Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

Hana Abdullahi Shash — April 22, 2011

[Student's name typed] — Date

The Nutritional Status of Populations in Refugee/Internally Displaced Camps that Include Refugees from the Same National Origin as Refugees in DeKalb County, GA

A Review of the Literature

By

Hana A. Shash
Bachelor of Science, University of California, Los Angeles
Masters of Arts, University of California, Los Angeles
Masters of Medical Science Physician Assistant, Emory University

Thesis Advisor: Susan Cookson, M.D., MPH, FACP

Thesis Committee Chair: Roger W. Rochat, M.D.

An abstract of
A thesis submitted to the Department of Global Health
Rollins School of Public Health
Emory University
In partial fulfillment of the requirements
for the degree of Masters in Public Health
in the Department of Global Health
May 2011

Abstract

Introduction: Undernutrition remains a major public health problem in developing countries. This issue is even more apparent in refugee populations who are displaced from war torn areas to neighboring countries and are exposed to factors that put them at an increased risk for undernutrition than the general population. Those who suffer from undernutrition have lower resistance to infection, impaired learning ability as well as work capacity and reduced economic productivity. Children under five are the most vulnerable population. Assessment in this age group is believed to be indicative of the condition in the general population.

Purpose: This literature review is to look at the nutritional status of populations in refugee camps that include the same national origin as refugees in DeKalb County, Georgia. It will also present assessment, treatment, risk groups and risk factors leading to the poor nutritional status of this population. This literature review is conducted in hopes of serving as a foundation for future analysis of data collected by the DeKalb County Refugee Health Services. It looks at the biases in anthropometric measurement collection in the clinic and gives recommendations for better anthropometric measurements based on the results of the literature review.

Methods: I conducted a review of the literature from September 2010 to March of 2011 to characterize the nutritional status in refugee populations having the same national origin as refugees settling in DeKalb County. Articles published after 1995 through 2010 were included in this review.

Results: Results from the literature review showed that populations of the same national origin as the majority of refugees in DeKalb County have a high prevalence of undernutrition, especially in children younger than 5 years of age. Observations of anthropometric measurement in the clinic indicated that protocol and standardization of data intake are necessary for appropriate assessment.

Discussion and Conclusion: The literature demonstrated a high prevalence of undernutrition in the camps that include refugees from the same national origin as refugees in DeKalb County, Georgia. Additionally, it also discussed some of the factors that contribute to the poor nutritional status of this population.

The Nutritional Status of Populations in Refugee/Internally Displaced Camps that Include Refugees from the Same National Origin as Refugees in DeKalb County, GA

A Review of the Literature

By

Hana A. Shash
Bachelor of Science, University of California, Los Angeles
Masters of Arts, University of California, Los Angeles
Masters of Medical Science Physician Assistant, Emory University

Thesis Advisor: Susan Cookson, MD, MPH, FACP

Thesis Committee Chair: Roger W. Rochat, MD

A thesis submitted to the Department of Global Health
Rollins School of Public Health
Emory University
In partial fulfillment of the requirements
for the degree of Masters in Public Health
May 2011

Acknowledgements

I would like to thank my advisor Dr. Susan Cookson, for her guidance and support with this project. Her involvement was instrumental in allowing me the courage to complete this work.

Many thanks to Dr. Roger Rochat, who is my committee chair for his advice and guidance as I faced unexpected challenges throughout this work.

My gratitude goes out to Dr. Alawode Oladele and the staff at the DeKalb County Refugee Health Services clinic for opening their doors and assisting me through this work. Dr. Oladele's hard work and dedication to the refugee health program is inspirational.

I would also like to thank my husband, Khalil and our daughter, for their love and immense support. They have sacrificed a great deal to help me complete both of my degrees, in the last four years, and I am eternally grateful.

Table of Contents

Abbreviations

UNICEF- United Nations Children's Fund formerly known as the United Nations International Children's Emergency Fund
WHO- World Health Organization
UNHCR- United Nations High Commissioner for Refugees
MUAC- Mid-Upper Arm Circumference
NCHS- National Center for Health Statistics
CDC- Centers for Disease Control and Prevention
BMI- Body Mass Index
GFD- General Food distribution
TFP- Therapeutic Feeding Program
SFP- Supplementary feeding programs
TFC- Therapeutic Feeding Center
NRU- Nutrition Rehabilitation Unit
CTC- Community-based Therapeutic Care
OTP- Outpatient Therapeutic Program
IDP- Internally Displaced Persons
CI- Confidence Interval
INCAP- Institute of Nutrition in Central America and Panama
NIH- National Institute of Health
CMR- Crude Mortality Rate
DHHS- Department of Health and Human Services
OGHA- Office of Global Health Affairs
SAMHSA- Substance Abuse and Mental Health Services Administration
ORR- Office of Refugee Resettlement
DGMQ- Division of Global Migration and Quarantine
VOLAG- Voluntary Resettlement Agency
WIC- Women and Infant Children
EPSDT- Early and Periodic Screening, Diagnosis, and Treatment
PPD- Purified Protein Derivative test or
STD- Sexually Transmitted diseases or
CAPI- Center for Asian and Pacific Islanders refugee
USAID- States Agency for International Development

List of Tables

List of Figures

Chapter 1: Introduction

Introduction

The United Nations Children's Fund (UNICEF) identifies malnutrition and micronutrient deficiencies as a "slight and largely invisible emergency", which can have adverse effects on physical health and cognitive development (Harvey & Rogers-Witte, 2007). This results in significant disadvantages to the population in terms of health, cognitive development and educational achievement, human capital, and ultimately the potential for economic development (Harvey & Rogers-Witte, 2007). According to World Health Organization (WHO) and the United Nations High Commissioner for Refugees (UNHCR), in 2006, undernutrition accounted for over half of the 12 million deaths that occurred globally among children less than 5 years old (The World Bank, 2006). This major condition is even more apparent in refugee populations where they are displaced from war torn areas to neighboring countries and are exposed to factors that put them at greater risk for undernutrition than the general population. Moreover, studies show that water, sanitation, and overcrowding also contribute to undernutrition in children; thus types, frequency, quality, and availability of food, are not the only causes of undernutrition (The World Bank, 2006). All these risk factors are evident in refugee camps where the main food resources come from humanitarian assistance and where overcrowding and harsh living environments are common. In fact, the length of stay in a refugee camp has been shown to be associated with poor health outcomes, not only for children but also in the elderly population (Goette, 2005).

DeKalb County, Georgia has one of the largest refugee populations in the southeastern United States. Refugees resettling, from various camps around the world, in DeKalb County vary from year to year, but the 2008 data from the Georgia Department of Community Health indicated that the majority of the refugee population is coming from Burma, Nepal, and Bhutan followed by Iraq, Eritrea, Burundi and Ethiopia (Georgia Refugee Policy Initiative (GRPI), Georgia Department of Community Health, & Division of Public Health/Infectious Disease Section: Refugee Health Unit, 2009). In 2007, a large majority resettled from Burma and Somalia. These data of national origins are important to this literature review as we will be identifying studies that asses the nutritional status in refugee camps specific to these populations.

Purpose

The purpose of this literature review is to look at the issue of undernutrition: classification, monitoring and treatment, risk factors and vulnerable populations. Additionally, this assessment aims to answer the question: Is undernutrition present in the refugees who share the same national origins as refugees in DeKalb County, Georgia? The objectives of this study include:

- Describe undernutrition and its classification, assessment and treatment
- Describe vulnerable and at risk populations, and their factors increasing risk
- Describe the medical assessment that refugees undergo after arriving in the United States

- Determine the nutritional status of populations in refugee camps that include the same national origin as refugees resettling in DeKalb County, GA
- Present Anthropometric intake data from a small sample of patients at the DeKalb County Refugee Health Services clinic
- Discuss the relevance and importance of proper Anthropometric measurements in this particular population based on the results of these findings and make conclusions and recommendations

Methods

A literature search was conducted in order to determine the nutritional status and presence of undernutrition in refugee and internally displaced populations. The search was conducted from September 2010 to March of 2011. Only articles published after 1995 through 2010 were included in the review. Reports and articles were included if they contained and presented nutritional status data relevant to the countries of origin from which the majority of refugees resettling in DeKalb County, GA. These countries included Burma, Nepal, Bhutan Iraq, Eritrea, Burundi, Democratic Republic of Congo and Ethiopia. If studies were conducted in neighboring countries and represented data for these populations they were also included. The exclusion criteria for the literature search were if the data were published before 1995 and if they did not have relevant data for the countries of origin. In order to select pertinent information for this review, literature searches were conducted using a computerized Pub Med database. Searches were repeated in the database Web Science as well as the worldwide web seeking guidelines published by UNHCR and other relevant agencies. Websites with information that

focused on refugees and nutrition were also examined. Search terms and results are located in Appendix A and website information can be found in Appendix B.

For this review, articles, web pages and reports dealing with refugees and nutrition were included if they: 1) demonstrated an overview of undernutrition: classification, assessment and treatment, 2) presented vulnerable and at risk populations and risk factors, 3) demonstrated the nutritional status of populations in refugee camps that included the same national origin as refugees in DeKalb County, Georgia 4) presented an overview of the medical assessment refugees undergo after arrival to the Unites States.

Chapter 2: Background

Classification of Undernutrition/Malnutrition

Malnutrition is a general term that encompasses undernutrition, over-nutrition and micronutrient deficiency diseases, such as vitamin A deficiency, iron deficiency anemia, iodine deficiency disorders, and vitamin C deficiency or scurvy (Young & Jasper, 2006). Undernutrition is an imbalance between the body's supply of nutrients, vitamins, minerals, as well as energy and the body's demand for them. To ensure growth, maintenance and function this balance must be maintained (Olwedo, Mworozi, Bachou, & Orach, 2008).

The spectrum of undernutrition ranges from severe or acute to chronic, including protein and energy malnutrition as well as nutritional marasmus, marasmic kwashiorkor and kwashiorkor. (Olwedo, et al., 2008). Acute undernutrition usually results in wasting, quantified by a low weight for height ratio, caused by an acute shortage of food and is usually reversible with proper treatment (Young & Jasper, 2006). Children aged 6 to 36 months receiving four or less meals per day were more likely to have acute undernutrition than children of the same age receiving five or more meals per day (Falkner, 1991). Daily caloric intake of children varies with age, stage of growth, activity level, and basal metabolic needs. Usually from birth to 1 year of age an infant requires roughly 100-200 kcal/kg body weight per day and this requirement decreases by about 10-15 kcal/kg/year for the next two years (Falkner, 1991).

Chronic undernutrition, reflected by stunting and measured by height for age (Falkner, 1991). It usually results from chronic shortages of nutrients in the presence of multiple infections (Falkner, 1991). Stunting is the failure to grow in stature, and its effects are not usually apparent until 2 years of age (Young & Jasper, 2006). Prevention and intervention for chronic undernutrition must start before the age of 2 years, because it is not completely reversible after that age, thus stunted children generally grow up to be small adults (Young & Jasper, 2006).

Undernutrition is further classified into kwashiorkor and marasmus; kwashiorkor is a form of acute undernutrition often caused by a deficiency of protein intake in the presence of adequate energy which is often associated with superimposed infection (Access Medicine, 2010). Kwashiorkor peaks in prevalence between 12 and 36 months of age when protein is not abundant in the daily diet because the child is being weaned from breast milk to solid foods (Falkner, 1991). The clinical presentations include mild pitting edema, which starts in the lower extremities and spreads to the face and hands in more severe cases, dermatitis, fine sparse lanugo type hair, hepatomegaly, apathy, failure to thrive, mental status changes, and diarrhea with or without visible wasting (Access Medicine, 2010). Kwashiorkor has increased risk of mortality and is more severe than marasmus (Falkner, 1991).

Marasmus usually occurs in infancy, characterized by severe weight reduction, gross wasting of muscle and subcutaneous tissue, and no detectable edema (Access Medicine, 2010). It is both inadequate energy and inadequate protein intake, usually seen in times

of acute food shortages and famines; this is the most frequent form of protein undernutrition found in humanitarian emergencies (Access Medicine, 2010; Young & Jasper, 2006). It occurs from prolonged starvation often associated with chronic infections (Young & Jasper, 2006). Marasmic children are usually irritable or apathetic (Access Medicine, 2010). It presents with severe wasting of fat and muscle, making the child appear very thin (Young & Jasper, 2006).

Anthropometry and Screening

Anthropometry is the measurement of the body parameters of weight, height or length usually relative to age to indicate nutritional status (see Table 1) (Young & Jasper, 2006). It also includes mid-upper arm circumference (MUAC), demi-span or arm span, knee height, sitting height, skin fold thickness, and head circumference (Young & Jasper, 2006). It is the easiest way to measure nutritional status for an individual or a population to determine prevalence (Young & Jasper, 2006). Growth can be measured as change over time or can be measured at one-time point (Li, 2002). Height or length and weight are widely used and are the most accurate for assessment of nutritional status (Young & Jasper, 2006). Weight is more sensitive than height in acute, emergency situations; therefore, in emergency food shortage situations to assess the malnutrition severity, weight for height is usually used to measure wasting (Li, 2002; Toole & Waldman, 1997). It is also a good tool in emergency food shortages because it does not involve age, which is often difficult to determine in humanitarian crises (Emergency Nutrition Coordination Unit (ENCU), 2004). Additionally, weight for height is used to monitor the effectiveness of feeding programs (Toole & Waldman, 1997). In chronic undernutrition,

height for age is used and in protein energy malnutrition, weight for age is used (Young & Jasper, 2006). Usually, the height for age is compared with gender and age-specific values in the reference population and expressed as a Z score (Li, 2002).

Table 1: Anthropometric and Clinical Indicators of Malnutrition (Courtesy of Susan Cookson MD, 2008)

Available at http://www.unscn.org/layout/modules/htp/pdf/mod10_nutrition_surveillance-technical_notes.pdf

* BMI, body mass index

Source: Adapted from FAO, Nutrition Assessment, EC/FAO Information for Action Project

Until recently, the National Center for Health Statistics (NCHS)/ Centers for Disease Control and Prevention (CDC) reference values were used. The NCHS/CDC growth reference is based on two samples of children in the United States: one nationally representative sample of individuals aged from 2 to 18 years from the NCHS and the second from a local sample of children under 36 months of age in Ohio who were mostly formula fed (Michael J. Dibley, Goldsby, Staehling, & Trowbridge, 1987). There were questions raised about the accuracy of the growth rate of breastfed babies using the NCHS/CDC reference values and the overestimation of malnutrition (Young & Jasper, 2006). The reference values were based on the concept that until age five growth of children from different populations is very similar and the differences in growth does not become evident until adolescence (Young & Jasper, 2006). However, in 2006, WHO published new growth standards based on breastfed babies using an international database and in September 2010 it was endorsed by CDC for use in U.S.-born children under 24 months of age (Grummer-Strawn, Reinold, & Krebs, 2010; World Health

Organization, 2006). This is based on a concept of how children should grow rather than providing a common reference for comparison (Young & Jasper, 2006).

Low birth weight can be used to assess nutritional status of newborns and MUAC is used both for children aged 6 to 59 months as well as for pregnant and breastfeeding women (Young & Jasper, 2006). MUAC changes little between one and five years of age, which means that there would not be a need to standardize it and the actual measurement can be used (Young & Jasper, 2006). MUAC is useful for nutritional screening in humanitarian emergencies for children aged 1 to 5 years to assess eligibility for a feeding program (Young & Jasper, 2006). It is also used to assess pregnant and lactating women because there are no Body Mass Index (BMI) indices for pregnant women to assess undernutrition (Emergency Nutrition Coordination Unit (ENCU), 2004). Studies have found that MUAC has a stronger association with risk of mortality than weight for height comparisons (Young & Jasper, 2006). Although the classification and cutoff numbers have been debated, MUAC less than 115 is classified as severe malnutrition, and has been used as the admission criterion for therapeutic feeding programs (Young & Jasper, 2006). WHO has recommended that MUAC be used in addition to reference values of height or length rather than being used alone (Young & Jasper, 2006).

A child's nutritional status is expressed either as a percentage of the reference median or as a Z score, which is a calculation (Table 2) (Young & Jasper, 2006). A Z score is the measure of how far a child is from the median weight of the reference population for children of the same height or age, taking into consideration the standard deviation of the

reference distribution (Emergency Nutrition Coordination Unit (ENCU), 2004). Therefore, a Z score is calculated by taking the measured values, i.e. weight, subtracting it from the reference median weight for that height or age group and dividing that by the standard deviation of the reference population. A Z score is statistically standardized and therefore, the best choice for use in nutrition surveys (Young & Jasper, 2006). A normal Z score is denoted as an individual with a Z score greater than -2 and less than +2 of the standard deviations compared with the reference population, which includes 95% of the reference population (Young & Jasper, 2006). Moderate to severe malnutrition is defined by weight for height either greater than two standard deviations below the median of the CDC/NCHS/WHO reference population (Z score less than -2 but greater than -3) or greater than 70% but less than 80% of the reference population median. These two values are not always equivalent and the results will vary depending on whether a Z score or percentage is used to express the malnutrition level (Toole & Waldman, 1997; Young & Jasper, 2006). Severe acute malnutrition is defined as weight for height greater than 3 standard deviations below the reference mean (Z score less than -3) or less than 70% of the reference median. It can also be defined if patients have bilateral edema, or if MUAC is less 115mm in children 1-5 years of age (Toole & Waldman, 1997; Young & Jasper, 2006).

Table 2: Classification of Acute Malnutrition Among Children Aged 6-59 Months (Young & Jasper, 2006)

	Normal	**Global Acute Malnutrition (GAM)**	**Moderate to Severe Acute Malnutrition**	**Severe Acute Malnutrition (SAM)**
Children 6-59.9 months	>-2 and < +2 Z scores weight for height (WFH) or 95% median WFH	< –2 Z scores WFH or 80% median WFH	–3 to < –2 Z scores WFH or 70% to < 80% median WFH	< –3 Z score WFH or < 70% median WFH; bilateral edema; or MUAC < 110 mm in children aged 1 to 5 years

Source: Young H, Jasper S. *The meaning and measurement of acute malnutrition in emergencies.* HPN Network Paper no. 56 (http://www.odi.org.uk/resources/download/354.pdf). London: Humanitarian Policy Group; November 2006.

Looking at population data to diagnose the prevalence of malnutrition among children 6 to 59 months old is indicative of the malnutrition level of the population in general [10]. According to a study by Toole, et al, the prevalence of moderate to severe acute malnutrition in a random sample of children under five years of age is generally a reliable indicator of the problem in the general population, especially in refugee camp settings (Toole & Waldman, 1997). In 1997, WHO classified the prevalence rate of wasting in a population as acceptable if it is less than 5% of the population; poor if it is between 5%−9% of the population; serious if 10%−14%; and critical or an emergency situation if it is greater than or equal to 15% (Table 3) (Courtesy of Susan Cookson MD, 2008).

Table 3: WHO Classification by Nutritional Status (Courtesy of Susan Cookson MD, 2008)

Severity of malnutrition	**Prevalence of wasting (% below -2SD*)**
Acceptable	<5%
Poor	5-9%
Serious	10-14%
Critical	≥15%

* SD, standard deviation of reference population
Source: WHO (1995) Rapid Nutritional Assessment in Emergencies.

Treatment and Therapy

Based on the WHO classification of malnutrition, humanitarian assistance agencies establish feeding programs after completing nutritional assessments with a high prevalence of malnutrition, which is considered 15% or greater (see Table 3). Feeding programs are divided into general food distribution and selective feeding programs (see Figure 1) (Courtesy of Susan Cookson MD, 2008). General food distribution (GFD) is ensured by an adequate supply of general foods with the recommended daily 2100 kcal, which is the standard general ration for persons experiencing food crises (Emergency Nutrition Coordination Unit (ENCU), 2004; Mason, 2003). This includes 10% to 12% (52-63 gram) of the 2100 kcal as protein and at least 17% (40 gram) as fat (Emergency Nutrition Coordination Unit (ENCU), 2004). The goal of GFD is to cover the immediate basic food needs of a population to prevent malnutrition and its consequences (Emergency Nutrition Coordination Unit (ENCU), 2004). In prolonged food shortages, usually longer than 2 months, there is an increased risk of developing micronutrient deficiencies. Therefore, foods should be fortified with micronutrients. The most effective strategy is to include supplementation and food fortification (Emergency Nutrition Coordination Unit (ENCU), 2004).

Figure 1: Classification of Feeding Programs
Avilable at
http://www.tulane.edu/~internut/publications/lessons%20on%20nutrition%20of%20displaced%20people.pdf
Source: Mason, John B. (2003). Lessons on Nutrition of Displaced People. *American Society for Nutritional Sciences: The Journal of Nutrition, 132*(Supplemental), 2096S- 2103S.

Selective feeding programs are divided into therapeutic feeding programs (TFPs) and supplementary feeding programs (SFPs). TFPs are for treating severely malnourished

children, such as one with marasmus, kwashiorkor, or edema in a facility on an inpatient basis by medical staff (Mason, 2003; Young & Jasper, 2006). In these cases of severe malnutrition, the first phase of treatment begins by treating co-morbid conditions such as diarrhea or other infections, and correcting dehydration and electrolyte abnormalities (Access Medicine, 2010). There is also a concern for depletion of potassium. magnesium, calcium and other acid-base abnormalities (Access Medicine, 2010). Therefore, TFPs combine diet treatment with medical treatment for diseases and complications associated with severe acute malnutrition (Emergency Nutrition Coordination Unit (ENCU), 2004). The second phase of treatment focuses on repletion of protein, energy, and micronutrients by giving small amounts of needed calories and protein calculated according to the person's weight and protein needs (Access Medicine, 2010). Adult patients require 1g/kg of protein and 30kcal/kg daily with supplementation of vitamins and minerals (Access Medicine, 2010). Initially, fat and lactose containing products are withheld in severely malnourished patients(Access Medicine, 2010). This repletion includes frequent feeding with high energy protein-based diets managed in inpatient settings of a therapeutic feeding center (TFC) or a nutrition rehabilitation unit (NRU) at a hospital or health facility, or in community-based therapeutic care (CTC) programs, because of high association of severe malnutrition with high mortality rates (Emergency Nutrition Coordination Unit (ENCU), 2004). CTCs were established to take the burden off of TFCs and address the issues of access and coverage (Gatchell, Forsythe, & Thomas, 2005). They are an innovative concept that mobilizes communities and supports local health services to rapidly and effectively treat those with acute malnutrition in their homes (Gatchell, et al., 2005). TFCs are often located in large health centers where other

sick patients are housed and where there are only few per geographic area. This led to increased infection of undernourished patients and created the issue of access leading to the establishment of CTCs (Gatchell, et al., 2005). There are four elements to a CTC program: 1) community mobilization, 2) outpatient therapeutic programs (OTP) for cases of severe acute malnutrition without medical complications, 3) in-patient care for those with medical complications and 4) supplementary feeding for those with moderate malnutrition to prevent them from becoming severely malnourished (Gatchell, et al., 2005).

The high mortality associated with severe malnutrition can be attributed to medical complications, such as dehydration, infection, septic shock, hypoglycemia, hypothermia, heart failure, congestive heart failure, and anemia (Emergency Nutrition Coordination Unit (ENCU), 2004). The main goal of TFPs or CTCs is to reduce mortality by providing intense medical and nutritional therapy quickly (Emergency Nutrition Coordination Unit (ENCU), 2004). Implementing the 1999 WHO guidelines and TFPs for severe malnutrition therapy in children has reduced mortality rates. This has been documented in a Colombian study, where mortality rates were reduced to 5.7% over a five year period (Bernal, Velasquez, Alcaraz, & Botero, 2008). In this study, underlying issues of diarrheal and respiratory infections were treated with hydration and antibiotics (Bernal, et al., 2008). Additionally, supplementation of vitamin A, folic acid, and other vitamins and feeding from the start of therapy were fundamental in obtaining successful outcomes (Bernal, et al., 2008).

Supplementary feeding programs (SFPs) are divided into targeted and blanket. They provide additional food to nutritionally vulnerable groups, including moderately malnourished individuals and pregnant or lactating women, either at feeding locations with cooked meals or by distribution of dry take home rations (Emergency Nutrition Coordination Unit (ENCU), 2004). Often, SFPs are needed when childhood malnutrition is prevalent or the general ration is inadequate to prevent further deterioration (Emergency Nutrition Coordination Unit (ENCU), 2004). The blanket SFPs is distributed temporarily to all potentially vulnerable members of a population at risk with the goal of preventing widespread malnutrition and mortality (Emergency Nutrition Coordination Unit (ENCU), 2004). The blanket SFP is supposed to be temporary, often no more than 3 months; when the nutritional status indicates improvement, a targeted SFP should begin (Emergency Nutrition Coordination Unit (ENCU), 2004). Targeted supplementary feeding is restricted to the moderately malnourished and others that are not severely malnourished but may need special attention because of their vulnerability, such as pregnant women, lactating mothers, and children under five years of age, to prevent them from becoming severely malnourished (Emergency Nutrition Coordination Unit (ENCU), 2004; Mason, 2003). Both targeted and blanket SFPs are conducted in addition to GFD on a mostly outpatient basis, unless the patient has no appetite or has other medical complications (Mason, 2003).

At Risk Populations

Refugees and Internally Displaced Populations

Under several international conventions, refugees are defined as persons who flee their country of origin through a well founded fear of or actual persecution for reasons of race, religion, social class, or political beliefs (Toole & Waldman, 1997). They are often affected by armed conflict, food scarcity and lack of basic health service, and have high mortality rates immediately following their migration (Goette, 2005; Toole & Waldman, 1997). According to UNHCR at the end of 2009 there were over 43 million forcibly displaced people worldwide, of which 15 million were refugees and 27 million were internally displaced persons (IDPs) (United Nations System Standing Committee on Nutrition, 2010). Undernutrition contributes significantly to increased prevalence of mortality and morbidity among refugee populations and IDPs. Data indicate that millions of refugees and displaced people have experienced some form of undernutrition (Goette, 2005).

Refugees are at the highest risk of mortality immediately following their arrival in the country of asylum, reflecting long periods of inadequate food and medical care prior to arrival (Toole & Waldman, 1997). The crude mortality rate varies with length of stay in refugee camps and is associated with factors leading to displacement from their home country. In some camps, mortality was high in the first couple of months post arrival; in other camps, it increased after months and continued to climb (Toole & Waldman, 1997). The highest risk for mortality is among children under five years of age (Toole & Waldman, 1997).

In war torn areas, conflict and violence lead to the destruction of infrastructures, diversion of resources away from social service, and general economic collapse (Toole & Waldman, 1997). This causes deterioration in health care services and immunization coverage leading to disease which may contribute to under nourishment and consequential stunting and wasting (Toole & Waldman, 1997). Deliberate diversion of food supplies by various armed forces, disruption of transport and marketing, and economic issues can lead to food shortages (Toole & Waldman, 1997). Farming and harvesting supplies and goods become unavailable, exasperating the situation (Toole & Waldman, 1997). Climatic conditions in drought prone areas can have catastrophic outcomes (Toole & Waldman, 1997).

In a 2007 study conducted in eastern Chad, the rates of undernutrition were well above the WHO 15% threshold in children under 5 years of age, with a rate of 20.6% (95% confidence interval [CI]=17.9-23.3) among internally displaced children, and among non-displaced children living in a village 16.4% (95% [CI]== 14.0-18.8) with non-displaced children living in a town 10.1% (95% [CI]=8.1-12.2 (Guerrier et al., 2009). This range in prevalence for non-displaced children was based on whether they resided in a village or town and can be attributed to easier access to food sources in a larger town versus a smaller village. Additionally, when looking at internally displaced children, the crude mortality rate under 5 years old exceeded the 2 per 10,000 per day used as the emergency benchmark; it was 4.1 per 10,000 per day ([CI]=2.1-7.7) (Guerrier, et al., 2009). Contributing factors for this increased mortality included malnutrition associated with diseases like diarrhea, fever, and respiratory infections (Guerrier, et al., 2009). Mortality

rates among children who are severely malnourished compared with those not malnourished is usually about six times greater (Emergency Nutrition Coordination Unit (ENCU), 2004). Diarrhea is the leading causes of death among refugee and IDP children and stems from poor hygiene and sanitation, and lack of clean drinking water (Harvey & Rogers-Witte, 2007). Diarrhea is often accompanied by malnutrition, which can lead to cycles of wasting, loss of nutrients, immunosuppression, and further diarrheal diseases and other infections (Toole & Waldman, 1997; Young & Jasper, 2006).

Children Aged 0-59 Months

Worldwide in 2005, more than 147 million or one in four children under the age of five years were stunted. In low income countries, 27% and 23% of the children under age 59 months remain chronically undernourished or stunted and underweight, respectively (The World Bank, 2006; United Nations System Standing Committee on Nutrition, 2004). High prevalence of chronic undernutrition or stunting rates are found in south Asia countries ranging between 38% to 51% in Afghanistan, Bangladesh, India, and Pakistan (The World Bank, 2006). In Africa in 2007, the prevalence rate of stunted children aged 0-5 years was 38.5% and is higher still in eastern Africa with a prevalence of 45.7% (United Nations System Standing Commitee on Nutrition, 2010; United Nations System Standing Committee on Nutrition, 2004).

Children 6-59 months of age are at the highest risk for undernutrition (Young & Jasper, 2006). Children 13-36 months of age who are no longer being breastfed are at a greater risk for undernutrition than children 37-59 months of age because of several factors (see

risk factors in the next section) (Falkner, 1991). Children 6-12 months are less likely to be undernourished than children 37-59 months as the greatest source of their food comes from breastfeeding (Falkner, 1991). Others who are vulnerable to undernutrition are women of childbearing age, pregnant and lactating women, the elderly, and adolescents (Li, 2002).

There are several factors that contribute to early childhood being the most vulnerable period for undernutrition. First, nutritional needs are greater in the first two to three years of life, the time when children experience most of their growth and development (Li, 2002). Secondly, energy and nutrient dense foods are necessary as children are weaned from breast milk (Li, 2002). Thirdly, children are still developing their immune systems and therefore are more prone to infections; frequent infections, especially among undernourished children, contribute to growth stunting during this period (Li, 2002). Moreover, children, especially younger children are dependent on others for care and are vulnerable to poor caring practices (Li, 2002).

Risk Factors and Outcomes

A study of internally displaced populations in Uganda found that increased intake of foods low in energy and decreased intake of foods with fat, meat, or milk are risk factors for malnutrition (Olwedo, et al., 2008). Lack of access to diverse food groups, potable water, and good sanitation, and crowding also contribute to malnutrition in children (Toole & Waldman, 1997). In Nigeria, children 6-59 months of age who drank water from unsafe sources were more likely to be malnourished than children who drank tap

water (Madusolumuo MA & OB, 1998). Larger family size and greater numbers of children per household in developing countries contributed to increased risk of malnutrition (Madusolumuo MA & OB, 1998). Additional factors, such as gender, have been linked to malnutrition; in some cultures preferential treatment of male children has resulted in increased malnutrition among female children 6-59 months old (Madusolumuo MA & OB, 1998).

Poor nutrition places children at a higher risk for severe disease and poor health outcomes associated with diarrhea, measles, malaria and pneumonia (United Nations System Standing Committee on Nutrition, 2004). Risk of immunosuppression associated with malnutrition increases the risk of mortality and morbidity (Gillespie, McLachlan, & Shrimptom, 2003). Factors that influence survival include infection, fluid and electrolyte imbalance, hepatomegaly, hypothermia, hypoglycemia, and severe dermatosis (see Figure 2) (Emergency Nutrition Coordination Unit (ENCU), 2004).

Figure 2: Conceptual Frame Work of the Causes of Malnutrition (Gillespie, et al., 2003)
Also available on page 17 figure 2.2
http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2003/09/06/000094946_03082204005064/Rendered/PDF/multi0page.pdf
Source: Gillespie, S., M. McLachlan, and R. Shrimptom, eds. *Combating Malnutrition: Time to Act*. 2003, Wold Bank UNICEF: Washington DC.

Early childhood is a critical period for brain development, starting in utero and continuing into the second year of life; good nutrition is essential for proper development (The World Bank, 2006). Some deficiencies associated with improper nutrition are reversible, but deficiencies causing alterations in the hippocampus and cerebellum are

irreversible (Li, 2002). Therefore, undernutrition in early life can lead to growth failure, and delayed motor cognitive and behavioral development (Li, 2002). Children in developing countries also suffer from micronutrient deficiencies, such as vitamin A, iron, iodine, folate, and zinc among others, which can have both short and long term consequences (Li, 2002). These macro- and micronutrient deficiencies lead to the syndrome of developmental impairment (G. Beaton, 1990). This impairment can affect children's ability to learn and attain educational goals and adults' ability to obtain high paying occupations perpetuating the cycle of poverty.

The Institute of Nutrition in Central America and Panama (INCAP) in collaboration with the National Institutes of Health (NIH) conducted a study in rural Guatemala that showed nutrition interventions improve physical growth and mental development among preschool children, leading to better cognitive function and school achievement (Li, 2002). In fact, the earlier the child receives the intervention the longer the impact (Li, 2002). The study provided nutrition interventions for pregnant women from 1969 through 1977 and then nutritional interventions for their children after birth, with a follow up assessment of these children as adolescent in 1988-1989. The findings showed that nutritional intervention during pregnancy and early childhood, specifically the first two years of life, improved intellectual functioning, school achievement, work capacity, and anthropometric growth (Li, 2002). The study demonstrated that interventions targeted at pregnant women and women of child bearing age along with nutritional supplementation for pregnant women results in better outcomes of children through age two (Li, 2002).

Refugees and Internally Displaced Populations: Undernutrition and Mortality Rates

Many factors including poverty, poor nutrition, inadequate water and sanitation, and lack of adequate health services put displaced populations at a high risk for mortality and morbidity (Olwedo, et al., 2008). However, undernutrition makes a substantial contribution to excess mortality rates directly and indirectly due to increased rates of communicable diseases in refugee populations (Severin, 1999). Poor sanitation and contaminated water are the two most important sources of infectious diseases, leading to diarrheal diseases and other infections such as trachoma and intestinal parasites (Severin, 1999).

Studies in the early 1990's established a clear relationship between mortality and undernutrition, including both protein energy and micronutrient deficiencies, this was most evident in refugee camps because of living conditions and increased communicable diseases (Severin, 1999). In eastern Chad camps, the overall Crude Mortality Rate (CMR) was found to be 1.8 per 10,000 per day (95% [CI]=1.2-2.8), greater than the 1.0 per10,000 per day that is recognized internationally as defining an emergency situation (Guerrier, et al., 2009). Although, gender-specific mortality rates are not always collected, in one situation, mortality rates of female children under 1 year of age was twice that of male infants, and the risk of morbidity and mortality rates for women of any age was greater than for men (Toole & Waldman, 1997). A study in the Hartisheik Camp in Eastern Ethiopia of Somali refugees showed that the prevalence of acute undernutrition in children under five increased from 15% in September 1988 to 26 % in March 1988 and this was associated with greater CMR for the same age group (Severin, 1999). Another

study showed that in 2004, the prevalence of undernutrition among internally displaced persons in Southern Darfur province ranged from 10.7% to 23.6% in various parts of the region, with CMR ranging from 2 to3.2 per 10,000 persons per day (Young & Jasper, 2006). Mortality rates of children under five years of age were even higher in that region varying between 1.0 to 5.9 per 10,000 persons per day (Young & Jasper, 2006). These data from the studies undoubtedly demonstrates a correlation between increased mortality rates in refugee camps and undernutrition.

United States Refugee Resettlement Process

Refugees are required to undergo a medical examination in their country of temporary asylum before resettling in the United States (U.S) (Vergara, Miller, Marin, & Cookson, 2003). For U.S. resettlement, they are screened for certain inadmissible conditions, which are established by the Center for Disease Control and Prevention (CDC) of the Department of Health and Human Services (DHHS) and are variable from year to year (Stauffer & Weinberg, 2009). These inadmissible conditions may include: communicable diseases of public health significance, persons who have physical or mental disorders with associated harmful behavior, and drug abusers or addicts (Stauffer & Weinberg, 2009). These communicable diseases of public health significance have changed over time and currently include active tuberculosis, syphilis, gonorrhea, lymphogranuloma venereum, granuloma inguinale, chancroid, and leprosy (Centers for Disease Control and Prevention, 2011b). The vaccine-preventable diseases include mumps, measles, rubella, polio, tetanus, diphtheria, pertussis, *Haemophilus influenzae* type B, hepatitis B, meningococcoccal disease, varicella, pneumococcal pneumonia, and

influenza (Centers for Disease Control and Prevention, 2011a). Panel physicians assigned by the U.S. Department of State perform the examination with technical oversight by CDC (Stauffer & Weinberg, 2009). There is mass pre-departure therapy for intestinal parasites and malaria but no vaccination requirements (Stauffer & Weinberg, 2009). This has lead to outbreaks of some vaccine preventable diseases after resettlement and public health experts have presented the idea of a comprehensive vaccine program to prevent and reduce outbreaks (Stauffer & Weinberg, 2009).

When refugees resettle in the United States they also undergo a second screening usually 30 days after arrival. This screening is managed by State and local health departments (U.S. Department Of Health & Human Services). The Office of Global Health Affairs (OGHA) and the Substance Abuse and mental Health Services Administration (SAMHSA) provide technical guidance on post arrival medical screenings making up the Office of Refugee Resettlement (ORR) health team of the Health and Human Services (HHS) department (U.S. Department Of Health & Human Services). The ORR health team in addition to the Division of Global Migration and Quarantine (DGMQ) of the CDC address the special health challenges of refugees (U.S. Department Of Health & Human Services).

The purpose of the 30 day post-arrival screening is to follow up on conditions found during the overseas screening; identify additional communicable diseases of potential public health importance; and to identify personal health conditions that adversely impact the resettlement process of job placement (Department Of Health & Human Services,

1995). The Voluntary Resettlement Agency (VOLAG) casework instructs the patients to bring copies of their exam papers from overseas, chest x-ray, immunization record, and other medical records to the initial exam often conducted by refugee health programs which are a part of the state or local health departments (Department Of Health & Human Services, 1995; Vergara, et al., 2003). Patients are informed about available public health programs like immunizations, nutritional supplementation programs like Women and Infant Children (WIC), and the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program. The patient's medical records are reviewed followed by a history and physical exam including hearing and vision, height, weight, blood pressure, hemotocrit, dental screening for anyone two years and older, Purified Protein Derivative (PPD) applied as tuberculin skin test (TST) for anyone 6 months and older, immunizations, Sexually Transmitted disease (STD) specifically syphilis follow up from the overseas screening, and a general mental status exam is obtained (Department Of Health & Human Services, 1995). Stool is obtained for ova and parasite analysis if height and weight are less than fifth percentile and/or diarrhea, anemia, gastrointestinal symptoms are present (Department Of Health & Human Services, 1995). Hepatitis B screening, and further evaluation and referral for follow up are also conducted during the initial screening post arrival to the United States (Department Of Health & Human Services, 1995). Moreover, for children under 5 years old it is recommended by the ORR to measure head circumference and to be screened for developmental milestones. In the case of DeKalb County head circumference is rarely measured: however as part of the pediatric physical exam developmental milestones are screened.

Nevertheless, even though the ORR gives guidance as to what needs to be done during the initial screening there are variations to the services provided by site, state or county, and most sites have the goal of addressing and treating infectious diseases only (Vergara, et al., 2003). There is a lack of focus on chronic diseases during the initial exam as well as patient education on nutrition and behavioral modification (Vergara, et al., 2003). Data indicates increased obesity rates with acculturation and eating of foods which are high in calorie and low in nutritional value indicate there may be a need for nutritional education at the time of the 30 day screening(Amanda J Rondinelli et al., 2010). There are also increased incidence of diabetes, heart disease, high blood pressure and obesity associated with time after resettlement (Amanda J Rondinelli, et al., 2010).

The exam and follow up is financed by the Refugee Medical Assistance and is provided for 8 months after the refugee arrives (Office of Refugee Resettlement, 2010). After 8 months, they must be economically independent and obtain medical insurance coverage through employment or they become subject to standard eligibility requirements of Medicaid. Studies have shown that refugees are likely to not seek health care and health services because they do not understand services available to them (Meghan D Morris, Steve T. Popper, Timothy C Rodwell, Stephanie K. Brodine, & Brouwer., 2009). Barriers to insurance included gaps in coverage due to obstacles with enrollment in public insurance programs, or unavailability through employment (Meghan D Morris, et al., 2009). Aside from language and communication issues, transportation as well as financial burden of insurance fees, co-payments and out of coverage prescriptions were also an issue (Meghan D Morris, et al., 2009). Therefore, resettled refugees were more

likely than the general population to suffer from medical conditions that are treatable due to lack of access to medical services.

Chapter 3: Results

The National Origin of Refugee Resettling in DeKalb County

Although the source population varies from year to year, the most current data in 2008, from the Georgia Department of Community Health indicate that the majority of the refugee population comes from Burma, Nepal, and Bhutan, followed by Iraq, Eritrea, Ethiopia, Burundi and Somalia (Georgia Refugee Policy Initiative (GRPI), et al., 2009). In 2007, a large majority resettled from Burma and Somalia (Georgia Refugee Policy Initiative (GRPI), et al., 2009).

To understand refugee camps and settlements we need to know that there is great fluctuation of populations and movement of people in and within the neighboring regions of the world. For example, in 2006, 100,000 Bhutanese refugees resided in seven camps in eastern Nepal (United Nations System Standing Committee on Nutrition, 2005). Currently, there is also a large settlement of Burmese refugees in Thailand, and Nepalese refugees in the neighboring countries. Additionally, in 2009, there were over 170,000 refugees in Ethiopia coming from neighboring countries of Somalia, Eritrea, and a sub-population of internally displaced Ethiopians (United Nations System Standing Committee on Nutrition, 2010). The conflicts in Somalia have led to over 600,000 refugees in neighboring countries of Kenya, Yemen, Ethiopia, Eritrea, Djibouti, Tanzania and Uganda (United Nations System Standing Committee on Nutrition, 2010). Another 1.4 million Somali natives are internally displaced (United Nations System Standing Committee on Nutrition, 2010).

Refugees from Burundi, in the Democratic Republic of the Congo, have experienced the world's worst humanitarian crises since the mid 1990's with more than 5 million people dying as a result of the conflict and the consequences of undernutrition and disease (United Nations System Standing Committee on Nutrition, 2010). As of October 2010, over 1.9 million Congolese are internally displaced and over 430,000 are refugees in neighboring African countries; in Burundi there were over 27,000 Congolese refugees (United Nations System Standing Committee on Nutrition, 2010). These data are important to this literature review as it will evaluate studies that examine the nutritional status of populations in refugee camps specific to these populations.

However, one must keep in mind the movement of the populations within neighboring countries and the establishment of the camps comprised of different population groups, which is why I have classified the studies based on WHO regions in an effort to get a comprehensive understanding of the data. For the purpose of this review, regions of South Central Asia (Burma, Nepal, and Bhutan) are discussed first as they comprise the majority of the refugee population in DeKalb County in 2008. The Middle East, specifically Iraq, and Sub-Saharan Africa including East Africa make up the minority refugee population in DeKalb County and will be discussed in the second half of this chapter**.**

South Central Asia

In 2007, south central Asia accounted for the largest number of underweight and stunted children 0 to5 years of age globally with a little less than 67.1 million underweight

children, a prevalence of 32.5% (United Nations System Standing Commitee on Nutrition, 2010; United Nations System Standing Committee on Nutrition, 2004). The prevalence for stunted children in 2007 for the same region was found to be 39.9% (United Nations System Standing Commitee on Nutrition, 2010). There were four reports that focused on south central Asian refugees and undernutrition for this review.

A report by Pierce in collaboration with the Center for Asian and Pacific Islander refugees (CAPI) examined the health disparities among south Asian and African refugee communities in St. Paul, Minnesota. In a survey conducted in 2010 by CAPI, refugee stake holders identified undernutrition as a major health problem in the Hmong, Burmese and Cambodian refugee communities in St. Paul (Pierce, 2010). Iron-deficiency anemia was found in high prevalence among Hmong toddlers attending special supplemental food programs for WIC sites in St. Paul, Minnesota (Pierce, 2010). Additionally, of Burmese children aged 6-59 months living in Nepalese refugee camps, 72% had anemia and 64.9% had iron-deficiency anemia (Pierce, 2010). The cause of the high rates of iron deficiency anemia in this group was attributed to early and continued bottle feeding of cow's milk past the children's second birthday with little to no complementary feeding was a feeding practice used in this region of the world (Pierce, 2010).

Furthermore, in a 2008 report published by the CDC by Abdalla, et. al. a 2007 survey conducted among Bhutanese refugees in refugee camps in Nepal demonstrated that chronic malnutrition in children 6-59 months was at a higher prevalence rate of 26.9% (95% [CI] 23.2-31.0) than acute malnutrition which was at 4.2% (95% [CI] 2.8-6.4)

although rates decreased with age (F Abdalla et al., 2008; United Nations System Standing Committee on Nutrition, 2005). One in three children 24-59 months had chronic malnutrition with a prevalence of 31.1%, indicating the vulnerability of children as they wean from breast milk (F Abdalla, et al., 2008). The prevalence of anemia in children 6-59 months was at 43.3% (95% [CI] 39.0-47.7) (F Abdalla, et al., 2008). When this was further stratified by age the prevalence of anemia was even higher in children 6-11 months of age, with 78.8% of whom were anemic, indicating the possibility of anemic mothers feeding their children breast milk low in iron (F Abdalla, et al., 2008). The prevalence of anemia decreased with age to 68.4% for children 12-23 months old (F Abdalla, et al., 2008). More evidently, as the children got older the prevalence of anemia decreased to 28.7% in children 24-59 months of age (F Abdalla, et al., 2008). The study suggested three reasons for the high prevalence of anemia in this population: inadequate amounts of iron rich foods, poor feeding practices, and frequent episodes of common diseases, such as diarrheal and respiratory infections, which can increase the loss of micronutrients (F Abdalla, et al., 2008).

A more recent report published in March of 2011 by the CDC summarizes the results of an investigation by state health departments on the hematological and neurologic disorders caused by vitamin B12 deficiency among Bhutanese refugees settling in the United States, specifically Minnesota, Utah, and Texas between 2008 and 2011. It was found that 64% of blood specimens evaluated overseas showed vitamin B12 deficiency with 27% of post arrival medical screenings in the two states and 32% the Bhutanese refugees screened in the St. Paul, Minnesota having vitamin B12 deficiency (PF Walker

et al., 2011). The main cause of this deficiency is thought to be diet consumed by these refugees for nearly two decades which lacked meat, eggs, and dairy products (PF Walker, et al., 2011).

Furthermore, refugees restriction of movement, participation in the local agriculture and inability to earn wages further reduce their ability to obtain fresh foods rich in vitamins and minerals (F Abdalla, et al., 2008). Often food is transported from a distance to refugee camps and stored and rationed, therefore it is difficult to distribute perishable foods such as green vegetables, fruits, and meats which can be costly and logistically difficult to purchase in large quantities, store and transport (F Abdalla, et al., 2008). These logistical factors lead to limitations in diversifying the general rationing given to refugees, therefore diet supplementation and fortification is a way to prevent undernutrition and micronutrient deficiencies (F Abdalla, et al., 2008). However, even this can be expensive and fortification can reduce the shelf life of foods (F Abdalla, et al., 2008). Other studies, such as one by Young et. al., have found that in some emergencies, particularly in protracted emergencies where populations are dependent on a limited source of food such as refugee camps, the population may be at risk of certain micronutrient deficiencies with reports of clinical symptoms from vitamin A, B or C deficiencies (Young & Jasper, 2006). Unfortunately, by the time clinical symptoms are apparent, the sub-clinical deficiency levels may be high (Young & Jasper, 2006).

Summary (see Table 4)

We can infer from these reports that undernutrition and micronutrient deficiencies are high in prevalence among refugees from south central Asia resettling in the Unites States as well as in Georgia. Thus, in this specific population to address the issue of undernutrition, not only is it necessary to overcome the challenge of food fortification, and diversification, it is also necessary to broaden our focus from acute undernutrition and prevention of other micronutrient deficiencies such as iron, riboflavin, and vitamins A and C. Since 2008, there has been a large influx of refugees from Burma, Nepal and Bhutan, with the source population camps found in Nepal, Bhutan and Thailand. In fact, refugees from south central Asia make up the largest population entering DeKalb County since 2008. The second largest group resettling in DeKalb County is refugees coming in from Iraq following the political unrest starting in 2006. The following studies will examine the prevalence of undernutrition in the Middle East and Iraqi refugees.

Table 4: Summary of Results from South Central Asia							
WHO Region **South Central Asia:** **Burma, Nepal, and Bhutan**							
Literature Reviewed	**Publication Year**	**Time frame of Study**	**National Origin and population Studied**	**Region of Camps or Settlement of Study**	**Results**		
1.	**2010**	**2010**	**Burmese Children 6-59 Months of Age**	**Nepalese Refugee Camps**	**Anemia**	**Iron-deficiency anemia**	
					72%	**64.9%**	
2.	**2008**	**2007**	**Bhutanese Children 6-59 Months of Age**	**Nepalese Refugee Camps**	**Chronic Malnutrition**	**Acute Malnutrition**	**Anemia**
					26.9%	**4.2%**	**43.3%**
			Bhutanese Children 24-59 Months Of Age		**31.1%**		
3.	**2006**	**2006**	**Unspecified**	**Unspecified**	**High Prevalence of Micronutrient Deficiencies: Vitamin A, B, and C**		
4.	**2011**	**2008-2010**	**Bhutanese Refugees Ages 15 to >50**		**Vitamin B12 deficiency**		
				Camps (unspecified)	**64%**		
				Utah, and Texas	**27%**		
				Minnesota	**32%**		

Middle East and Iraq

When reviewing the literature on refugees coming from the Middle East and Iraq, few studies have looked at malnutrition among Iraqi refugees. Although the problem may not be as extensive as it is in south central Asia, rates of acute undernutrition are still high in camps post arrival for Iraqi refugees. For this review two studies were examined to assess the prevalence of undernutrition in Iraqi refugees.

A study conducted by Oliveira in 2009 of Iraqi refugees in Syria found that 5.4% of the children under five years old had global acute undernutrition, of which 2.4% were children 6-17 months old (Oliveira, 2010). Additionally, 3.5% of the children under five had moderate acute malnutrition (Oliveira, 2010). Moreover, 5.9% of the children were underweight and 11.9% were stunted (Oliveira, 2010). Although these may not be as concerning as the high numbers we have examined elsewhere, there was great concern because 50% of the children were anemic and 1.9% of children were severely malnourished (Oliveira, 2010).

Diarrhea was the main cause of malnutrition as it effected 48% of the malnourished children coupled with poor breastfeeding and complementary feeding practices, as well as lack of access to safe water and sanitation (Oliveira, 2010). The average household size was large at six persons, which is a contributory factor for limited availability and types of food; most refugees consumed less than the 2100 kcal per day requirement (Oliveira, 2010).

Toole, et. al. found that in some cases, refugee children who were adequately nourished before arrival to camps developed acute undernutrition either because of inadequate food rations or severe diarrheal diseases acquired after arrival (Toole & Waldman, 1997). The prevalence of acute undernutrition was higher in children ages 12-23 months in Kurdish refugee camps in northern Iraq in 1991 and increased from 5% to 13% during a two month period following a severe outbreak of diarrheal diseases (Toole & Waldman, 1997). However, the prevalence was less than 4% in children under the ages of 12 months either indicating the protective factors of breastfeeding or the increased risk of mortality for children under 12 months old before arrival to the camps (Toole & Waldman, 1997). In displaced populations, protein energy malnutrition and chronic undernutrition prevalence rates may range between 5% to 30% or even up to 80% under long term conditions of stress (Toole & Waldman, 1997). Rates under 20% are usually considered normal in refugee camps, rates of 20-40% are considered moderate, and prevalence of 40% and above are considered high (Toole & Waldman, 1997). Treatment and intervention in terms of selective feeding programs are complicated to implement and establish, especially among internally displaced populations where access by international relief agencies maybe difficult or impossible because of war conditions (Toole & Waldman, 1997).

Summary (see Table 5)

These two studies indicate that undernutrition may not be a major issue in the source population of Iraqi refugees resettling in DeKalb County, Georgia. However, the problem still exists because these populations become vulnerable to

undernutrition after arrival to the camps. Rates of global acute undernutrition were high in both studies, indicating vulnerability to living conditions, disease, and access to diverse foods in the camps after arrival. The next studies will highlight the prevalence of undernutrition in the third largest refugee group arriving in DeKalb County: those coming from Sub- Saharan Africa, specifically the countries of Ethiopia, Eritrea, Burundi, the Democratic Republic of the Congo and Uganda.

Table 5: Summary of Results from Middle East and Iraq

WHO Region Middle East and Iraq											
Literature Reviewed	**Publication Year**	**Time Frame of Study**	**National Origin Studied**	**Region of Camps or Settlement of Study**	**Results**						
1.	**2010**	**2009**	**Iraq**	**Syria**	**Global Acute Malnutrition 0-59 months of Age**	**Global Acute Malnutrition 6-17 months of Age**	**Moderate Acute Malnutrition 0-59 months of Age**	**Severe Malnutrition 0-59 months of Age**	**Under-weight 0-59 months of Age**	**Stunted 0-59 months of Age**	**Anemic 0-59 months of Age**
					5.4%	**2.4%**	**3.5%**	**1.9%**	**5.9%**	**11.9%**	**50%**
2.	**1997**	**1991**	**Kurdish refugees**	**Northern Iraq**	**Global Acute Malnutrition 12-23 months of Age**	**Global Acute Malnutrition Children under the Ages of 12 months**					
					5% to 13%	**4%**					

Sub-Saharan Africa and East Africa

Africa and especially eastern Africa was the second largest WHO region with a high prevalence of undernutrition. In 2007, Africa in general had a prevalence of 19.6% of underweight children 0-59 months old, with east Africa having the largest prevalence in the region with 22.3% (United Nations System Standing Commitee on Nutrition, 2010). The prevalence of stunted children was also high in this region with a percentage of 39.8, of whom 47.4% were in eastern Africa (United Nations System Standing Commitee on Nutrition, 2010). There were four reports and one study that examined the issues of undernutrition in refugees in Sub-Saharan Africa.

Olwedo, et. al. estimated the prevalence and described the risk factors associated with protein energy malnutrition among children under five year olds living in internally displaced persons camp in Omoro County, Gulu District in northern Uganda (Olwedo, et al., 2008). The study found that Uganda has high rates of undernutrition with prevalence rates of global stunting in 2006/2007 estimated at 39.1%, underweight 22.8% and global wasting 4.1% (Olwedo, et al., 2008). The majority or 78% of households in this camp obtained food from the World Food Program (WFP), but they also cultivated and either exchanged or purchased their food within the camp (Olwedo, et al., 2008). However, newcomers to the camp were not immediately entitled to WFP rations, they had to wait until their names were included in the registry for food distribution and this may take a minimum of one year (Olwedo, et al., 2008). Most of the foods rationed in this camp were comprised of maize seeds, beans and cooking oil, complemented with cultivated vegetables which were corn, sweet potatoes and cassava (Olwedo, et al., 2008). Animal

based protein foods were unavailable and expensive, accounting for the high prevalence of protein energy malnutrition (Olwedo, et al., 2008). Several factors including poor socioeconomic status, being unable to acquire foods easily, mother's absence from home while she is trying to earn extra income, and poor weaning practices contribute to undernutrition (Olwedo, et al., 2008). The prevalence of global stunting in this camp was 52.4% and severe stunting 24.9% (Olwedo, et al., 2008). The prevalence of global acute malnutrition was 6.0% (Olwedo, et al., 2008). Co-morbidities of communicable infectious diseases such as malaria accompanied by fever, and diarrhea and pneumonia have been associated with malnutrition in camps in Uganda and Sudan (Olwedo, et al., 2008). The most prevalent diseases in children in this camp were fever (84.8%), cough (81.7%) and diarrhea (62%) (Olwedo, et al., 2008). The presence of fever was significantly associated with acute undernutrition (OR 7.42 (95% [CI] 1.01-54.61 (p value=0.021) (Olwedo, et al., 2008).

A report by Harvey, et. al. published by the United States Agency for International Development (USAID), looked at the prevalence of acute undernutrition in preschool children in southern Sudan, the causes of undernutrition in the region. The results from this report demonstrated that the prevalence of acute undernutrition in 2004 of preschool children in southern Sudan in the general population in southern Sudan to be one of the highest in the world at 22%, well above the WHO 15% cut-off for nutrition emergencies (Harvey & Rogers-Witte, 2007). In addition, the nutritional status of southern Sudanese has not improved in the recent years, the prevalence of stunting and underweight are 45% and 48%, respectively (Harvey & Rogers-Witte, 2007). Breastfeeding and other practices

of discarding of colostrums, pre-lacteal feeds, lack of exclusive breastfeeding, and inappropriate introduction and types of complementary foods put children 6-30 months of age at the greatest risk for undernutrition (Harvey & Rogers-Witte, 2007). The causes of undernutrition vary widely by area, ethnic group, livelihood, ecological zone, but there is a common uniformity of cause such as the high burden of diseases and access to diverse foods (Harvey & Rogers-Witte, 2007). This report also found that the prevalence of global acute undernutrition in 2004 to be 6% in Kenya, 11% in Ethiopia and 13% in the Democratic republic of the Congo, with stunting rates of 37%, 52% and 42% respectively (Harvey & Rogers-Witte, 2007). To further substantiate this data the 2005 Ethiopian Demographic and Health Survey (DHS) found a prevalence of stunting among children under five years of age of 46.5%, severe stunting of 24.1%, and wasting of 10.5% (Central Statistical Agency & ORC Macro, 2006). The 5th report on the world nutrition situation reported that in 2005, the proportion of stunted children, thus chronic malnutrition, was higher in east Africa where 44.4% of school children were stunted and this proportion will increase because of higher population growth rates in this region (United Nations System Standing Committee on Nutrition, 2004).

A background report on the issues in nutrition for refugee children by Goette, published by the center for refugee research, found that malnutrition rates are among the highest in Sub-Saharan Africa refugee camps; in the 1980's and 1990's, Somali, Ethiopian, and Kenyan refugee camps had acute malnutrition rates over 15% (Goette, 2005). In July 2009, a survey was conducted to look at refugees in Ethiopia which number over 170,000, the largest group coming from Somalia, followed by Eritrea and Sudan (United

Nations System Standing Committee on Nutrition, 2010). This survey showed global acute undernutrition rates between 4.3%-12.5% in the seven camps spread across the country (United Nations System Standing Committee on Nutrition, 2010). Out of the seven camps studied, four showed rates above 10% and two showed severe acute undernutrition rates of 2% (United Nations System Standing Committee on Nutrition, 2010). Rates of anemia were also very high in these camps. The prevalence of anemia among children 6-59 months ranged between 21.5%-42.3% and among non-pregnant women between 6.3%-27.6% (United Nations System Standing Committee on Nutrition, 2010). Moreover, in October of 2009 a study among Somalian, Ethiopian, Ugandan, Rwandan, Congolese, Burundian, Liberian, Angolan and Eritrean children 6-59 months of age in a KenKakuma Refugee Camp in Kenya found high levels of global acute undernutrition at a rate of 17% (95% [CI]: 14.5-19.9) (United Nations System Standing Committee on Nutrition, 2010). One of the factors leading to such high rates included the prevalence of malnutrition in the source populations from which the refugees originated as well as an outbreak of watery diarrhea at the time the survey was conducted. A second survey in April 2009 showed a decrease in the global acute undernutrition rate to 7.9% (95% CI: 6.1-10.1) (United Nations System Standing Committee on Nutrition, 2010).

Summary (see Table 6)

These reports and studies indicate the high prevalence of acute and chronic undernutrition in Sub-Saharan African camps which includes the same nationality as the third largest group of refugees resettling in DeKalb County. The literature

review in this sub-population indicates that undernutrition is the most prevalent issue in these camps. The causes of the high prevalence in this population vary but the nutritional conditions of the refugees prior to arrival in the camps and their living conditions as well as an increase in susceptibility to communicable diseases play a major role.

Table 6: Summary of Results from Sub-Saharan Africa								
WHO Region **Sub-Saharan Africa**								
Literature Reviewed	**Publication Year**	**Time Frame of Study**	**National Origin Studied**	**Region of Camps or Settlement of Study**	**Results**			
1.	**2008**				**Global stunting**	**Severe stunting**	**Under-weight**	**Global Wasting**
		2006/2007	**Uganda < 5 years of Age**		**39.1%**		**22.8%**	**4.1%**
		2006/2007	**Internally displaced Ugandan < 5 years of Age**	**Omoro County, Gulu District in northern Uganda**	**52.4%**	**24.9%**		
2.	**2007**	**2004**			**Global acute Malnutrition**	**Stunting**	**Under-weight**	
			Southern Sudan	**Preschool children in the General population**	**22%**	**45%**	**48%**	
			Kenya	**Preschool children in the General population**	**6%**	**37%**		
			Ethiopia	**Preschool children in the General population**	**11%**	**52%**		
			Democratic republic of the Congo	**Preschool children in the General population**	**13%**	**42%**		

WHO Region **Sub-Saharan Africa**					
Literature Reviewed	**Publication Year**	**Time Frame of study**	**National Origin studied**	**Region of Camps or Settlement of Study**	**Results**
3.	**2005**	**2004**	**Africa (age not specified)**	**School Age children**	**Stunting**
					44.4%
4.	**2005**	**1980's and 1990's**	**National Origin not specified but Populations from Neighboring countries**	**Somali, Ethiopian, and Kenyan refugee camps**	**Global Acute Malnutrition**
					15%

WHO Region **Sub-Saharan Africa**							
Literature Reviewed	**Publication Year**	**Time Frame of Study**	**National Origin Studied**	**Region of Camps or Settlement of Study**	**Results**		
5	**2010**	**2009**	**Somalia, Eritrea and Sudan**	**Seven refugees Camps in Ethiopia**	**Global Acute Malnutrition**	**Anemia Children 6-59 months**	**Anemia non-pregnant women**
					4.3%-12.5%	**21.5%-42.3%**	**6.3%-27.6%**
			Somalian, Ethiopian, Ugandan, Rwandan, Congolese, Burundian, Liberian, Angolan and Eritrean children 6-59 months of age	**KenKakuma Refugee Camp in Kenya**	**Global Acute Malnutrition Children 6-59 months**		
		Oct 2009			**17%**		
		April 2009			**7.9%**		

Chapter 4: Discussion, Conclusion and Recommendations

Discussion

The Nutritional status of refugee populations has been an emerging topic of interest in public health over the past several years. The evidence garnered from this literature review indicates that undernutrition is unquestionably in high prevalence in the camps that include refuges from the same national origin as refugees resettling in DeKalb County. We can infer that refugees from Burma, Nepal, and Bhutan in south central Asia, which have one of the highest rates of underweight and stunted children, suffer from undernutrition based on the literature reviewed. This population also suffers from micronutrient deficiencies of vitamin B12 and iron deficiency anemia. There needs to be more studies conducted to look at other micronutrients such as vitamin D and iodine.

The literature has gaps due to the lack of information for each refugee subgroup and specific prevalence data. However, this can be a reflection of the fluctuation and movement of the refugees to neighboring countries as well as the population make up of the refugee camps. The conclusions have limitations in terms of the age groups studied in the literature reviewed. Most of the literature, surveys, studies and reports did not stratify by age or focus on the most relevant age group affected by undernutrition; children ages 0-59 months. Therefore, the results presented in this review were general and included refugees of all age groups.

The literature presented very little data for Iraqi refugees in the Middle East. However, studies showed that acute undernutrition rates were high in camps because of living

conditions and communicable diseases post arrival. Further studies should be conducted in Iraqi refugees to better understand if the acute undernutrition has long term effects as they resettle in the United States. The effects of undernutrition on development in children under five years old, especially those under two years old, if not adequately treated in the camps could be detrimental.

There was abundant and significant data present for countries of Sub-Saharan Africa which included Eritrea, Ethiopia, Burundi and Somalia. Evidently this region has the second most prevalent rates of underweight and stunted children. The nutritional status of general populations is less than optimum due to the high rates of poverty and disease in these countries; therefore their nutritional status is exasperated in refugee camps. In countries undergoing armed conflict, the nutritional status of children prior to migration into refugee camps has a protective effect on post arrival nutritional status in the camps and finally on resettlement in Georgia (Goette, 2005). Even in non-emergency or non-conflict times the nutritional status of children in countries of Sub-Saharan Africa and south central Asia are not at optimum because of poverty and disease, and are worsened in emergency situations (Goette, 2005).

Undoubtedly, the extreme vulnerability of children arriving from these countries indicates the need for specialized nutritional services post settlement in DeKalb County. Clearly the data indicates the poor nutritional status of the populations in refugee camps that include the same national origin as refugees in DeKalb County. The current services available through WIC and the minimal referral services available are not sufficient to

meet the needs of this specialized population. WIC and nutritional education and counseling available in the clinics do not address the issue of chronic undernutrition and stunting. The difficult process of resettlement, cultural, language and economic barriers can contribute to ongoing malnourishment post resettlement.

DeKalb County Refugee Health Services allowed me to follow the pediatric refugee clinic from January 2011 to March of 2011. I was able to observe the anthropometric measurements, and follow some of the patients during this time. Undernutrition and nutritional deficits such as anemia were clearly indicated in the labs of patients and some children even had clinical symptoms of fatigue and constipation due to lack of variation in the types of foods consumed. There were also several patients who received nutritional counseling by the pediatrician, but there is a need for added services via a volunteer nutritionist or a full time pediatric nurse who can do continued teaching and follow up for vulnerable families. The lack of access and availability of culturally appropriate foods, and changes in preparation as well as shopping habits post arrival can also be contributory (Goette, 2005).

Prevention is the key in undernutrition; in the case of refugee populations, adequate GFD, clean water and good sanitation, diarrheal disease control, maternal child health care, and selective feeding programs when necessary are indicated as preventive measures (Toole & Waldman, 1997). Diarrheal diseases, which have high incidence rates in refugee camps, especially among children, can contribute to decreased absorption of micronutrients increasing the loss of vital vitamins and minerals (F Abdalla, et al., 2008).

It is also important to educate mothers and caretakers about proper breastfeeding and complementary feeding practices to prevent anemia and undernutrition in young children (F Abdalla, et al., 2008). This includes exclusive breastfeeding until 6 months of age and providing complementary foods rich in vitamins and minerals usually starting at 6 months of age (F Abdalla, et al., 2008). Additionally, clinicians should be aware of the risk for micronutrient deficiencies like vitamin B12 deficiency in Bhutanese refugees. All Bhutanese refugees should be given nutrition advice and should receive supplemental vitamin B12 upon arrival in the United States (PF Walker, et al., 2011). Refugees with clinical manifestations suggestive of deficiency should be tested for adequate serum vitamin B12 concentrations and, if found to have a B12 deficiency, screened for underlying causes, and treated with parenteral vitamin B12 or high-dose oral supplements, and evaluated for response to therapy (PF Walker, et al., 2011).

Figure 3 from the New Sudan Center for Statistics and Evaluation (NSCSE) summariezs the findings from this literature review. It depicts the countries of Burma, Nepal, and Bhutan, Eritrea, Ethiopia, Burundi and Somalia as having high prevalence of underweight children less than 5 years old, the prevalence ranging between >30% to 20.0-29.9%. When looking at Iraq the map depicts the prevalence range for underweight children in this region to be between 10.0-19.9%. Evidently we can see that the source populations for the refugees resettling in DeKalb County have high prevalence of underweight children less than 5 years of age.

Figure 3: Geographical Pattern of Underweight in Children Younger Than 5 Years Globally (Harvey & Rogers-Witte, 2007)
Also avilable on page 16 Annes 1 part 2
http://www.a2zproject.org/pdf/A2Z_SouthSudan_Doc_MEH_Edits_092308.pdf
Source: New Sudan Center for Statistics and Evaluation (NSCSE) Series Paper

Future Direction

The influx of refugees from different parts of the world has led to studies in the highly refugee populated cities of the United States. There are several papers published on refugees in Minnesota and Rhode Island. To date there are no studies published assessing the nutritional status of refugees in Georgia, which houses the largest settlement of refugees in the southeastern United States. The evidence from this literature review indicates that undernutrition is in high prevalence in the source population of Georgian refugees. The next step in this process will be to collect adequate data for analysis in this subpopulation to look at the prevalence. Proper anthropometric assessment during the initial exams in the clinics will be a foundation to this future study.

Observations were collected on initial anthropometric measurements at the DeKalb County Refugee Health Services from February 2011- March 2011 on three different days (see Table 7, Table 8, Table 9). During the three days of observation, data were collected on preparation for collection and analysis of anthropometric data. These observations indicate clear inconsistencies in anthropometric measurements in the clinic.

There were clear inconsistencies in anthropometric measurements, indicating the need for standardization of measurement methods and technique. These data are not only used for

nutritional assessment in pediatric patients, but are also used to calculate dosage of pediatric medications. Therefore have significant impact in assessment and standard of patient care. There were a total of 33 patients, varying in age from 12 months to 39 years of age observed in three days. The results from the observation showed that:

1. Scales were never calibrated at the beginning of the day
2. Shoes, jackets and hats were not always taken off
3. For children under 2 years old, soiled diapers were left on
4. Height was recorded in feet and inches or in inches alone based on the personnel conducting the measurement
5. Numbers were often rounded to whole numbers and sometimes to one or two decimal places
6. Weight measurements were consistently in pounds, however again there were issues with rounding

Table 7: Clinic Anthropometric Intake Observation Date 2/16/2011

Patient #	Measurer	Jacket off	Shoes off	Hats off	Diapers off	Pt. Age	Height	Weight
1	Interpreter	No	Yes	N/A	N/A	14 years	5.4	79.2 lbs
2	Nurse	Yes	Yes	N/A	N/A	8 years	4.3	49.0 lbs
3	Interpreter	Yes	Yes	N/A	N/A	11 years	4.10	81.8 lbs
4	Interpreter	Yes	Yes	Yes	N/A	12 months	2.7	19.6 lbs
5	Interpreter	Yes	Yes	N/A	N/A	5 years	3.10	40 lbs
6	Interpreter	Yes	Yes	N/A	No-soiled	13 months	2.6	25.2 lbs
7	Interpreter	Yes	Yes	N/A	N/A	7 years	4	46.0 lbs
8	Pediatrician	Yes	Yes	N/A	N/A	10 years	51 inches	58.8 lbs
9	Pediatrician	Yes	Yes	N/A	N/A	4 years	41 inches	34.4 lbs
10	Interpreter	No	Yes	N/A	N/A	17 months	2.8	22 lbs
11	Interpreter	No	Yes	N/A	N/A	6 years	3.9	42 lbs
12	Interpreter	No	Yes	N/A	N/A	17 years	4.8	103 lbs
13	Interpreter	No	Yes	N/A	N/A	11 years	4.8	80.6lbs

*Note Scales were not calibrated in the morning

Table 8: Clinic Anthropometric Intake Observation Date 3/1/2011

Patient #	Measurer	Jacket off	Shoes off	Hats off	Diapers off	Pt. Age	Height	Weight
1	Interpreter	No	Yes	N/A	N/A	26 years	5.1	106 lbs
2	Interpreter	No	Yes	N/A	No- Empty	17 months	18 inches	24 lbs
3	Interpreter	Yes	Yes	N/A	N/A	N/A	5.20	115 lbs
4	Interpreter	No	Yes	N/A	N/A	N/A	4.25	50 lbs
5	Interpreter	No	Yes	N/A	N/A	N/A	5.60	180 lbs
6	Interpreter	Yes	Yes	N/A	N/A	N/A	5	95 lbs
7	Interpreter	No	Yes	N/A	N/A	N/A	5.4	108 lbs
8	Interpreter	Yes	Yes	N/A	N/A	N/A	4.5	55 lbs
9	Nurse	Yes	Yes	N/A	N/A	N/A	N/A	115.8lbs
10	Interpreter	No	Yes	N/A	N/A	N/A	4.3	49lbs
11	Interpreter	Yes	Yes	N/A	N/A	N/A	5.9	163 lbs
12	Interpreter	Yes	Yes	N/A	N/A	N/A	4.11	125 lbs

*Note Scales were not calibrated in the morning

Table 9: Clinic Anthropometric Intake Observation Date 3/2/2011

Patient #	Measurer	Jacket off	Shoes off	Hats off	Diapers off	Pt. Age	Height	Weight
1	Interpreter	Yes	Yes	N/A	N/A	N/A	5.5	96 lbs
2	Interpreter	Yes	No	N/A	No-soiled	13 months	2.7	21 lbs
3	Interpreter	Yes	Yes	N/A	N/A	13 years	4.8	68.2 lbs
4	Interpreter	Yes	Yes	N/A	N/A	15 years	N/A	148 lbs
5	Interpreter	Yes	Yes	N/A	No- Empty	16 months	2.15	25 lbs
6	Interpreter	Yes	Yes	N/A	N/A	18 months	2.7	17.3 lbs
7	RN	Yes	Yes	N/A	N/A	11 years	5.4	254 lbs
8	RN	Yes	Yes	N/A	N/A	6 years	3.10	42.8 lbs

*Note Scales were not calibrated in the morning

According to CDC guidelines, scales should be calibrated daily by the technician assigned to the body measurement station, a random standard weights should be applied to check the accuracy of the weight scales, and this measurement should be logged in the equipment calibration log book (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). The scales at the DeKalb County Refugee Health Services were found to be calibrated yearly, which will lead to inconsistent readings of weight. It may not be possible due to resources and staffing to calibrate the scales daily at the clinic, but a recommendation can be made for the scales be calibrated at least once a week and logged in a log book. Additionally, jackets or coats as well as shoes were not taken off consistently, diapers if noted as being soiled should be changed. Ideally, the optimum way to record the weight of the patient is if the patient is wearing an exam gown and only underpants or clean diapers (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). Weight data collected if the patient is wearing shoes on the scale are considered invalid, if the patient refuses to remove the shoes the weight should be noted as could not obtained in the charts (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). Shoes not only affect the weight readings but also can affect the height measurements as well. Therefore, proper training of intake staff either through a workshop or training orientation is necessary to standardize anthropometric data.

CDC guidelines for height measurements indicate that the equipment should be checked daily to make sure that it is operating smoothly; the horizontal bar should be attached firmly to the upright sliding section and move effortlessly (Centers for Disease Control

and Prevention & National Center for Health Statistics, 2007). The digital counter and foot board for an infant measuring board should also be checked daily and lubrication can be applied it the foot board is having trouble sliding (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). When taking standing height, patients should remove all hair ornaments and stand with weight evenly distributed on both feet, the heels should be together and toes apart (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). For an infant, the child should be laid in the recumbent position and the recorder should support the child's head while the examiner positions the feet, a gentle traction should be applied to bring the top of the head in contact with the fixed head piece while the legs are aligned by applying mild pressure over the knees (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). Head circumference should be measured for children from birth to 6 months of age (Centers for Disease Control and Prevention & National Center for Health Statistics, 2007). At the clinic head circumference was never obtained for any of the patients observed under 6 months of age.

To resolve these discrepancies when taking anthropometric data at the clinic it is recommended that staff be trained through a workshop, or orientation with printed manuals that can be distributed. The inconsistencies in recording number and rounding can also be addressed at the workshop. Numbers were often rounded to whole numbers and infrequently rounded to one decimal place during my observation. Although there are no specific guidelines that address this issue, the recommendation for accuracy in terms of rounding numbers is that numbers should be rounded to two decimal places to

improve the accuracy of records. Additionally, a protocol guideline should be posted at each of the scales and standiometers in the clinic. Although it may not be possible to check equipment daily, equipment should be checked at least once a week, and scales calibrated as well as logged onto a log book. This will allow for more exact data available for analysis in future studies to determine the prevalence of undernutrition in this population.

Conclusion

In conclusion, it is evident that rates of undernutrition are high among the source population for refugees resettling in DeKalb County. Various studies and reports have shown high prevalence of undernutrition among refugees in camps. Education and prevention is the key in combating undernutrition rates, specifically women's education, income growth and food production (The World Bank, 2006). Therefore, educating women and caregivers in refugee camps is essential in decreasing the prevalence rates of undernutrition in refugee children. Additionally, it is important to assess the extent of the problem in resettled refugee children in DeKalb County and establish a supplementary feeding program if a need exists. Nutritional status is very important in brain development and educational achievement which may determine the success of an individual to live a prosperous life. These vulnerable populations need special attention and nutritional services to meet their needs. It is recommended as part of the supplementary feeding program that a volunteer nutritionist or a full time pediatric nurse trained in nutritional assessment and treatment may be needed to meet the goals of this program. Finally, general practitioners servicing in the network of the DeKalb County

Refugee Health Services clinic need to be aware of the health issues specific to refugees in order to conduct a comprehensive health assessment and treatment.

Recommendations

1. A study needs to establish the prevalence of undernutrition for children 0-59 months of age based on the initial anthropometric intake during the initial assessment.
2. Staff should be trained in proper anthropometric intake guidelines in order to have accurate data for analysis in future studies.
3. As part of the initial clinical assessment all refugees should undergo a nutritional assessment if the study establishes a high prevalence in this population.
4. As part of the initial clinical assessment patients should be educated about proper nutrition supplemented by informational pamphlets in the appropriate language, pictures, food pyramids, and culturally appropriate recipe pamphlets or books. Additionally all children should be provided multivitamins during the initial exam.
5. A supplementary feeding program should be established to meet the needs of the refugee population with appropriate nutritional and vitamin supplements as needed. As part of this program a volunteer nutritionist or a pediatric nurse should be assigned cases of vulnerable families to continue patient education and follow up as well as monitoring nutritional status of patients.

6. Federal agencies and county health departments should provide training or workshops on nutritional status of refugees and their special needs to healthcare providers in the surrounding referral network for refugee health services. This will increase their capability of diagnosing and appropriately treating undernutrition and micronutrient deficiencies specific to this population.

References

Access Medicine. (2010). Nutritional Disorders Current Medical Diagnosis and Treatment (Vol. Chapter 29): McGraw-Hill

Amanda J Rondinelli, Meghan D Morris, Timothy C Rodwell, Kathleen S. Moser, Paulino Paida, Steve T. Popper, & Brouwer, Kimberly C. (2010). Under and Over Nutrition Among Refugees in San Diego County California. *Journal of Immigrant Minority Health*.

Bernal, Carlos, Velasquez, Claudia, Alcaraz, Gloria, & Botero, Jorge. (2008). Treatment of Severe Malnutrition in Children: Experience in Implementing the World Health Organization Guidelines in Turbo, Colombia. *The Journal of Pediatric Gastroenterology and Nutrition 46*, 322-328.

Centers for Disease Control and Prevention. (2011a). Diseases and Vaccines Included, 2011, from http://www.cdc.gov/immigrantrefugeehealth/exams/diseases-vaccines-included.html

Centers for Disease Control and Prevention. (2011b). Immigrant and Refugee Health. *Immigrant and Refugee Health* Retrieved March 20, 2011, from http://www.cdc.gov/immigrantrefugeehealth/exams/diseases-vaccines-included.html#comm

Centers for Disease Control and Prevention, & National Center for Health Statistics. (2007). National Health and Nutrition Examination Survey (NHANES) *Anthropometry Procedures Manual*. Rockville, MD: Centers for Disease Control and Prevention

Central Statistical Agency, & ORC Macro. (2006). *Ethiopia Demographic and Health Survey 2005*.

Courtesy of Susan Cookson MD. (2008). *Module 10: Nutrition information and surveillance systems*. CDC.

Department Of Health & Human Services. (1995). Medical Screening Protocol for Newly Arriving Refugees. Washington D.C.: Administration for Children and Families.

Emergency Nutrition Coordination Unit (ENCU). (2004). Emergency Nutrition Intervention Guideline. Addis Ababa, Ethiopia: Early Warning Department of the Disaster Prevention and Preparedness Commission

F Abdalla, J Mutharia, N Rimal, O Bilukha, L Talley, T Handzel, & Bamrah., S. (2008). Malnutrition and Micronutrient Deficiencies Among Bhutanese Refugee Children Nepal 2007 *Morbidity and Mortality Weekly Report (MMWR)* (pp. 370-373): Center for Disease Control and Prevention

Falkner, Frank (Ed.). (1991). *Infant and Child Nutrition Worldwide: Issues and Perspectives*. Boca Raton, Florida: CRC Press.

G. Beaton, A. Kelly, J. Kevany, R. Martorell, and J. Mason. (1990). Appropriate Uses of Anthropometric Indices in Children − Nutrition policy discussion paper No. 7 (pp. 1-48). Geneva: United Nations.

Gatchell, Valerie, Forsythe, Vivienne, & Thomas, Paul-Rees. (2005). The sustainability of Community-based Therapeutic Care (CTC) in non-acute emergency contexts. Dublin: Concern Worldwide

Georgia Refugee Policy Initiative (GRPI), Georgia Department of Community Health, & Division of Public Health/Infectious Disease Section: Refugee Health Unit. (2009). Fact Sheet: Refugees in Georgia. from Georgia Refugee Policy Initiative (GRPI)

Gillespie, Stuart, McLachlan, Milla, & Shrimptom, Roger (Eds.). (2003). *Combating Malnutrition: Time to Act*. Washington DC: World Bank UNICEF.

Goette, J. (2005). Hopes Fulfilled or Dreams Shattered? From resettlement to settlement Conference: Issues in Nutrition for Refugee Children Center for Refugee Research.

Grummer-Strawn, Laurence M, Reinold, Chris, & Krebs, Nancy F. (2010). Use of World Health Organization and CDC Growth Charts for Children Ages 0-59 Months in the United States (Physical Activity and Obesity Division of Nutrition, National Center for Chronic Disease Prevention and Health Promotion Trans.). In Morbidity and Mortality Weekly Report (MMWR) (Ed.), (Vol. 59, pp. 1-15). Atlanta: Center for Disease Control and Prevention

Guerrier, Gillrd, Zounoun, Malaika, Delarosa, Olimpia, Defourny, Isebella, Lacharite, Michelo, Brown, Vincent, & Pedalino, Biagio. (2009). Malnutrition an Mortality Patterns among Internally Displaced and Non-Displaced Populations Living in a Camp, a Village or Town in Eastern Chad. *PLOS One, 4*(11).

Harvey, Phillip, & Rogers-Witte, Beth. (2007). Nutrition Status and its Determinants in Southern Sudan: USAID A 2 Z project: Micronutrient Sight Innovation Academy for Educational Development.

Li, Hajoie. (2002). *Effects of nutrition in early life on body size, composition, and intellectual functioning in young adulthood.* Doctor of Philosophy, Emory University Atlanta. (3059012)

Madusolumuo MA, & OB, Akogun. (1998). Social cultural factors of malnutrition among under five in Adanawa State, Nigeria. *Nutrition and Health, 12*, 257-262.

Mason, John B. (2003). Lessons on Nutrition of Displaced People. *American Society for Nutritional Sciences: The Journal of Nutrition, 132*(Supplemental), 2096S- 2103S.

Meghan D Morris, Steve T. Popper, Timothy C Rodwell, Stephanie K. Brodine, & Brouwer., Kimberly C. (2009). Healthcare Barriers of Refugees Post-resettlement *Journal of Community Health 34*, 529-538.

Michael J. Dibley, Goldsby, James. B., Staehling, Norman W, & Trowbridge, Frederick L. (1987). Development of Normalized Curves for the International Growth Reference: Historical and Technical Considerations. *American Journal of Clinical Nutrition, 46*(5), 736-748.

Office of Refugee Resettlement. (2010). Cash and Medical Assistance, from http://www.acf.hhs.gov/programs/orr/programs/cma.htm

Oliveira, Lucia. (2010). How to assess and respond to Iraqi refugee needs in Syria *Field Exchange: Emergency Nutrition Network*.

Olwedo, Mary Abwola, Mworozi, Edison, Bachou, Hanifa, & Orach, Christopher Garimoi. (2008). Factors associated with malnutrition among children in internally displaced person's camps, northern Uganda. *African Health Science, 8*(4), 244-252.

PF Walker, MD, A O'Fallon, MA, K Nelson, MPH, B Mamo, MPH, S Dicker, MS, MPH, , S Chute, MPP, . . . JL Foltz, MD. (2011). Vitamin B12 Deficiency in Resettled Bhutanese Refugees --- United States, 2008--2011. In Centers for Disease Control and Prevention (Ed.), *Morbidity and Mortality Weekly Report (MMWR)* (Vol. 60, pp. 343-346). Atlanta, : Centers for Disease Control and Prevention.

Pierce, Alexandra Sandi. (2010). Health disparities in Southeast Asian and African refugee communities. St. Paul: Othayonih Research and Evaluation Services.

Severin, Justine. (1999). An exploration of the impact of malnutrition in refugee camps. In Australian National University (Ed.), *Asia Pacific Press*: Australian National University

Stauffer, William M, & Weinberg, Michelle. (2009). Emerging Clinical issues in refugees *Current Opinion in Infectious Diseases, 22*, 436-442.

The World Bank. (2006). Directions in Development: Repositioning Nutrition as Central to Development, a Strategy for Large- Scale Action Washington, DC: The World Bank.

Toole, MJ, & Waldman, RJ. (1997). The Public Health Aspect of Complex Emergencies and Refugee Situations. *Annual Review of Public Health 18*, 283-312.

U.S. Department Of Health & Human Services. Administration for Children & Families, from http://www.acf.hhs.gov/programs/orr/benefits/health.htm

United Nations System Standing Committee on Nutrition. (2010). 6th Report on the World Nutrition Situation: Progress in Nutrition. In UNSSON (Ed.), *Report on the World Nutrition Situation*. Geneva: United Nations.

United Nations System Standing Committee on Nutrition. (2004). 5th Report on the World Nutrition Situation: Nutrition for Improved Development Outcomes − March 2004. Geneva, Switzerland.

United Nations System Standing Committee on Nutrition. (2005). Nutrition Information in Crisis Situations- Report Number VII, August 2005. In United Nations (Ed.), *Nutrition Information in Crisis Situations* (Vol. VII). Geneva: United Nations.

United Nations System Standing Committee on Nutrition. (2010). Nutrition Information in Crisis Situations. In United Nations (Ed.), (Vol. XXII). Geneva: United Nations.

Vergara, Alferdo E., Miller, Joy m., Marin, David R., & Cookson, Susan T. (2003). A survey of Refugee Health Assessment in the United States. *The Journal of Immigrant health 5*(2), 67-71.

World Health Organization. (2006). World Health Organization releases new Child Growth Standards Retrieved October 25, 2010, from http://www.who.int/mediacentre/news/releases/2006/pr21/en/index.html

Young, Helen, & Jasper, Susanne. (2006). The meaning and measurement of acute malnutrition in emergencies *Humanitarian Practice Network*. London: Humanitarian Policy Group.

APPENDIX A: Database Searches

Database	Search Terms	#of Results
Pub Med	Undernutrition, Children	20364
	Nutrition, classification	4094
	Anthropometric methods, assessment for under nutrition	675
	Treatment, undernutrition, refugees	85
	At risk populations, undernutrition, children	1268
	At risk populations, undernutrition, refugees	30
	Risk factors, undernutrition, children and refugees	21
	Mortality rates, undernutrition, children and refugees	26
	Asian refugees, undernutrition	4
	Middle eastern refugees, undernutrition	23
	Iraqi refugees, undernutrition	1
	African refugees, undernutrition	20
Web of Science	Undernutrition, Children	918
	Nutrition, classification	834
	Anthropometric methods, assessment for undernutrition	33
	Treatment, undernutrition	524
	At risk populations, undernutrition, children	29
	Undernutrition, refugees	7
	Risk factors, undernutrition, children	153
	Mortality rates, undernutrition, children	29
	Refugees from Asia, undernutrition	2
	Middle eastern refugees, undernutrition	0
	Refugees from African, undernutrition	3

APPENDIX B. Website Searches

Organization Name	Website
WHO	http://www.who.int
CDC	http://www.cdc.gov
UNHCR	http://www.unhcr.org/cgi-bin/texis/vtx/home
UNSCN	http://www.unscn.org/
UNICEF	http://www.unicef.org/
WORLD BANK	http://www.worldbank.org/
HHS	http://www.acf.hhs.gov/programs/orr/benefits/health.htm.
ORR	http://www.acf.hhs.gov/programs/orr/programs/cma.htm.

APPENDIX C– Nutrition Issues for Refugee Children During Resettlement (Goette, 2005)

Also available on page 16 Appendix 3 http://www.crr.unsw.edu.au/media/File/Nutrition_Issues.pdf