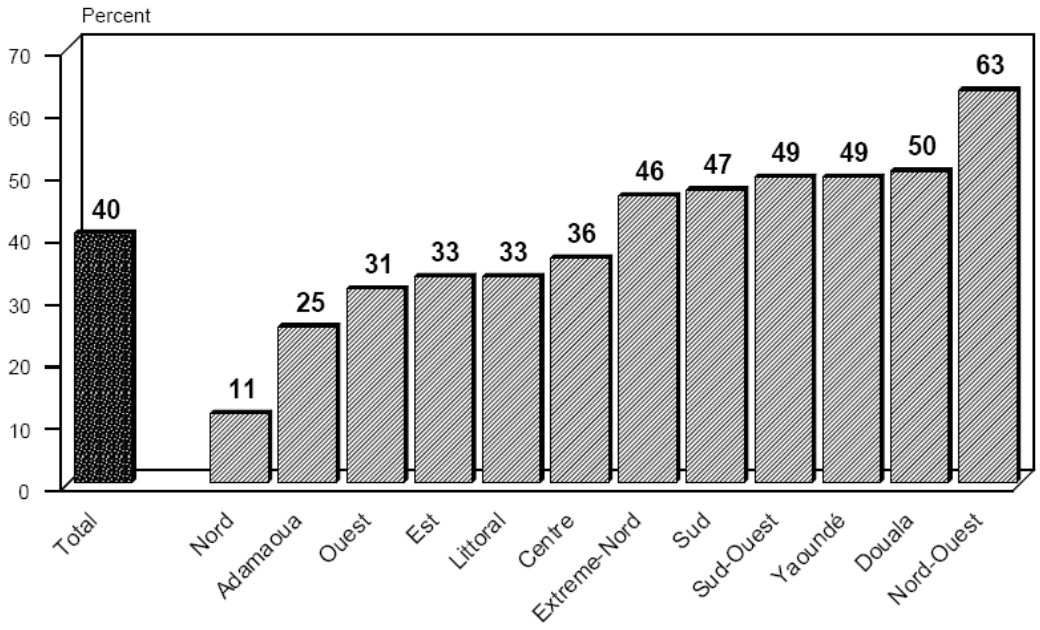
In Cameroon, Vitamin A is found in breast milk, liver, eggs, fish, red palm oil, mangos, papayas, carrots, pumpkin, and dark leafy greens. The liver can store an

adequate amount of the vitamin for four to six months. Periodic dosing (every four to six months) with vitamin A supplements is a rapid, low-cost method of ensuring children at risk does not develop VAD. During National Immunization Days for polio or measles vaccinations large numbers of children are given vitamin A supplements as well.

In Cameroon, forty percent of children 6-59 months received a vitamin A dose in the past six months. The rate of vitamin A supplementation of children varies throughout Cameroon. The rates of supplementation were lowest in the North region (11 percent) and highest in North-West (63 percent).

Figure 2.3

Vitamin A Supplementation among Children 6-59 Months in the Past Six Months by Region, Cameroon



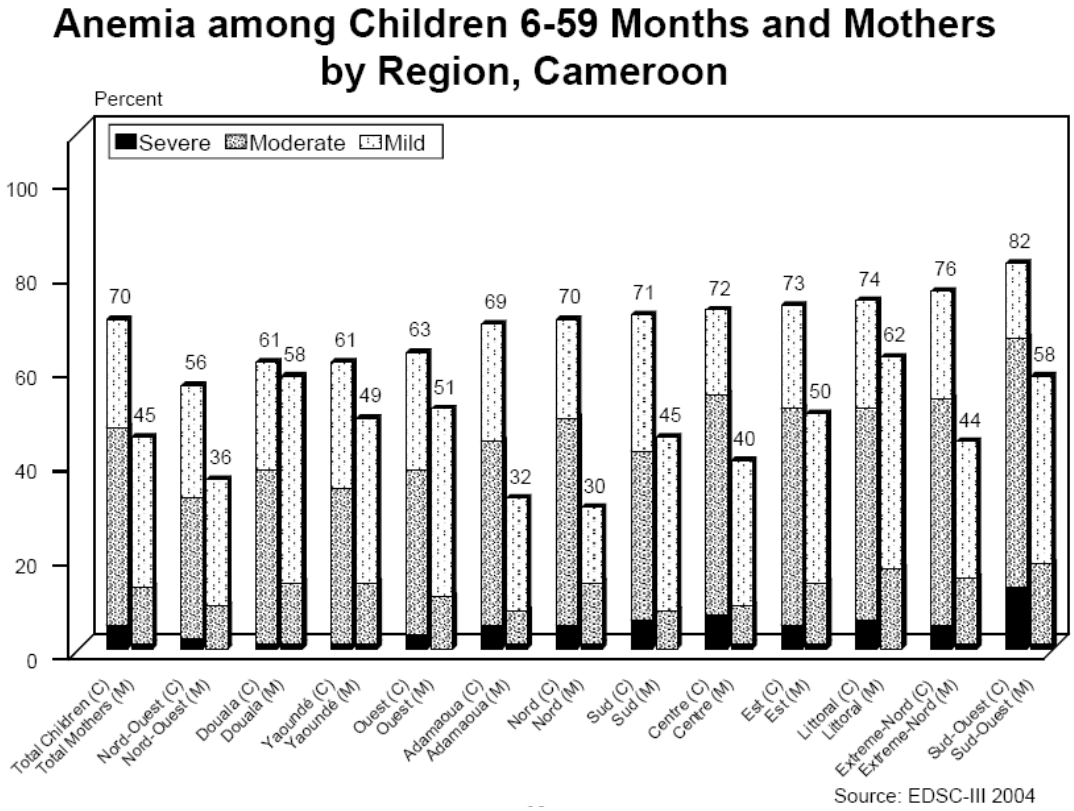
Source: EDSC-III 2004

Anemia is the lack of an adequate amount of hemoglobin in the blood. It can be caused by several different health conditions; iron and folate deficiencies are some of the most prevalent conditions related to anemia. Vitamin B12 deficiency, protein deficiency,

sickle cell disease, malaria, and parasite infection also cause anemia. Iron-deficiency anemia is the most common form of nutritional deficiency worldwide. This type of nutritional deficiency develops slowly and does not manifest symptoms until anemia becomes severe. Since iron is found in meats, poultry, fish, and dark leafy greens, diets that are heavily dependent on one grain or starch as the major staple often lack sufficient iron intake. Anemia is common in children 6-24 months of age who consume purely a milk diet and in women during pregnancy and lactation. Iron-deficiency anemia is related to decreased cognitive development in children, decreased work capacity in adults, and limited chances of child survival. Severe cases are associated with the low birth weight of babies, perinatal mortality, and maternal mortality.

In Cameroon, seventy percent of children age 6-59 months and 45 percent of mothers are anemic. Anemia rates for children are highest in the South-West region (82 percent) and lowest in the North-region (56 percent). Anemia rates for mothers are highest in the Littoral region (62 percent) and lowest in North region (30 percent). This is largely due to food available in these regions. In the North the people are herdsmen and eat primarily animal products, such as milk and beef. In the Southwest and Littoral provinces, it is a more tropical environment and thus, the land is not suitable for cattle raising; instead the people follow a more plant-based diet.

Figure 2.4



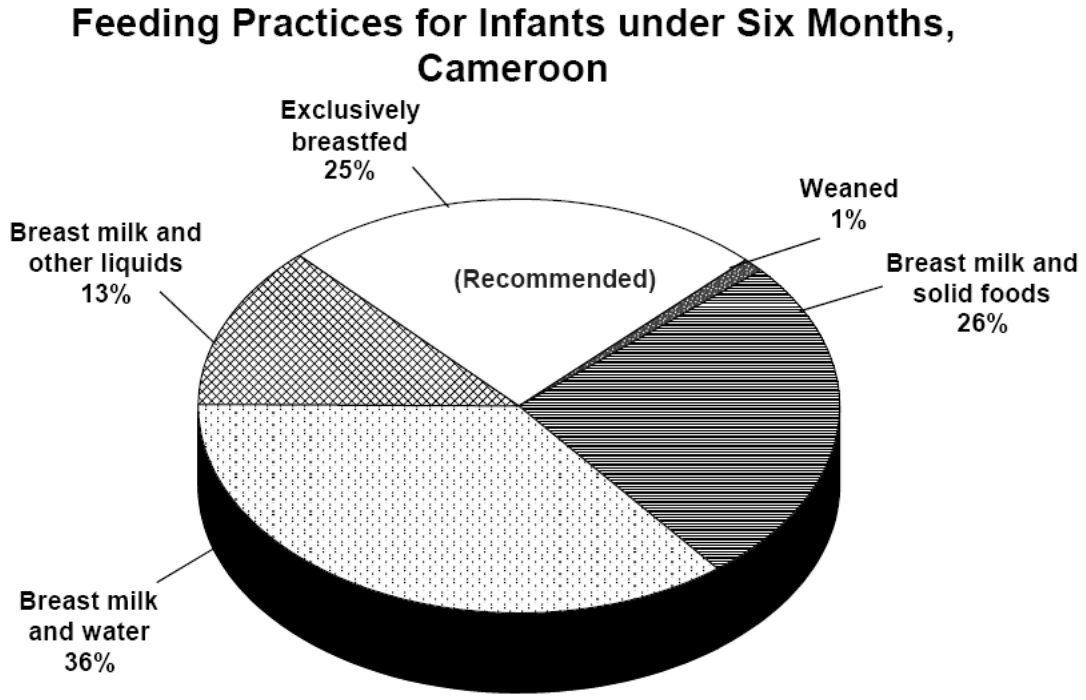
Improper infant feeding practices, in addition to diarrheal disease, are important determinants of malnutrition. WHO and UNICEF recommend that *all infants should be exclusively breastfed from birth until six months of age*. In other words, infants should be fed only breast milk during the first six months of life. In Cameroon, the introduction of liquids, such as water, sugar water, and juice; formula; and solid foods takes place earlier than the recommended age of about six months. This practice has a deleterious effect on nutritional status for a number of reasons. First, the liquids and solid foods offered are nutritionally inferior to breast milk. Second, the consumption of liquids and solid foods decreases the infant's intake of breast milk, which in turn reduces the mother's

supply of milk. (Breast milk production is determined, in part, by the frequency and intensity of suckling.) Third, feeding young infants liquids and solid foods increases their exposure to pathogens, thus putting them at greater risk of diarrheal disease.

In Cameroon, 25 percent of children under the age of six months are exclusively breastfed, as is recommended by WHO and UNICEF. Thirty-six percent of infants below six months of age are given a combination of breast milk and water. Additionally, 13 percent of infants below six months are given liquids other than water, and 26 percent receive solid food in addition to breast milk and/or water. One percent of infants below six months of age are fully weaned.

In the Northwest Province a survey questionnaire was carried out among over 300 women in the Ndu Subdivision in 2005. The researchers reported that more than a third of the infants received water supplement in the first month of life and almost all babies had received water supplement by 6 months of age. The most common reasons for introduction of mixed feedings were family and community pressure, the belief that breast milk is an incomplete food that does not increase the infants weight, the belief that all family members should receive the benefit of food grown in the family farm, and the belief that a woman who is breastfeeding cannot engage in sexual intercourse because it spoils the breast milk. When asked about initiating breastfeeding, 250 (78.4%) initiated breastfeeding immediately or within hours of birth (P. Kakale *et al,* 2005). From this study the authors concluded that exclusive breastfeeding is not a common practice of the tribal groups living in the Ndu area of the Northwest Province, Cameroon.

Figure 2.5



Note: WHO and UNICEF recommend that all infants be breastfed exclusively up to six months of age.

Source: EDSC-III 2004

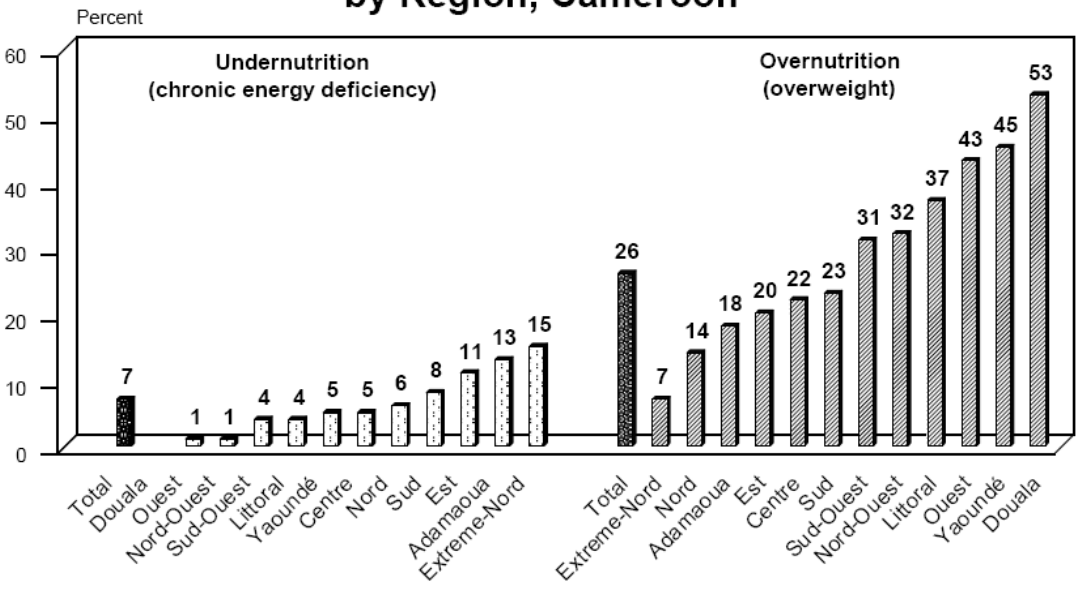
Besides being of concern in its own right, a mother's nutritional status affects her ability to successfully carry, deliver, and care for her children. There are generally accepted standards for indicators of malnutrition among adult women that can be applied.

Malnutrition in women can be assessed using the body mass index (BMI), which is defined as a woman's weight in kilograms divided by the square of her height in meters. Thus, BMI=kg/m2. When the BMI is below the suggested cutoff point of 18.5, this indicates chronic energy deficiency or undernutrition for nonpregnant, nonlactating women. When the BMI is above 25, women are considered overweight. Seven percent mothers of children under age five in Cameroon are undernourished. The highest level of maternal undernutrition is in the Extreme-Nord region (15 percent). None of the mothers

were found to be undernourished in Douala region. Twenty-six percent of mothers of children under five are overweight. The highest level of maternal overnutrition is in Douala (53 percent). The lowest level is in the Extreme-Nord region (7 percent). Thus, overweight appears to be a more common than underweight among women in Cameroon (EDSC III, 2004).

Figure 2.6

Malnutrition among Mothers of Children under Five Years by Region, Cameroon



Note: Maternal undernutrition is the percentage of mothers whose BMI (kg/m²) is less than 18.5. Maternal overnutrition is the percentage of mothers whose BMI is greater than 25.

Source: EDSC-III 2004

2.3 Nutrition and Chronic Diseases

While malnutrition is an important health and welfare problems among infants and young children, overweight, obesity, and obesity-related health problems are rapidly increasing, especially among people older than forty living in an urban environment. Urbanization, demographic and economic changes in recent decades have led to a nutritional transition characterized by higher caloric content and/or reduction in physical

activity. When measured in 2002, Cameroon had one of the highest rates of urbanization rate growth in Sub-Saharan Africa: 9.8% in 1950, 40.8% in 1990 and the United Nations predicted in 1993 that it would increase to 67% by 2025 (P. Pasquet *et al*, 2003). Currently there is evidence that Cameroon is on track to meet this estimate as currently 52% of the country's population lives in an urban environment (UNICEF, 2006)

In a research study conducted by P. Pasquet *et al,* in 252 men and 519 women living throughout Yaoundé in June 1998-March 1999, researchers took anthropometric and body composition measurements and found that overweight (BMI ≥25) and obesity (BMI ≥30) were associated with age for both men and women as the prevalence rates increased in persons aged 20-29 and peaked in the 40-49 age group for men and at the 50-59 age group in women and then declined. The table below demonstrates that women as a group were more overweight than men as half of the women were overweight and 20% were obese and a third of the men were overweight and 5% classified as obese. Increasing age, being female and increasing educational level was identified as risk factors for both overweight and obesity. Length of residence in Yaoundé and physical inactivity also appeared to influence being overweight at an early age.

Table 2.1

Age-specific prevalence rates of overweight and obesity in Yaoundé adults

Women			Men		
Age group (years)	Overweight (%)	Obesity (%)	Age group (years)	Overweight (%)	Obesity (%)
20–29	26.7	4.7	20–29	13.8	1.0
30–39	54.6	25.5	30–39	35.3	5.9
40–49	63.8	24.8	40–49	50.0	13.1
50–59	67.1	34.1	50–76	38.2	5.9
60–75	54.6	24.2			
20–75	50.3	20.5	20–76	31.4	5.2

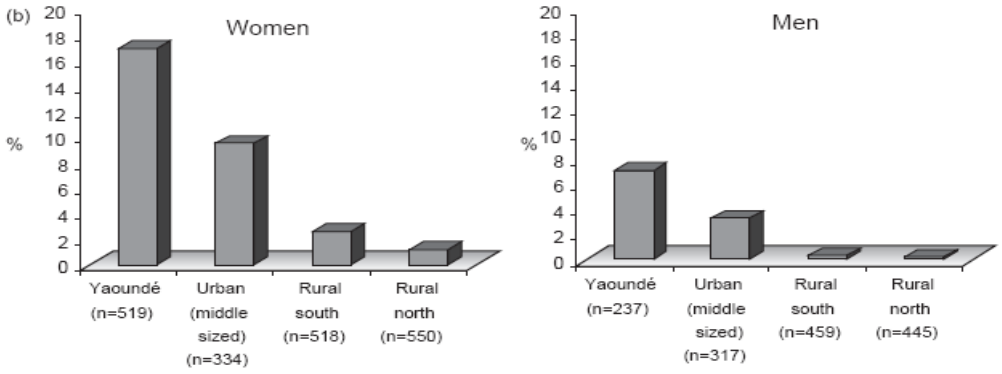
Overweight and obesity are defined as a BMI above 25 kg/m² and 30 kg/m², respectively

Source: P.Pasquet, 2003

The authors of this research study suggest that high overweight sexual dimorphism as observed in Yaoundé, could reflect an early nutrition transitional situation during which women are more affected by obesity as observed by other researchers (Beltaifia *et al*, 2001). The following graph compares age-adjusted percentages of excess fat for adults in Yaoundé (18% for women, 8% for men) to urban areas (10% for women, 5% for men), rural south (4% for women, 1% for men), and rural north (2% for women, .5% for men). These results confirm the existence of a clear rural-urban trend towards increasing obesity. However, other researchers have noticed similar trends of increasing obesity in rural areas, particularly in the Humid Highlands/Grasslands region of Cameroon where strong economic dynamism and satisfactory sanitary conditions exist.

Figure 2.7

Age-adjusted percentages of excess fat for adults in various ecological settings in Cameroon.



Source: P.Pasquet, 2003

When considering diet, P. Pasquet *et al.* state that in the rural-urban shift there is a trend towards an increased lipid content of the diet: the percentage of calories from lipids

varies from 16% in the northern savannah to 22% in the southern rural areas up to 27% in the middle-sized urban areas. In addition, the researchers had the participants fill out a questionnaire and the results indicated that cultural perception of body weight may influence the prevalence of obesity in Yaoundé as only 46% of obese men and 54% obese women perceive themselves as overweight as compared to 87% African American obese women and 95% of white obese women. Also, only 4% of men and 30% of women that perceive themselves overweight are actually trying to loose weight. By comparison, in America, the figure for US women is 68%.

Other researchers have discovered similar trends in obesity. In 2002, researchers from the University of Yaoundé began a cross-sectional study called the Cameroon Burden of Diabetes (Cam-BoD) Project as an extensive survey in four urban areas of Cameroon to assess the prevalence of cardiovascular risk factors. The study sought to provide baseline and reference data on the prevalence and distribution of overweight and obesity, using anthropometric and body composition measurements in the adult population from four urban centers conducted in four urban districts, Yaoundé, Douala, Garoua, and Bamenda. It was conducted among 6,004 women and 4,007 men and found similar results as the previous mentioned study. Based on BMI, over 25% of men and almost half of the women were either overweight or obese with 6.5% of men and 19.5% of women in the obese category. The prevalence of obesity estimated from this Baseline Survey was particularly high in women and increased markedly between 15-34 and 35-44 years in both sexes. Prevalence of obesity was 5 times higher in females aged 15-34 compared to men. In addition, the researchers found that the age-adjusted ratio of being overweight or obese or having a high waist circumference (WC) was increased with

greater duration of education in both sexes, particularly among men. In men, having 7-14 years and more than 15 years of education increased the likelihood of overweight or obesity by 2 and 3.5 fold respectively. In women this gradient was present, but less pronounced. (Kamadjeu *et al*, 2006).

In a similar study, a sample of 1530 women and 1301 men aged 25 years and above, from 1897 households in the Biyem-Assi health area in Yaounde, were interviewed about their household amenities, occupation, and education. Weight, height, and waist circumference were measured and subjects were classified as obese if their BMI> or =30 kg/m2 or overweight if BMI was between 25.0 and 29.9 kg/m2. Abdominal obesity was defined by a waist circumference > or =80 cm in women and > or =94 cm in men. The researchers found that of the sample studied 33% of women and 30% of men were overweight (P<0.08), whereas 22% of women and 7% of men were obese (P<0.001). Abdominal obesity was present in 67% of women and 18% of men (P<0.001). After adjusting for age, leisure time physical activity, alcohol consumption, and tobacco smoking, the prevalence of overweight and obesity, obesity, and abdominal obesity increased with quartiles of household amenities in both genders and with occupational level in men. Thus, SES is positively associated with adiposity in urban Cameroon after adjusting for confounding factors (Fezeu *et al*, 2006).

Number of years of education can be used as a proxy for SES status in this population; the greater the number of years of education, the higher the SES. It is likely that higher SES in developing countries is characterized by a westernization of the lifestyle; including reduced physical activity, a more sedentary life, and adoption of a

higher energy, higher fat diet, all of which may lead to an increase in obesity (Kamadjeu *et al,* 2006).

In comparison, the researchers of the previous studies highlighted that studies in develop***ed*** countries show an inverse relationship between education and obesity, particularly among women. However, in develop***ing*** societies, a strong positive relationship often exists between SES and obesity among men, women, and children.

The aforementioned trends in obesity and rural-urban shift have created a nutritional transition in Cameroon that has led to an increase in chronic diseases such as type II diabetes. The following table depicts the increase prevalence in diabetes mellitus between 2003 and 2025 for males and females, rural and urban dwellers in the 20-39 age range, 40-59 age range, and 60-79 age range. Again, the biggest increase especially for woman occurs between the 20-39 age range and the 40-59 age range.

Table 2.2
Changes in Prevalence of Diabetes Mellitus between 2003 and 2025
Number of people with DM (000's) in the 20-79 age group

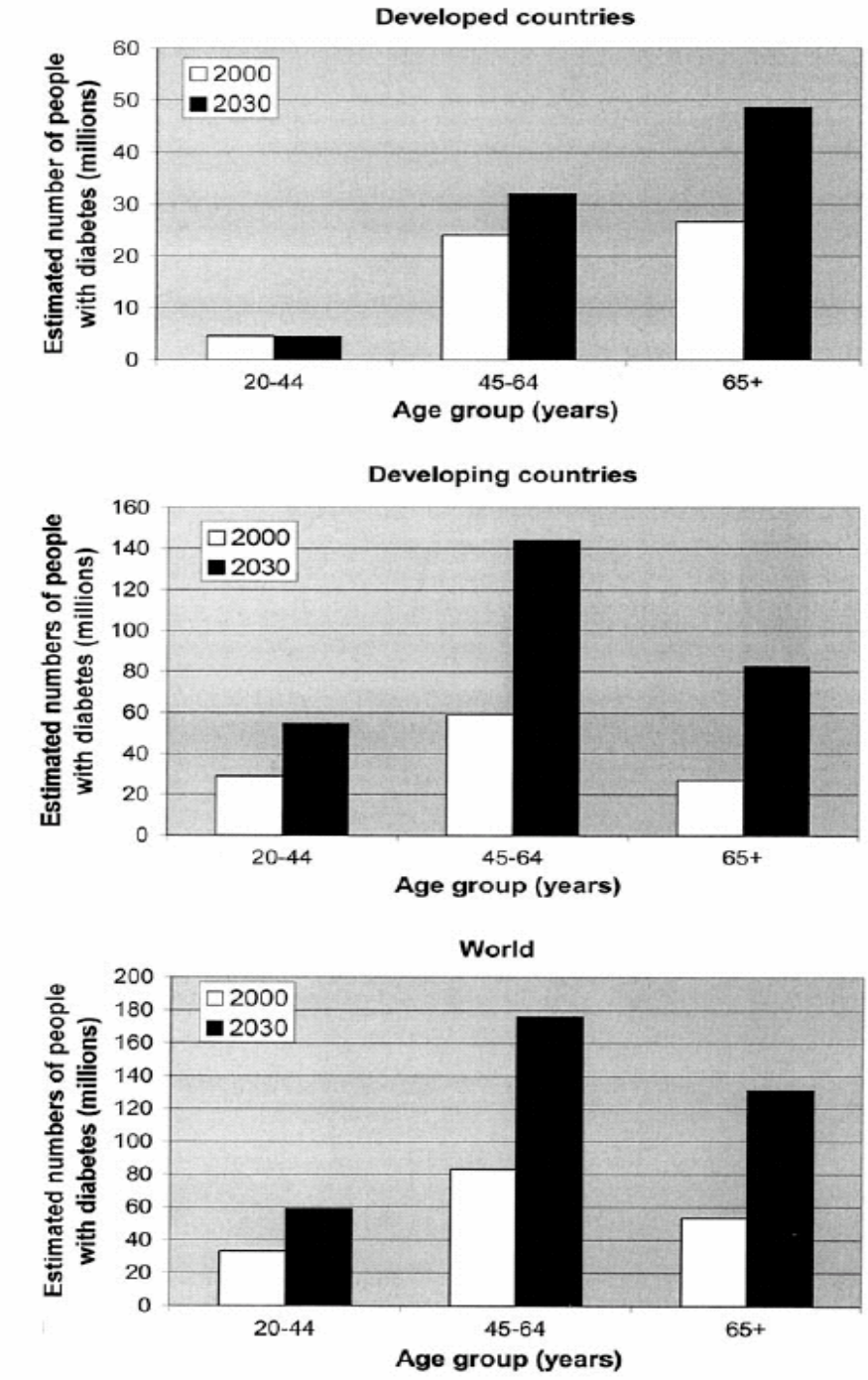
Year	DM Prevalence (%)	Rural	Urban	Male	Female	20-39 yrs	40-59 yrs	60-79 yrs	Total
2003	.80%	19.5	38.9	23.9	34.5	9.4	42.3	6.7	58.4
2025	1.20%	28.3	119.5	64.5	83.3	49.9	52.7	45.2	147.8

Source: Diabetes Atlas, International Diabetes Federation . 2008

The figure below shows that in developing countries, the majority of people with diabetes are in the 45-65 year range. In contrast, the majority of people with diabetes in developed countries are >64 years of age. By 2030, it is estimated that the number of people with diabetes >64 years of age will be >82 million in developing countries and >48 million in developed countries.

Figure 2.9

Estimated number of adults with diabetes by age-group, year, and countries for the developed and developing categories and for the world



Source: Wild, 2004.

When looking at these statistics it is important to also understand how diabetes as a disease affects those living in resource-poor settings. The researchers Kengne *et al.* state:

> The classic symptoms of diabetes in Africa, including polyuria and polydipsia, are similar to those seen elsewhere in the world. However, limited access to health care, the insidious course of type II diabetes, and late presentation to health facilities lead to more severe illness and diabetic complications at diagnosis. The economic cost of diabetes and its complications are unaffordable by most individuals and families in sub-Saharan Africa. Their incomes are insufficient to purchase insulin, oral hypoglycemic agents, and other supplies for the management of diabetes. The limited resources available to sub-Saharan African countries are shared between fighting poverty, implementing education strategies, provision of housing and appropriate sanitation, and the socioeconomic and health burden of fighting the increasing incidence and prevalence of HIV/AIDS. Diabetes poses an additional burden on the limited health care delivery system and resources. Many people with diabetes are managed by traditional health care providers and general practitioners who are inadequately integrated into the primary health care system. At a macroeconomic level it is often assumed that global economic development increases income and subsequently improves all aspects of health in developing countries. Although greater economic investment and higher incomes among some groups have eased some of the health challenges in developing countries, chronic diseases have been exacerbated.

In Cameroon, diabetes is a disease that cannot easily be managed. Due to lack of resources and knowledge amongst health care professionals and patients, it is a life-threatening illness with a rising prevalence in a country which already suffers from a deficient, poorly-managed health care system.

2.4 Nutrition and HIV/AIDS

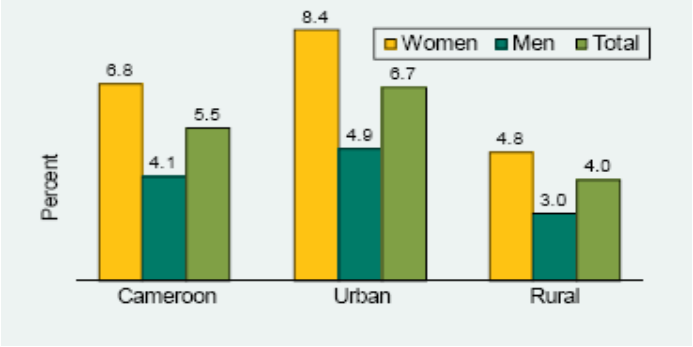
Globally, HIV/AIDS remains and will remain for the foreseeable future an enormous, social, economic and human challenge to sub-Saharan Africa. This region is considered the global epicenter of the disease. Currently there are 37.8 million people around the world living with HIV/AIDS and of this total, 25 million live in Africa. AIDS is the leading cause of premature death in Africa and affects young people and women disproportionately. An estimated 12 million children under the age of 18 have lost one parent and either live as orphans or as vulnerable children. The epidemic continues to reverse life expectancy gains, erode productivity, decimate the workforce, consume savings and dilute poverty reduction efforts (World Bank, 2006).

Figure 2.10
The African Epidemic of HIV at a Glance

Category (as of end-2005)	Persons (millions)	% of global total
Adults and children living with HIV	24.5	**64%**
Women (15+) living with HIV	13.2	**76%**
Africans newly infected in 2005	3.2	**64%**
Adults and children deaths from AIDS in 2005	2.0	**71%**
Children (0-17) orphaned by AIDS	12.0	**79%**
Total Africans who have died of AIDS	22.9	**91%**

Source: UNAIDS May 2006 Report

Figure 2.11
HIV Prevalence in Cameroon

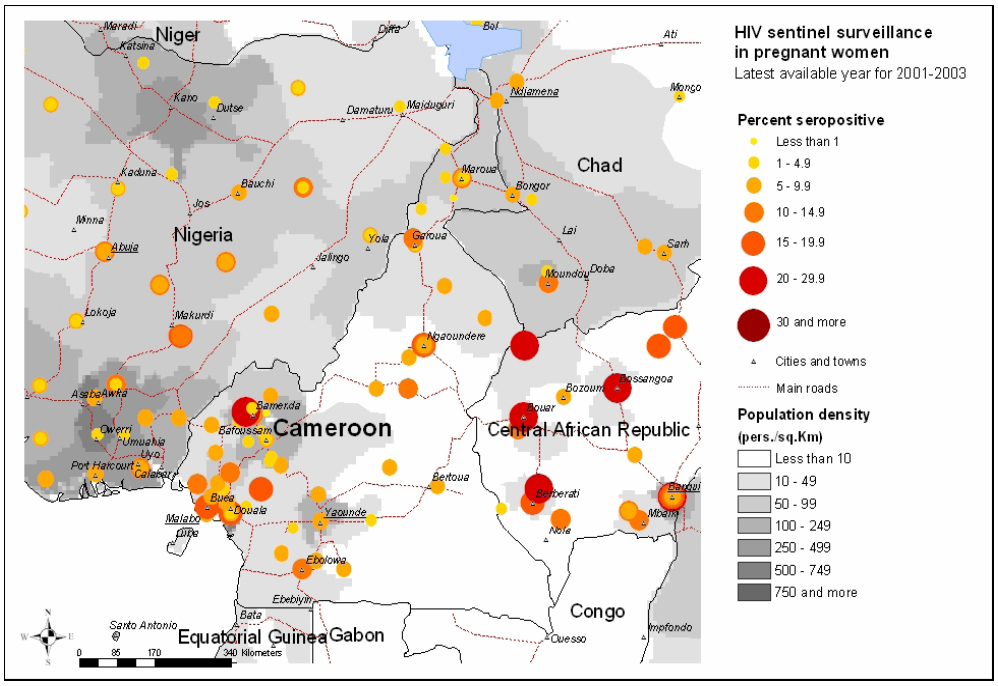


Source: DHS, 2004

In Cameroon, the first case of AIDS was diagnosed in 1985. Since then, about 40,000 cases have been officially reported. Cameroon is facing a generalized epidemic, with adult prevalence rates in the range of 4.8–9.8%. The Demographic and Health Survey in 2004 estimated an HIV prevalence of 5.5% in the population as a whole.

The graph below demonstrates that the prevalence is higher in urban areas than in rural areas. Prevalence rates vary from one province to another, with highest rates in the Northwest and East Provinces. At the end of 2002, 53,000 people were estimated to have lost their lives to the disease – leaving 210,000 children orphaned. HIV transmission is primarily heterosexual, and women are more vulnerable, with 170 infected women for every 100 infected men (WHO, 2005).

Figure 2.12
Map of HIV Prevalence in Pregnant Women



Source: WHO/UNAIDS Epidemiological Fact Sheets

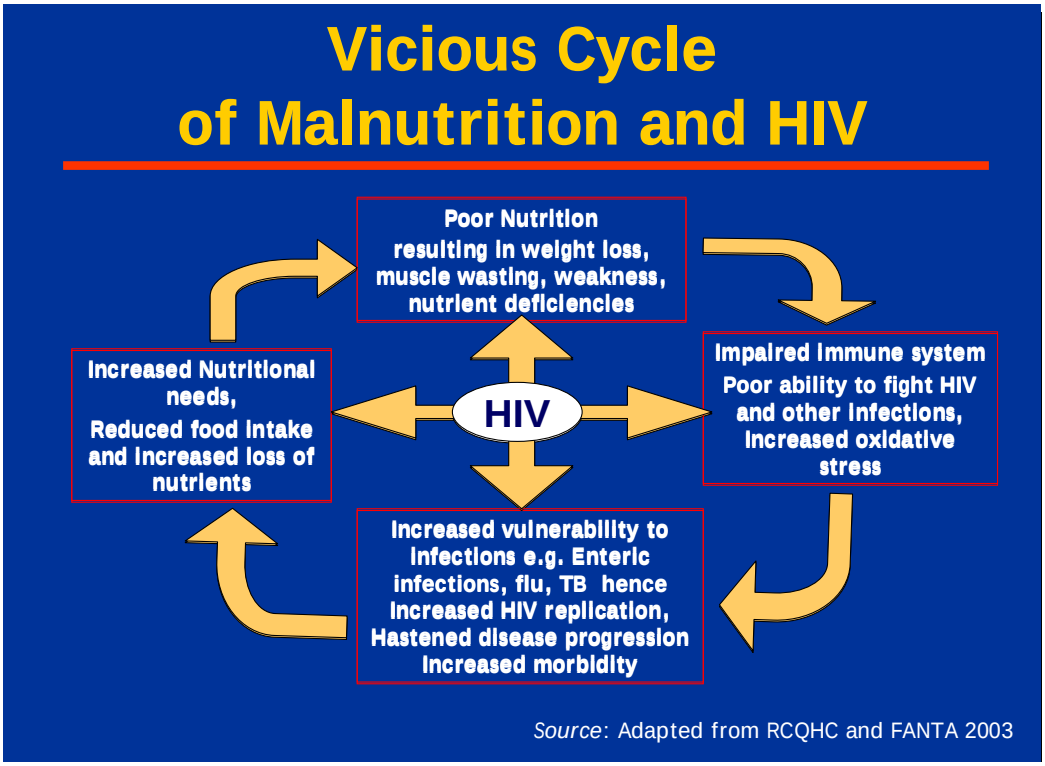
and the United States Census Bureau

PLWHA usually suffer from food and nutrition insecurity as a result of a loss of productive labor, income, savings, and food reserves, as well as general poverty. These factors limit food availability and access and ultimately affect proper nutrition care and support. Good nutrition has an important role for PLWHA to stay healthy, lead productive lives, prevent weight loss, and ensure the efficacy of drugs such as anti-retrovirals (ARVs). (Ndure, 2004).

The following information comes from the *Nutrition and HIV/AIDS: A Training Manual* is a publication of the Regional Centre for Quality of Health Care (RCQHC) in Kampala, Uganda, the FANTA (Food and Nutrition Technical Assistance) Project, and the LINKAGES Project. The training manual was used during a technical training

session the author taught on Nutrition and HIV/AIDS for Peace Corps Trainees in November 2007.

Figure 2.13



The above graph depicts how malnutrition and HIV negatively affect each other. HIV infection may result in poor nutrition as a result of insufficient dietary intake, which in turn impairs the immune system, which in turn increases vulnerability to opportunistic infections and increases HIV replication, which increases nutritional needs and loss of nutrients which increases weight loss and impairing of the immune system. This cycle results in vitamin and mineral deficiencies, reduced immune function and competence, increased susceptibility to secondary infections, and increased nutritional needs because of reduced food intake and increased loss of nutrients, leading to rapid HIV disease progression.

Malnutrition and HIV affect the body in similar ways. Both conditions affect the capacity of the immune system to fight infection and keep the body healthy. Before AIDS, the impairment of immune function caused by malnutrition was called nutritionally acquired immune deficiency syndrome, or NAIDS.

HIV affects nutrition in three sometimes overlapping ways: a reduction in the amount of food consumed, interference with the digestion and absorption of nutrients consumed, and changes in the body's metabolism.

Decreased food consumption may result from the inability to eat or swallow because of painful sores in the mouth and throat, loss of appetite as a result of fatigue, depression, and other changes in the mental state, side effects of medications, including nausea, loss of appetite, a metallic taste in the mouth, diarrhea, vomiting, and abdominal cramps, and reduced quantity and quality of food in the household as a result of the inability to work or reduced income because of HIV-related illness.

HIV infection also interferes with the body's ability to absorb nutrients. Poor absorption of fats and carbohydrates can occur at any stage of HIV infection in both adults and children and results in excess nutrient loss. Poor absorption is caused by HIV infection of the intestinal cells, which may damage the gut, even in people with no other symptoms of infection, increased incidence of opportunistic infections such as diarrhea, which is a common cause of weight loss in people living with HIV, and poor absorption of fat reduces the absorption and use of fat-soluble vitamins such as vitamins A and E.

Changes in metabolism in HIV-infected people occur as a result of the immune system's response to HIV infection. As the body mounts its acute phase response to infection, it releases pro-oxidant cytokines and other oxygen-reactive species. These

cytokines produce several results, including anorexia (causing lower intake of food) and fever (increasing energy requirements). If the infection is prolonged, muscle wasting occurs because muscle tissue is broken down to provide the amino acids with the immune protein and enzymes they need. These processes increase energy requirements of people living with HIV/AIDS during the asymptomatic phase by 10 percent over the level of energy intake recommended for healthy, non-HIV-infected people of the same age, sex, and physical activity level. They increase energy requirements during the symptomatic phase by 20 percent-30 percent over the level of energy intake recommended for healthy, non-HIV-infected people of the same age, sex, and physical activity level.

The body also responds to this release of pro-oxidant cytokines by increasing the demand for antioxidant vitamins and minerals, such as vitamins E and C, beta-carotene, zinc, and selenium. Oxidative stress occurs in an imbalance between the pro-oxidants and antioxidants and there are not enough antioxidants to meet the demands of the pro-oxidant cytokines. This stress is believed to increase HIV replication and transcription, leading to higher viral loads and disease progression. For this reason, many studies have examined the impact of antioxidant vitamin supplementation on HIV transmission and disease progression.

When a healthy person suffers an acute illness that reduces food intake, inadequate levels of nutrients are ingested and absorbed by the body to meet increased energy needs. As a result, weight (fat mass) may be lost first but is usually regained immediately after normal eating habits return. Fats stored in adipose tissues are catabolized to fuel the body energy needs, thus sparing amino acids needed to build or preserve lean body mass.

In PLWHA, however, the opposite seems to occur. Amino acids are more readily used to fuel energy needs, while fat continues to accrue. The patient may consume adequate nutrient levels but utilizes and stores them inadequately. The patient has excess adipose tissue in proportion to lean tissue as the body converts the digested nutrients into fat instead of lean tissue. With high triglyceride levels in the blood, resting energy expenditure is increased. The underlying causes of an HIV-infected person's inability to preserve or regain lean tissue remain unknown.

Effective and inexpensive ways to deal with the cycle of infection and poor nutrition include good nutrition, hygiene, and food safety. Since the 1980s a number of controlled clinical trials have studied the effects of nutrition on HIV. Many of the trials were done with patients with AIDS, but some were done with patients at early stages of HIV infection. These studies show that nutrition supplementation and counseling interventions may reduce HIV patients' vulnerability to weight loss and muscle wasting. This effect is confirmed particularly when nutrition supplements are given in the early stages, when low dietary intake and poor nutrient absorption are the primary causes of weight loss. Later in the course of infection, when metabolic changes begin to play a leading role in the wasting process, other types of interventions are required.

CHAPTER III

NUTRTION INTERVENTIONS

The aforementioned nutrition realities in Cameroon led to the design of three nutrition interventions among three different populations in the Northwest Province. The first intervention was among women of young children in the Bafut Health District, the second and ongoing intervention was among people with diabetes in Bamenda, and the third was a nutrition seminar for PLWHA in Fundong.

3.1Northwest Province

Bamenda is the provincial capital of the Northwest Province, which, along with the Southwest, comprises Anglophone Cameroon. Although nutrition may seem far removed from the political sphere, it is necessary to mention Bamenda's political and linguistic landscape as it intangibly influences the "feel" of the city and the rest of the province, and in some cases access to government-subsidized health care, education, and infrastructure. Bamenda has served as the seat of political opposition to the current administration since the 1992 presidential elections, in which a Bamenda-based opposition leader, John Fru Ndi, earned more votes than incumbent President Paul Biya, who simply rewrote the results and was backed by the Supreme Court into the position of power that he still maintains after 26 years. Today, the main political pressure group in Bamenda is the Southern Cameroon National Congress, which claims that Anglophone Cameroon colonized by the British rather than the French after the Germans left, was never part of French Cameroon and therefore should never have been joined with it after Independence. As such, they advocate a "restoration" of the former federal system, in which the Northwest and Southwest Provinces would be a separate state from the other

eight Francophone provinces, and so independently governed.

The major ethnic groups are Bafut, Mankon, Bali, Nkwen, and Mendakwe, all of whom dominate the local traditional chief leadership system of *fons* and *fondoms* throughout surrounding villages. However, there is a small but strong presence of Fulani Muslim cattle herders, who are often treated as second-class citizens by the strongly Christian and agriculturally-based dominant Bafut.

In Bafut the major occupation is farming. Subsistence farming is carried out by women and children and men are involved in animal husbandry and palm wine tapping.

3.2 Overview of Diet in the Northwest Province

There are two main seasons in the Northwest Province of Cameroon. The rainy season typically begins mid-March and extends into the beginning of November, with the months of late-July to September as the rainiest. The dry season therefore begins mid-November and last until mid-March. The Northwest Province is part of the humid highlands region in Cameroon and the people are able to grow a wide variety of food stuffs. Using the seasonal calendar method for data collection (ICE, 1996) 15 women who attended the antenatal clinic at St. Theresa Catholic Medical Centre in Bafut, NWP on February 19, 2007 were asked to describe the variety of foods eaten (both grown and bought) throughout the year. It is interesting to note that when asking when does the year begin, the women responded in March, at the end of the dry season, when most women are in the fields planting. The foods that are typically grown and available year-round are edible leaves, locally knows as huckleberry or njamajama, plantains, bananas, cassava, and palm nuts. The crops that are planted in March and harvested in Jun-August include groundnuts, red/black beans, maize, squash, soy beans, cow peas, and yams. Irish

potatoes are usually planted in May and available until November. Sweet Potatoes are planted in October and available throughout the dry season, until mid February. The foodstuffs that are bought throughout the year include rice, spaghetti, white beans, fish, beef, frozen chicken, onions, and tomatoes (when not locally grown). Fruits such as bananas, passion fruit, papayas, watermelons, pineapples, and oranges are available year round and are either grown or bought, depending on availability. In May to June there is a surge of mangoes and many children can be found climbing the mango trees to pick the precious fruit. In fact, many children also are taken to the hospital during this time due to tree-climbing injuries and/or intestinal worms from eating the fruit without properly washing beforehand. Apples are imported from South Africa and available year round, but few Cameroonians buy them because they are expensive in comparison to locally available fruits.

It is interesting to note that when the mothers were asked when are the children most often sick, they consistently replied November to February. This can be attributed to a variety of factors. It is the beginning of the dry season and there are more air-borne diseases. Since there are few paved roads throughout the province, it is extremely dusty. It is also when the food that was planted in March and first harvested in June, such as groundnuts, beans, corn, squash, soy beans, and cow peas, are no longer available. The only food that is grown and available during this time are edible leaves, cassava, palm nuts, plantains, and bananas—a starchy, unbalanced diet.

3.3 Bafut District Health and Nutrition Week

June 25-29, 2007 was designated as Bafut District Health and Nutrition Week. Nurses and the Peace Corps Volunteer from St. Theresa Catholic Medical Centre visited

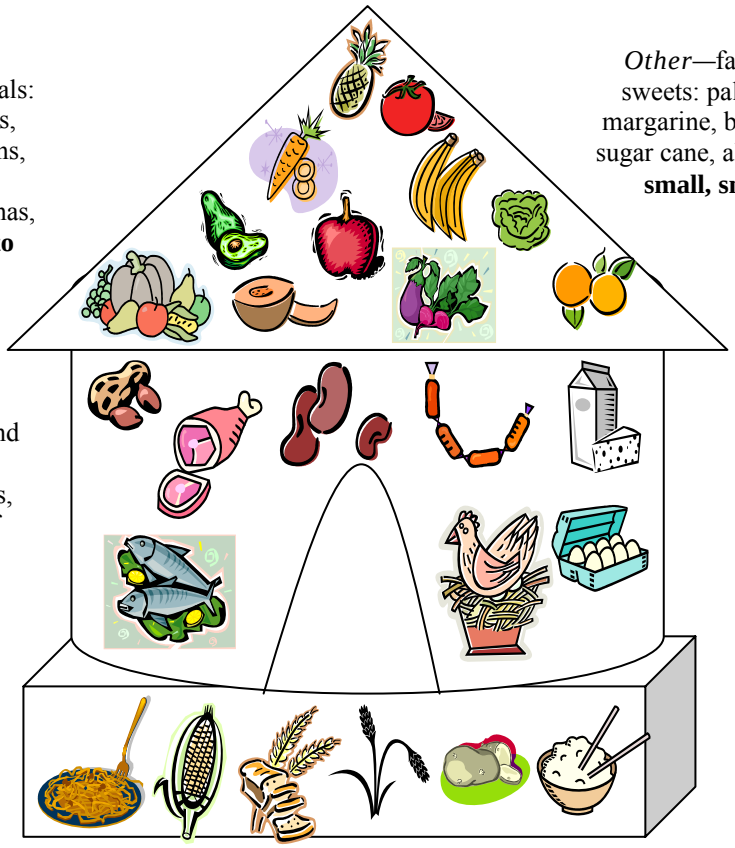
three health zones and checked vaccination cards and heights and weights of all children under the age of 5. For those children not up-to-date on their Vitamin A supplementation, Vitamin A was administered and de-worming medicine distributed. A nutrition presentation was designed to educate women on how to prepare nutritious meals for their family. Health Educators (usually nurses) in Cameroon teach women about three food groups (energy foods, body-building foods, and protective foods) using the diagram below:

Figure 3.1

House of Nutrition

Protection—vitamins and minerals: fruits and vegetables – avocados, papaya, oranges, tomatoes, onions, cabbage, eggplant, cucumber, carrots, pineapple, oranges, bananas, mangoes, green leaves—**25% to 35%** of calories per day

Other—fats and sweets: palm oil, margarine, bonbons, sugar cane, alcohol—**small, small**



Body-building—proteins: meat and animal products – beef, chicken, fish, eggs, milk, groundnuts, beans, yogurt, cheese—**10% to 15%** of calories per day

Energy—carbohydrates: rice, bread, puff-puff, plantains, corn, yams, Irish potatoes, cassava, grains, fu-fu, spaghetti, pap—**55% to 60%** of calories per day

Source: Peace Corps Community Health Training Manual, 2005

However, when using this method to teach about a balanced diet, it does not impart knowledge that different family members need to eat different amounts of food, or that certain foods should be eaten at the same time to increase nutrient absorption. For example, the prevalence of nutritional anemia is relatively high in the Northwest, yet few families can afford to buy and eat meat on a regular basis. Encouraging women to eat an orange or other citrus fruit at the same time they eat fufu corn and njamajama is a practical, accessible way woman can increase iron absorption in their diet. Thus, in an effort to go beyond simply teaching the three food groups, a nutrition presentation that included the 'mixed meal' guide and drawings depicting different plates for different family members and presented to 300 women over the course of 3 days. After the nutrition presentation there was also a cooking demonstration that showcased what a balanced diet should consist of and portion sizes for children and women.

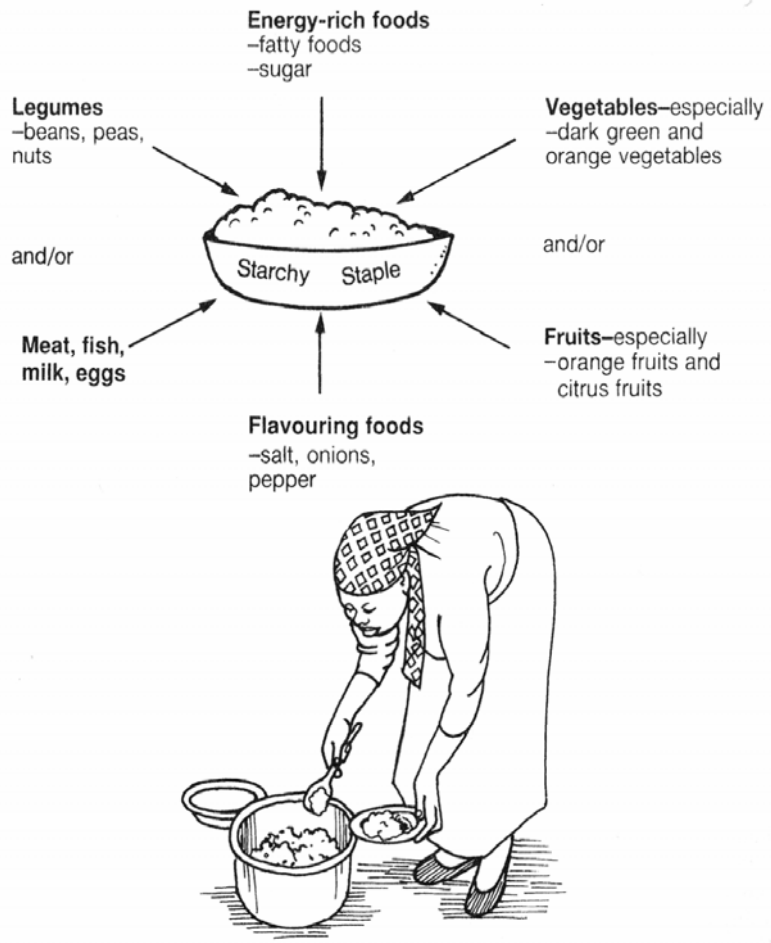


Fig. 8–3 The 'mixed meal guide'. The guide shows how you add foods to the staple. Try to add one or more foods from each part of the guide.
From the left: legumes and/or food from animals. *From the right*: fruit and/or vegetables; some energy rich food from above and some flavouring foods from below. *From above*: some energy-rich food. *From below*: some flavouring foods.

Source: *Nutrition for Developing Countries,* King, 2000

The above picture was drawn on a poster and then demonstrated to the mothers all of the different foods that should be included when they are preparing a meal for their families. Since almost every meal contains some type of starchy staple (rice, cassava, potatoes, fu-fu corn, etc.), it was important to highlight that different foods that could be added to the starchy staple at each meal.

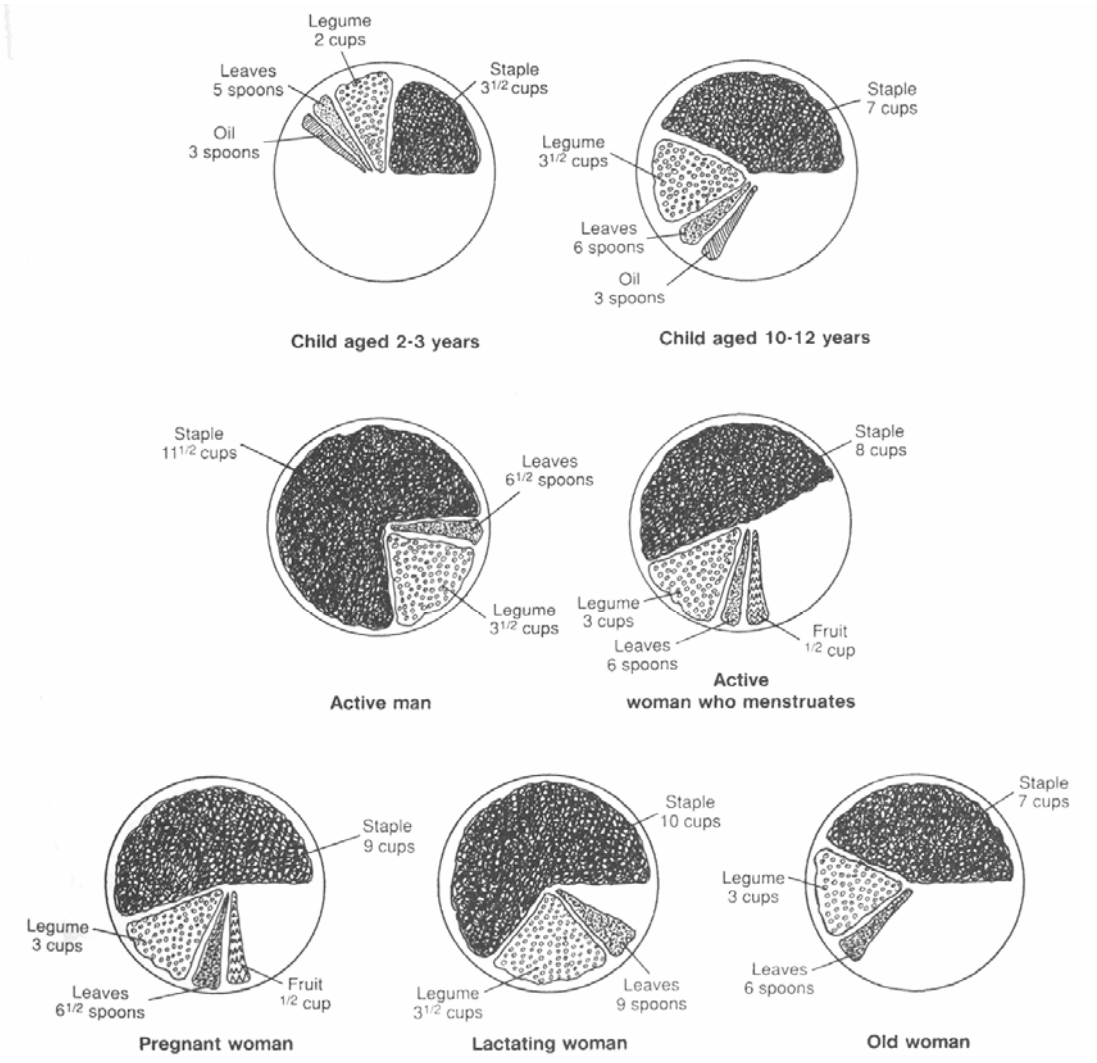


Fig. 8–4 Comparison of amounts of basic cooked foods needed by different people each day.
On this diet menstruating and pregnant women need supplementary iron to cover needs. Fruit is included to increase iron absorption. 1 cup = 200 ml; 1 spoon = 10 ml.

Source: *Nutrition for Developing Countries,* King, 2000

This picture was also used to show the relative amounts of different foods that each family member should eat. It was emphasized that in the children's plate oil is added to ensure they receive enough kilocalories. In the woman who menstruates or is pregnant adding fruit was suggested to increase iron absorption

from the legumes and leaves. During the presentation it was highlighted that the plate for women who are pregnant or lactating is fuller since they need to eat more.

Lessons Learned:

- Doing the cooking demonstration with the mothers was a great educational tool as it helped the women to understand how to apply what was discussed during the nutrition presentation. A meal of cooked green pumpkin leaves, rice, and red tomato sauce with fish was prepared and showed the women how easy it is to prepare meals that are colorful like the rainbow.

- Include Cameroonian nurses when talking to young mothers. The nurses are usually older and are more respected than a young, white girl who doesn't have any children of her own.

3.4 Dining with Diabetes

After meeting Dr. Nkwenti, a pharmacist working with people with diabetes in Bamenda, in December 2005, weekly nutrition education sessions for 10-15 people commenced covering such topics as the difference between complex and simple carbohydrates, the importance of exercise, how to create and follow a balanced diet, and the influence of alcohol on blood sugar. Many of the patients never had such information, even after having the disease for as long as 10 years, and the classes were well-received. There are many myths surrounding diabetes in Cameroon such as patients cannot eat fruit, it is a result of ju-ju (witchcraft), traditional doctors can cure the disease, women with diabetes will have miscarriages, blood sugar can be lowered by eating bitter

greens, and it is contagious. This problem is exacerbated by few people having access to quality medical care and medical practitioners dispensing inaccurate, outdated advice. After learning about these common myths and realizing that people with diabetes are not getting the necessary nutrition information to manage their disease, it was decided to design and implement a four-week structured nutrition class complete with a pre and post test and cooking demonstration at two different locations in Bamenda in June and July of 2006. In total 35 people attended the 4-week class and 25 returned on a weekly basis for a year and a half, for further personal nutrition counseling, goal setting, and exercise demonstrations.

The four-week nutrition class curriculum was based on a program produced by West Virginia University Extension Service called *Dining with Diabetes.*

The goals of the class were:

- to increase knowledge about healthy foods
- to provide ***basic*** information about diabetes and nutrition
- to provide opportunities for people with diabetes to share and learn from one another and from diabetes health professionals

While attending the International Diabetes Federation Conference in Capetown, South Africa, a valuable teaching tool called the Zimbabwe Hand Jive was discovered. It was developed by Dr. Kazzim G.D. Mawji who practices medicine in Zimbabwe. His situation is similar to that in Cameroon. Patients live in the bush and are illiterate. Physical resources and time are scarce, and printed materials often are of no use. Morbidity and mortality due to diabetes are high. In an attempt to address these challenges, Dr. Mawji wanted to make education practical and accessible to his

population. He developed a teaching method based on a tool readily available to virtually every patient: their own hands. Through this method, the hands are used both as a memory device and as a measuring tool to help people remember diabetes tasks and implement their meal plans.

The hands are also used as a visible point of reference for estimating food portions. For example, a closed fist is the size of the standard starch portion and is always readily available to compare to the amount of food served. This teaching tool met Dr. Mawji's requirements of having no or low cost and freed him of any dependence on written materials. As a memory device, the hands have the great advantage of always being available one can never forget one's own hands! And as a measuring device, they are personalized to an extent, since larger people have larger hands and smaller ones have smaller hands (Baumer, 1999).

Hand Teaching Method for Food Portions

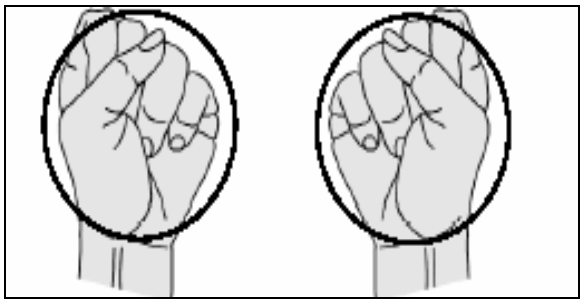
- The cupped palm of the hand or the fist represents the size of a standard carbohydrate portion. The fist can easily be placed next to a served portion to judge its size. The fist portion applies to both starches, such as rice, noodles, potatoes, pasta, and dumplings, and fruits. More than one portion of either starch or fruit can be recommended to further individualize the nutrition plan to energy needs. The educator helps determine the right total amount of food and has the responsibility to communicate this to the patient. In Cameroon, some of the starches such as fu-fu corn and water fu-fu come in bundles pre-wrapped in banana leaves or plastic bags. The amount was

usually about 2 standard carbohydrate serving sizes. The patients were encouraged to eat half of the bundle at a time.

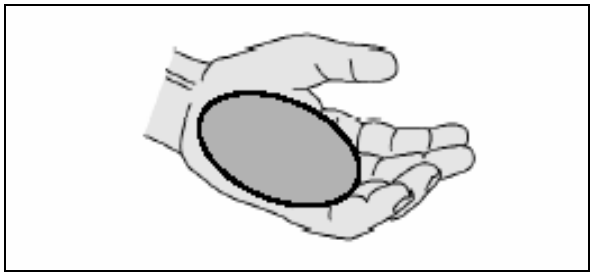
- The palm of the hand shows the approximate size of both the bread and meat that one should eat at a meal. The thickness of the bread or meat is represented by the little finger.
- Both hands cupped together and overflowing represent a portion of vegetables or salad.
- High-fat foods, such as chips and nuts, are limited to a portion that fits in the cupped hand.

Figure 3.2

Zimbabwe hand jive

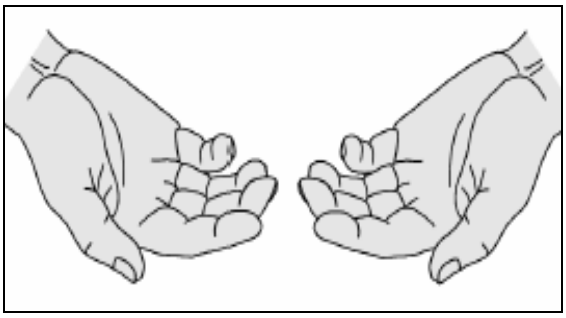


Carbohydrates (starch and fruit): choose an amount equivalent to the size of two fists. For fruit use one fist.

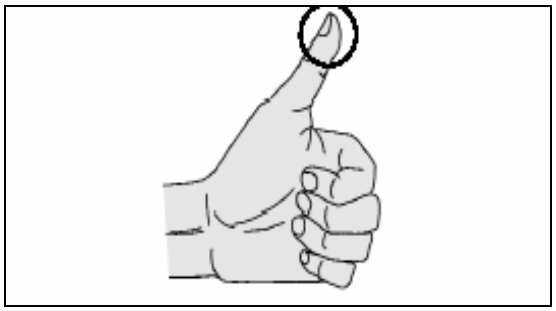


Protein: choose an amount equivalent to the size of the palm of your hand

and the thickness of your little finger



Vegetables: choose as much as you can hold in both hands. These should be low carbohydrate vegetables – green or yellow beans, cabbage or lettuce.

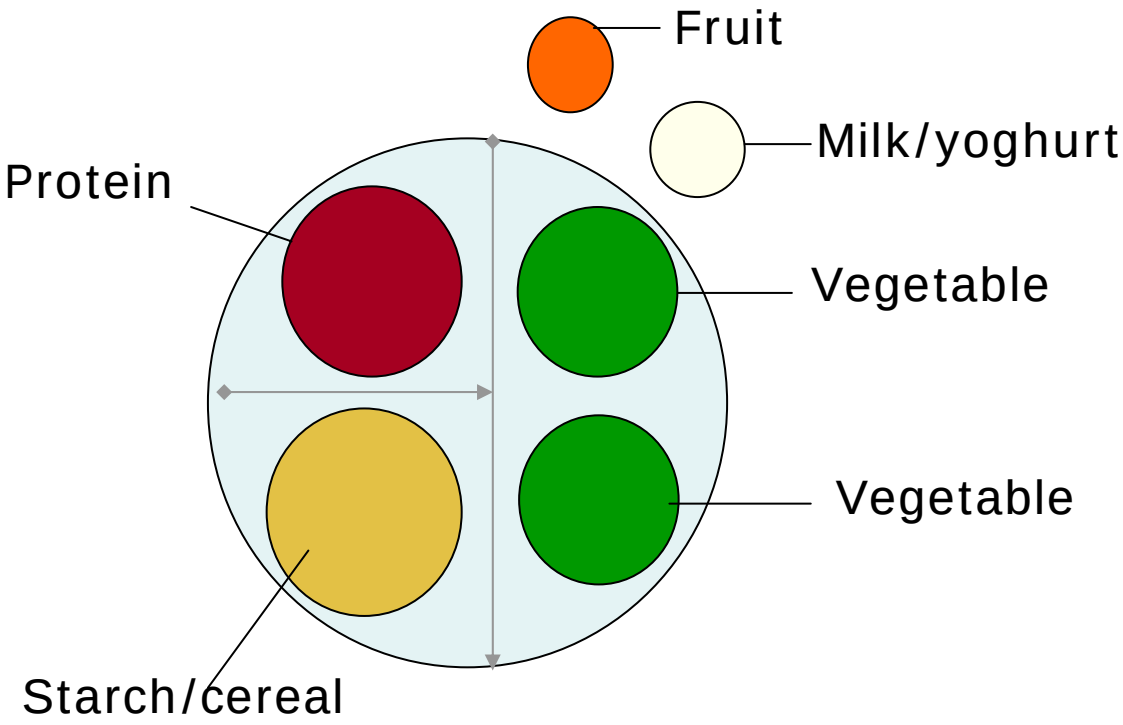


Fat: limit fat to an amount the size of the tip of your thumb. Drink no more than 250 ml of low-fat milk with a meal

Source: Interdnational Diabetes Federation, 2006

This teaching tool along with a picture of the plate model (see below) was used to teach people with diabetes about how food can help manage their blood sugar. In a country where nutrition labels and the concept of carbohydrate counting do not exist and literacy is low compared to Western standards, it was the easiest, most understandable teaching method for this audience.

Figure 3.3
Plate model



Source: Interdnational Diabetes Federation, 2006

Lessons learned:

- Don't do it on your own. Whenever doing a cross-cultural nutrition education session have a Cameroonian doctor or nurse present. They can help with interpretation of languages and cultural myths. Explain to him or her what you want to teach before you teach the patients and then have the Cameroonian counterpart give you suggestions on how to make it relevant to the audience.

- Include more than just the patient. In Cameroon men rarely prepare the meals, yet they are most likely to come for an education session because they have the time and money. Encourage the male patient to bring his wife/sister/niece/ aunt/daughter or whoever prepares his meals on a regular basis. If it is an elderly woman, request that her daughter/niece attend with her. Usually older woman can only speak their tribal language and they will need someone to translate for them.

- Be aware of locally-grown foods and growing seasons. Usually one cannot start offering nutrition education until after a year of living in the country. It takes that long before one knows what foods are available when. However, if that's not possible, ask the patient. Most have farms and are well aware of the food that is available when

- Understand the economic and environmental situation. People with diabetes in Cameroon can't join an athletic gym to increase physical activity because they don't exist, and if they did they couldn't afford the membership. Instead encourage them to walk to their farms at a more brisk pace 3 times a week or demonstrate basic yoga/callisthenic activities they can do at their own home.

- Use pictures whenever possible. Encourage them to copy your own pictures of a plate and bring it home with them.

3.5 Positive Living

In May of 2007 two support groups for PLWHA in Fundong asked for information about using food to help their immune systems. In collaboration with the

Fundong Council's coordinator for HIV activities, a 4 hour nutrition seminar was held in July 2007. The goals of the seminar were:

- Explain why nutrition is essential to good health and a strong immune system
- Describe the different nutritional needs of people living with HIV/AIDS and identify the food categories and appropriate portion sizes.
- Explain how people can increase micronutrients in their diets
- Describe how food can be used to help with HIV complications such as diarrhea, nausea and lack of appetite
- Demonstrate that they can conduct a personal assessment of their nutritional status

40 HIV positive participants and 5 local health workers attended the seminar. Topics covered included essential micronutrients for PLWHA, how to prevent food-borne illnesses, how to use food to prevent HIV complications, how to eat a balanced diet using locally available foods, and personal nutrition assessment. To evaluate what was learned during the seminar, a "football" game was used to test knowledge gained. This evaluation tool was appropriate for this low-literate audience and with an end score of a tie it was obvious that members of both teams gained valuable information during the seminar. At the end of the seminar all participants enjoyed a balanced lunch consisting of beans and rice, pineapple, and carrot soup.

Lessons learned:

- 75% of the PLWHA group members participated in the day. They never get that rate at their monthly meetings. Part of this success came from

using the PLWHA presidents to pass out invitations individually to each member.

- The most popular session was the personal assessment of nutrition. The participants were asked to name all the food they ate yesterday. Then, as a group they looked to see what micronutrients they were missing and what foods they could eat to improve on their diet.

- For the taste-testing, it was a good idea to mix a new recipe with a familiar recipe. Some people liked the carrot soup, some didn't. One participant said that he wasn't used to eating carrots this way, but it was ok to try new things.

- Evaluation of behavior change is important. Upon return to one of the PLWHA's monthly meetings each person was asked what was one thing they had changed in their diet as a result of our seminar. Some had done very little, but 3 individuals made significant changes in their diets from adding fruit to trying to eat a variety of things.

CHAPTER IV

WATER PROJECT

A household's source of drinking water is linked with its socioeconomic status. Poor households are more likely to obtain drinking water from contaminated sources such as surface water or open wells. Without an adequate supply of good-quality water, the risks of food contamination, diarrheal disease, and malnutrition rise. Infants and children from households that do not have a private tap are at greater risk of being malnourished than those from households with this amenity. Among the households surveyed with children under five years in the 2004 Cameroon Demographic and Health Survey (EDSC), 36 percent of Cameroonians use piped water, 35 percent obtain their drinking water from a well, and 29 percent use surface water. In Cameroon, children whose drinking water is well water or surface water are more likely to be stunted (37 percent and 38 percent, respectively) than children with access to piped water (21 percent). Children whose drinking water is well water or surface water are more likely to be wasted (6 percent and 7 percent, respectively) than children with access to piped water (3 percent).

The 2004 EDSC also found that the type of toilet used by a household reflects its wealth, and poor households are less likely to have adequate toilet facilities. Inadequate sanitation facilities result in an increased risk of diarrheal disease, which contributes to malnutrition. Infants and children from households that do not have ready access to a flush toilet are at greater risk of being malnourished than children from households with this amenity. In Cameroon, 85 percent of households surveyed with at least one child

under five years have access to a latrine, 9 percent have no facilities, and 6 percent of surveyed households have access to a flush toilet. In Cameroon, children who have no access to toilet facilities and those who have access to a latrine are much more likely to be stunted (44 percent and 32 percent, respectively) than children who have access to a flush toilet (6 percent). Children who have no access to toilet facilities and those who have access to a latrine are more likely to be wasted (7 percent and 5 percent, respectively) than children with access to a flush toilet (1 percent).

Upon first arriving in Mambu-Bafut, I met with local women's and men's groups to determine the needs of the community. The Prioritizing Needs exercise from the Partcipatory Analysis for Community Action handbook was used to assess the needs. Every group invariably said that the lack of water was the biggest development problem in the community. When asked what could be done to solve this problem the members from the groups said a new water management committee (WMC) should be formed with women and young men. With this information, I met with the Fon of Mambu and the Mambu Social and Cultural Development Association, MASCUDA, and asked if they could appoint people to form a new Water Management Committee (WMC) for me to work with throughout the next two years. This first committee comprised of 5 members. Two of the members were women, three were men. Half were members on the previous WMC, half are new members. During these initial meetings I learned that the Mambu water system was first conceived in 1980 and implemented in two phases. The first phase was initiated by the Late Reverend Father Kolkman from 1983 - 1985 in which water from the two catchments flows by gravity to a pump sump and pumped by three rams to twin storage tanks, and distributed to the population by gravity. Niba Gregory initiated

the second phase from 1999 – 2000 through Reverend Father Peter Nabel, with financial assistance of thirty million (30,000,000 FCFA) from a donor in Holland. Because of the inability of the three rams to pump sufficient water to the twin storage tanks, the three rams were replaced with three electrical pumps and water was pumped from a steel storage tank to the twin storage tanks. During the second phase, the system was functional for some time (6 months) but later ran into the following shortcomings:

- Confusion among the villagers about the parties responsible for the payment of maintenance and usage of water after the Dutch

  Benefactors vacated. The population thought they would be able to use the water for free and when the WMC began asking people to pay for the water, the inhabitants accused the WMC of stealing money. This caused the villagers to loose confidence in those appointed to manage the system in particular and the entire scheme in general and hence, the present dilapidating state of the structures.

- The inability of the population to pay their maintenance and electricity levy to the Water Management Committee (WMC) resulted in an outstanding electricity bill of 462,854 FCFA and the eventual removal of the community SONEL meter.

While meeting with the WMC and learning this past history, I was actively looking for local water engineers and international donors that would be able to assist the community in rehabilitating and extending the water system. In November 2006, I met Mr. Peter van Leerdam. He is a board member of the organization, Holland Helps Worldwide, and has been coming to Mambu for many years to offer assistance to SAJOCAH. He was well aware of how the water problems in Mambu affect SAJOCAH,

but did not know about exactly how it affected the community. However, he didn't want to just assist SAJOCAH and insisted that if any money was give to SAJOCAH for a water project, money must also be given to Mambu. The Reverend Sister in charge of SAJOCAH introduced Mr. van Leerdam to the WMC and in March 2007 he gave us 3.5 million CFA on the condition that we worked with a water engineer from Njinikom. This money was used first to clean and repair the water catchment area, install a new pipeline leading to the twin storage tanks, buy two new electric pumps, build a small storage tank at the catchment area, buy and install a new electricity meter, and install two new stand taps.

In January of 2007, the WMC was restructured and the development association presidents from Mambu and Bawum became more actively involved. They assisted the WMC by requesting donations from Bawum and Mambu people who live abroad. In total, they contributed over 1 million CFA and this money was used to clean and patch the twin storage tanks and covered the transport and communication costs of the WMC.

At the beginning of this project I thought that the rehabilitation of the water system could be finished during the two years. Unfortunately it didn't, but a firm foundation was laid for future volunteers to work with the WMC and oversee the project so that it continues to move forward. As of November 2007, the community members were waiting for the tank at the water catchment area to finish drying. After this occurred, technicians could install the new pumps and begin pumping water from the catchment area to the twin storage tanks. The water would then flow by gravity to two stand taps, one in Mambu and one in Bawum. In January of 2008 the first phase of the water project

was completed and water was pumped from the catchment area to the storage tank and down to the market square in both Mambu and Bawum.

Throughout the two years increasing the management capacity of the committee members was a priority because non-transparent money-collection is what caused the project to fail in the first place. This was done by organizing a management seminar, encouraging receipt usage, and giving regular lessons on the management of village water systems.

Lessons Learned:

- Start slow, *very* slow. Don't start a project until it is evident that the community wants the project, is willing to work for it, and manage it once it's completed.
- Be patient. It takes some time to get all the background information, and even then you'll probably never have or understand it all because of cultural differences. Always work *with* host country nationals and not *for* or *without* them.
- Be aware of the edifice complex—the idea that one has to leave a physical marker of their time or effort at a particular place.
- Be persistent. Successful projects can and do happen, but they usually take longer than originally planned. Any large project will encounter many setbacks from the government, school holidays, donors, banks, weather, deaths, selfish gain attempts, etc. Follow-up after each delay to ensure that the project continues to move forward.
- Remember, it should never be *your* project

References

Fitzpatrick, Mary. *West Africa: Cameroon.* Lonely Planet Publications, 2002. pgs. 216-220

Peace Corps, Country Profiles: Cameroon. 2004.

Diamond, Jared. *Guns, Germs, and Steel: The Fate of Human Societies.* W.W Norton. New York, 1997.

World Bank. *Country at a Glance: Cameroon.* http://go.worldbank.org/F6U6GVCEO0 Accessed: 16 August, 2007

Cameroon Demographic and Health Survey III: *Nutrition of Young Children and Mothers in Cameroon.* USAID Department of Health and Human Services, May 2006.

Pongou R, Ezzati M, and Salomon J.A: Household and community socioeconomic and environmental determinants of child nutritional status in Cameroon. *BMC Public Health* 2006; **6**:98.

Kakute P, Ngum J, Mitchell P, Kroll K , Forgwei G, Ngwang L, and Meyer D, Cultural barriers to exclusive breastfeeding by mothers in a rural area in Cameroon, Africa. *J. Midwifery Women's Health* 2005, **50**: 324-328.

Pasquet P, Temgoua L.S, Melaman-Sego F, Fromentz A, and Rikong-Adie A.: Prevalence of overweight and obesity for urban adults in Cameroon. *Annals of Human Biology* 2003; **30**:5, 551–562.

United Nations Children's Fund. *State of the World's Children 2006: Excluded and Invisible*. United Nations Children's Fund, New York, 2006.

Kamadjeu R, Edwards R, Atanga J.S, Kiawi E.C, Unwin N, and Mbanya JC: Anthropometry measures and prevalence of obesity in the urban adult population of Cameroon: an update from the Cameroon Burden of Diabetes Baseline Survey. *BMC Public Health* 2006; **6**:228.

WHO Global InfoBase Version:1.292 beta, April 2005. Accessed: 19 February 2007

Fezeu L, Minkoulou E, Balkau B, Kengne AP, Awah P, Unwin N, Alberti GK, Mbanya JC: Association between socioeconomic status and adiposity in urban Cameroon. *International Journal of Epidemiology* 2006; **35:**1, 105-111.

International Diabetes Federation, *Diabetes Atlas: Cameroon.* Brussels, Belguim, International Diabetes Federation, 2005 http://www.eatlas.idf.org/ Accessed: 6 February 2008.

Wild S, Roglic G, Green A, Sicree R, King, H: Global prevalence of Diabetes: Estimates for the year 2000 and projections for 2030. *Diabetes Care* 2004; **27**:5.

Kegne A.P, Albert A, Mbangya JC: Cardiovascular complications of diabetes mellitus in Sub-Saharan-Africa. *Circulation* 2005; **112:** 3592-3601. http://circ.ahajournals.org/cgi/content/full/112/23/3592 Accessed: 9 January 2007.

World Health Organization: Diabetes in the WHO Africa Region. http://www.who.int Accessed: 16 August 2007

World Health Organization: Profile for HIV/AIDS Treatment and Scale-up, 2005 http://www.who.int/hiv/HIVCP_CMR.pdf Accessed: 16 August, 2007

International Bank for Reconstruction and Development: *Our Commitment: The World Bank's Africa Region HIV/AIDS Agenda for Action*. June, 2007

Ndure KS. *Nutrition and HIV: Opportunities and Challenges.* USAID, 2004

Regional Centre for Quality of Health Care, Food and Nutrition Technical Assistance: *Nutrition and HIV/AIDS: A Training Manual.* Tokyo, 2003

Peace Corps Information Collection and Exchange. *Participatory Analysis for Community Action*. Washington D.C., 1996.

Peace Corps Cameroon. *Health Project Technical Manual.* Yaoundé, Cameroon. 2005

King F.S, Burgess A. *Nutrition for Developing Countries*. Oxford University Press. New York, 2000.

Baumer EM. Using the Zimbabwe Hand Jive teaching method with an urban Austrian population. *Diabetes Spectrum* 1999; **12**:3, 185.

International Diabetes Federation. *Diabetes Education Modules: Dietary Education*. International Diabetes Federation, 2006.

Appendices

Appendix I
General Health and Population Indicators for Cameroon

Indicator	Year	Value	Source	Reference
Total population	2004	16,038,000	UNICEF	State of the World's Children Report 2006
Population annual growth rate	1990-2004	2.3	UNICEF	State of the World's Children Report 2006
% of population living in urban areas	2004	52	UNICEF	State of the World's Children Report 2006
Average annual growth rate of urban population (%)	1990-2004	4.1	UNICEF	State of the World's Children Report 2006
Crude Death Rate (per 1,000)	2004	17	UNICEF	State of the World's Children Report 2006
Crude Birth Rate(per 1,000)	2004	35	UNICEF	State of the World's Children Report 2006
Total Fertility Rate(per 1,000)	2004	4.5	UNICEF	State of the World's Children Report 2006
Life expectancy at birth	2004	46	UNICEF	State of the World's Children Report 2006
Total adult literacy rate (%)	2004	68	UNICEF	State of the World's Children Report 2006
Infant Mortality Rate (IMR) (per 1,000)	2004	87	UNICEF	State of the World's Children Report 2006
Under 5 Mortality Rate (<5MR) (per 1,000)	2004	149	UNICEF	State of the World's Children Report 2006
Neonatal Mortality Rate (NMR) (per 1,000)	1995-2000	37	UNICEF	State of the World's Newborns Report 2004
% of babies born with low birth weight	1998-2004	11	UNICEF	State of the World's Children Report 2006
% deliveries attended by skilled attendant	1995-2004	62	UNICEF	State of the World's Children Report 2006
% underfives with moderate and severe wasting	1995-2004	5	UNICEF	State of the World's Children Report 2006
% underfives with moderate and severe stunting	1995-2004	32	UNICEF	State of the World's Children Report 2006
Median Breastfeeding Duration (months)	2004	3.4	DHS	Selected Indicators for Cameroon 2004
% of children who are exclusively breastfeed (<6 months)	1996-2004	21	UNICEF	State of the World's Children Report 2006
% of children who are	1996-	80	UNICEF	State of the World's Children

breastfeed with complementary foods (6-9 months)	2004			Report 2006
% of children who are still breastfeeding (20-23 months)	1996-2004	29	UNICEF	State of the World's Children Report 2006
Vitamin A supplementation coverage rate (6-59 months)	2003	86	UNICEF	State of the World's Children Report 2006
% of households consuming iodized salt	1998-2004	61	UNICEF	State of the World's Children Report 2006
% of Children Fully Immunized	2004	48.2	DHS	Selected Indicators for Cameroon 2004
% of population using improved drinking water sources	2002	41	UNICEF	State of the World's Children Report 2006
% of population using adequate sanitation facilities	2002	33	UNICEF	State of the World's Children Report 2006
Contraceptive prevalence	1996-2004	26	UNICEF	State of the World's Children Report 2006
Estimated Adult prevalence rate (15-49 yrs) of HIV/AIDS	2003	6.9	UNICEF	State of the World's Children Report 2006
Estimated # children living with HIV/AIDS	2004	43,000	UNICEF	State of the World's Children Report 2006
Estimated number of annual deaths due to HIV/AIDS	2001	53,000	UNAIDS	http://www.unaids.org/EN/other/functionalities/Search.asp
Estimated current living orphans	2001	210,000	UNAIDS	http://www.unaids.org/EN/other/functionalities/Search.asp

Appendix II

Map of Cameroon