

Framework in Global Health
Global Health Scholars Program

February 2009 Fellowship Recipient

Proposal Title:

“Child Energetics in American Samoa”

[1 of 4]

Introduction:

Before arriving at Brown, I deferred college for a year during which I attended cooking school and worked as a cook in a restaurant. When I began my freshman year I became involved with issues around food – from both the supply and demand side – by getting involved in the university farmer’s market and student garden. I was interested in concentrating in Environmental Studies. During the summer of 2008 I took an internship through Americorps working at the NYC Coalition Against Hunger where I dealt primarily with access to fruits and vegetables in various low-income neighborhoods. My experience conducting market basket surveys and helping to coordinate a farm share program at the Queensbridge Housing Development helped me to realize that I was, in fact, more interested in human beings than I was in environmental studies. That realization inspired me to take Dr. McGarvey’s course, Burden of Disease in Developing Countries, and I was for the first time exposed to an academic discipline in which I could understand and explore the reasons behind the existence of many of the issues I had been exposed to – where I worked, obesity and type II diabetes seemed to fall along certain economic and racial fault lines. After taking Burden of Disease I decided to change my concentration to Development Studies so that I could combine my interest in human beings with my interest in the environment. I was attracted to the research that Dr. McGarvey is conducting in American Samoa and hope to both perform the project proposed below and to assist him as an assistant in his study to obtain more research experience in this field.

Specific Aims:

Obesity and overweight have reached epidemic rates in the United States with the prevalence of obesity at 33% in men and 35% in women (Ogden, et al. 2006). The distribution of obesity prevalence is far from uniform and certain ethnic groups are significantly more affected than others (Kumanyika, 1993). American Samoa, a US territory since 1878, has an alarmingly high prevalence of obesity and type II diabetes throughout all age groups (Keighley, et al. 2007). Such high rates of obesity and the subsequently high rates of cardiovascular disease (CVD) and type II diabetes have combined to create a heavy burden on the patients and their care takers, as shown in a study examining cultural, social and environmental stress associated with the care of type II diabetes (Elstad, et al. 2008). While the importance of preventing such burdens is clear, the methods of combating them are less so. The roles that the level of physical activity and the amount of energy expended play in the incidence of obesity in American Samoan children and adolescents have yet to be determined.

In American Samoa, the prevalence of obesity in children and adolescents aged 6 to 17 have exploded from rates of obesity prevalence hovering around zero in 1976-8 to rates approaching 50% for ages 15-17 in 2002 (Keighley, et al. 2007). Obviously, the reasons behind this explosion are multi-causal; even factors such as activity and food intake can be broken down into countless categories for detailed study. However, the aim of this study is to begin to explore how physical activity (as measured by both the doubly labeled water (DLW) method and activity monitors) and energy intake (as measured by the 24 hour food recall method) are connected to the high rates of overweight and obesity in American Samoa. In addition to collecting this concrete data, we will administer questionnaires to the study participants and their parents about external factors that may be related to the variations in overweight and obesity within our study sample. While the data collected from this questionnaire will be far from conclusive, it will help us to determine if we can conduct a future larger longitudinal study on the underlying causes of overweight and obesity in Samoan children and adolescents.

Specific Aim 1: To use the DLW method and activity monitors to determine the scientific accuracy and feasibility, which includes acceptability to participants and ease of use for researchers, of their use for future research in children and adolescents in both American Samoa and Samoa.

Specific Aim 2: To adapt interviews used in studies conducted on Pacific Islanders in Hawaii and New Zealand to create a version of the 24-hour food recall method specific to American Samoan children and adolescents.

Specific Aim 3: To administer a questionnaire to the study participant and his or her parents, conducted by a local Samoan research assistant. It will include questions about the parents' occupation, estimated family income, material lifestyle, the parents' body mass index (BMI), and connections with the Samoan community and culture, among other questions. The responses to these questions will help to give us more information on the variations in physical activity of participants.

Specific Aim 4: At the end of the energy expenditure and intake measurements we will conduct open-ended interviews with the participants and parents about their views on the experience of these assessments of energy balance.

Background/Significance:

As of 2002, the percentage of normal weight American Samoan children aged 6-11 years was only 49% - 56%, meaning that almost half of all children were overweight or obese. As American Samoa continues to modernize, data indicates that we can expect progressively higher rates of overweight and obesity, leading to a substantial increase in obesity related pediatric health disorders. These findings paint an ominous picture of the future health burdens in American Samoa. (Keighley, et al. 2007)

The interactions between physical activity (PA) and BMI or body fat (BF) in American Samoan children are not yet conclusive. Research conducted in 2002 that asked American Samoan children aged 6-17 years the types of physical activity in which they were involved (farm work, sports and gym class) showed that participation in farm work and sports were associated with lower BF. However, the study showed no significant decrease in BMI with reported levels of physical activity. (Keighley, et al. 2007) We plan to use the current gold standard, DLW, to access energy expenditure (EE) and subsequently PA, thus giving us very reliable data (Vanhees, et al. 2005). Activity Monitors give us activity specific information, as opposed to solely the average EE that DLW provides, which further helps to give us the most accurate data possible (Vanhees, et al. 2005).

The diets of American Samoans have been changing since the beginning of the twentieth century due to modernization arising from an increased interaction with American culture. However, the beginning of the 1990's marked a period of increased food importation creating changes in dietary habits across generations. For example, according to data gathered in 2002-3, American Samoan children and adolescents aged 6-17 years consume fewer green vegetables and more potato chips, cake and soda than adults 45 years and older. (Keighley et al, 2007) The purpose of the 24-hour food recall survey is to estimate average daily caloric intake of the thirty study participants. Because the 24-hour food recall survey has been found to be a reliable way to obtain dietary information on a population level rather than an individual level, the data we obtain from the survey will be generalized and thus will not serve as a platform for individual analysis (Galanis et al., 1999).

Currently, insufficient data exists specific to American Samoa that addresses possible confounding influences in the general predictors of adult obesity. For example, socioeconomic status (SES) has been shown to be a prominent predictor of future adult obesity, but the mechanisms through which it actually leads to obesity have yet to be agreed upon. Possible explanations include early childhood nutrition, various psychosocial factors and cultural/social norms regarding body size and weight (Power and Parsons, 2000). Our questionnaire aims to illuminate possible mechanisms through which SES and other factors contribute to an elevated risk of becoming obese.

Methods/Procedure:

Our study will be based out of the Tafuna Family Health Center (TFHC), located in Tafuna, American Samoa. Using local research assistants and translators, we will recruit 30 study participants, both male and female, between the ages of 8-13 years from nearby communities to participate in our study. Because this is a pilot study, we will choose participants as an opportunity sample but will seek to balance the numbers of boys and girls and older and younger children within the age range. Informed consent will be obtained from study participants' parents and assent from the minor participants. The data collected will include: DLW, activity monitors, 24-hour food recall survey, anthropometric data (BMI, skin fold thickness and blood pressure), and a health and lifestyle questionnaire.

The DLW method measures the energy expenditure (EE) of the subject, which can be translated into an estimate of PA by indirect calorimetry. DLW has high reproducibility and reliability both in the lab and the field. The principle behind DLW is the ingestion of two stable isotopes (^2H and ^{18}O) in the form of water, which then distribute themselves throughout the body. The hydrogen isotope is then released from the body in the form of water and the oxygen isotope is released as carbon dioxide. Because the amount of carbon dioxide released is an indicator of EE, the difference between the elimination rates gives a good estimation of EE. (Vanhees et al., 2005) We will administer the DLW when we first screen participants and will collect urine at 1, 3 and 4 hours after the initial ingestion. Then we will collect another spot urine at both 5 and 9 days after initial ingestion.

Our second method of assessing PA will be to use accelerometers as activity monitors. Accelerometers assess movement in more than one plane, which makes them superior to using pedometers. They have more accurate measurements of PA than they do EE, which makes them a good complement to our use of DLW to get both accurate measurements for both EE and PA. (Vanhees et al., 2005) We will attach the accelerometers used in this study to each participant's belt and will check that they are functioning correctly when we collect urine samples.

Dietary intake will be measured using the 24-hour food recall method, which has been shown to provide accurate results at the population level. We will follow the methods used by Galanis et al. in their study on the dietary intake of modernizing Samoans. Portion size will be determined through model eating utensils and/or specific questions. We will also assume that the cooking fat used by American Samoans is corn oil, based on studies conducted in American Samoa in 1994. (Galanis et al., 1999) We plan to perform the 24-hour food recall survey two to three times for each participant over the course of the study.

A local Samoan research assistant will administer a separate questionnaire to the study participant and to his or her parents. It will aim to gather information from the parents on topics such as income level, material lifestyle, occupation, BMI, 24-hour food recall, physical activity and connection with Samoan community and culture. The data gathered from the study participants will give us information on what types of physical activity the participants take part in, foods most commonly eaten, amount of time spent watching television, and perceived body

image. The questions and phrasing will be adapted from questionnaires developed for American Samoan subjects.

After we have collected the data on PA, dietary information and administered the questionnaire we will hold individual interviews with the participants about the methods of measurement we used so as to get feedback on the acceptability of our methods. The interviews let us know what did and did not work so that we can alter our methods in possible future studies.

Analysis/Plans for dissemination:

The data collected will be analyzed after returning to Brown in the fall using Excel and SAS. I plan to remain connected to this project when I return and will obtain equally valuable experience in the analysis of the data. As a current sophomore, I am presently not preparing my senior thesis, but this research experience will help me in either furthering this project or developing another project that will contribute to my thesis.

Proposed Budget:

Plane fare: \$2000

Housing/food: \$1000

Transportation within American Samoa: \$500

All other research and data collection costs will be covered by Dr. McGarvey's funds.

Works Cited:

- Elstad, Emily, et al. "Living with Ma'i Suka: Individual, Familial, Cultural, and Environmental Stress among Patients with Type 2 Diabetes Mellitus and their Caregivers in American Samoa." *Preventing Chronic Disease: Public Health Research, Practice and Policy* 5.3 (2008).
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- Power, C., Parsons, T. "Nutritional and other influences in childhood as predictors of adult obesity." *Proceedings of the Nutrition Society* 59 (2000): 267-72.
- Vanhees, L., et al. "How to Assess Physical Activity? How to Assess Physical Fitness?" *European Journal of Cardiovascular Prevention & Rehabilitation* 12.2 (2005): 102-114.