Framework in Global Health

Global Health Scholars Program

February 2009 Fellowship Recipient

Proposal Title:

"Child Energetics in American Samoa"

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Child Energetics in American Samoa: June-August 2009

A.) Specific Aims

Since the 1970s, children and adolescents in Samoa, an independent developing nation, and the U.S. territory of American Samoa have exhibited increasing rates of overweight and obesity. While this trend is associated with the processes of modernization, which lead to alterations in dietary and physical activity patterns, there is a paucity of data that focuses specifically on these changes in relation to children. Thus, the objective of this study is to demonstrate the feasibility of certain detailed measures of energy intake and expenditure among children and adolescents, which will be used in a larger prospective study on child overweight in relation to energy balance and expenditure in Samoa and American Samoa. Specifically, we will be measuring total energy expenditure using the method of doubly labeled water—a stable isotope solution that can be detected in urine analysis. Furthermore, energy expenditure from physical activity will be assessed using an accelerometer type of activity monitor. Thereafter, resting energy expenditure will be calculated using equations approved for other Pacific populations. These measures will be supplemented by dietary intake and physical activity interviews, which will provide a deeper understanding of the risks of overweight in relation to diet and energy balance and expenditure among Samoan and American youths. Under the mentorship of Dr. Stephen McGarvey, my fellow student researchers and I will assist in the collection and analysis of this data, with the ultimate purpose of discovering some insight on the dietary and physical activity patterns of Samoan and American Samoan youths that might inform possible public health interventions.

B.) Background and Significance

As a Development Studies concentrator and as someone with a strong interest in global health, I was immediately drawn to Dr. McGarvey's course, "The Burden of Disease in Developing Countries". I especially enjoyed the interdisciplinary nature of the course, as this has helped me narrow the focus of my interests by exposing me to the many disciplines involved in the issues of development and global health. During the course, I was particularly fascinated by the concept of the "nutrition transition", which is defined as the shift from traditional diets of complex carbohydrates, fruits and vegetables to those replete with processed foods that are high in fat, sodium and sugar. This transition ultimately results in increasing rates of obesity and such chronic conditions as diabetes and heart disease. I was so interested by this concept that I chose to write my term paper on the issue of obesity among women and children in urban India, a country in the midst of this very nutrition transition. Coincidentally, Dr. McGarvey's own research focuses on the issue of obesity in Samoa and American Samoa. This in part led to my eager interest in participating with Dr. McGarvey in his research on obesity and child energy expenditure in American Samoa. From my collaboration with Dr. McGarvey and my fellow student researchers, I hope to gain valuable field experience as well as insight on whether my future academic and career choices will focus specifically on global health within my wider interests in development.

I am also especially eager to participate in this research, because understanding the relationships between child overweight, dietary and physical patterns and in turn

energy balance, is of the utmost public health significance, as child overweight is associated with many health problems that persist into adulthood. Among these morbidities are type-2 diabetes, glucose intolerance and cardiovascular disease. Similarly, child and adolescent overweight frequently forecast issues with weight management in adulthood. Since health habits are often solidified during childhood or adolescence, it is vital to understand health related trends during these years if an effective obesity intervention is to be implemented. Research in this area can yield particularly useful insights in countries that are currently undergoing the nutrition transition, such as Samoa and American Samoa.

C.) Methods and Data Collection Procedures

This study is meant to demonstrate the feasibility of certain detailed measures of energy balance and expenditure among children and adolescents in Samoa and American Samoa in preparation for a larger longitudinal study on child overweight and energy balance and expenditure. We will begin by recruiting from rural villages a convenience sample of at least 30 participants ages 8-14, who exhibit varying BMIs, aiming for approximately equal representation of each gender across the age range. Student researchers under the direction of Dr. McGarvey will be aided by Samoan-speaking research assistants in explaining all procedures and obtaining parental consent and minor assent from all participants. Moreover, female fieldworkers will be working specifically to facilitate interactions among female participants and the research time.

First, standard anthropometric methods will be used to measure height, weight and body mass index, skin-fold thickness and circumferences. Blood pressure will also be measured using standard protocols. These measures will be taken multiple times to assure accuracy, and they will the basis of our data on the relationship between adiposity and childhood energy expenditure and diet.

Total daily energy expenditure is comprised of expenditure from physical activity, resting expenditure and the thermic effect of food (EE from physical activity = total EE - resting EE - thermic effect of food). Resting energy expenditure will be calculated using a simple equation derived from those used for other Pacific populations. The thermic effect of food will be estimated at 10% of total energy expenditure. We will determine total energy expenditure through the use of doubly labeled water (DLW), comprised of water and a stable isotope solution, and the subsequent analysis of urine samples. The participant will be given an oral dose (calculated according to body weight) of DLW, which is the only technique that measures total energy expenditure directly at the present. Spot urine samples will be collected at 1, 3 and 4 hours the first day after the DLW has been administered. Two additional spot urines specimens will be collected about 5 days and 9 days after the DLW dose with revisits to the child's home. These samples will be stored and sent to the United States for analysis.

Physical activity will be measured using both the aforementioned equation, and lightweight, waterproof physical activity monitors to be worn on the belt of each participant. These monitors record the duration, frequency and intensity of physical activity using an accelerometer, which produces a variable electric current based on the amplitude and frequency of motion. This information will be supplemented by physical activity questionnaires given to parents and children about television viewing habits,

school physical education activities, formal sports participation in school teams and informally in village teams, as well as subsistence activities.

Dietary assessments will be administered through interviews, in which the children and parents will provide a 24-hour recall of their child's dietary consumption. These interviews will provide information on the quality, frequency and quantity of food consumed. Also, interviews conducted by Samoan-speaking research assistants will record important socioeconomic and demographic data, including aspects of household composition such as parental education and income.

D.) Analysis

As this study will serve as a pilot project to demonstrate the feasibility of a larger study in Samoa and American Samoa, analysis will be comprised mostly of laboratory assays of the doubly labeled water and the collation and limited statistical evaluation of the data on physical activity, diet and energy expenditure and balance. Since the sample size will consist of approximately 30 participants, analysis will not show statistically significant trends, but rather correlations between child overweight, diet and energy expenditure and balance. These associations may be used to estimate the required sample size in the later larger study.

E.) Plan For Dissemination

Upon my return to Brown in the fall of 2009, I will collate and analyze the data that was collected by our research team during the summer pilot study. Ultimately, this will be presented in the form of both a poster or powerpoint and an abstract to be presented at scientific meetings throughout the semester. Moreover, it is likely that I will be involved in the writing of a more detailed manuscript, which may also evolve into a senior thesis.

F.) Detailed Budget

- Flight: Approximately $2000
- Lodging: Approximately $750
- Per Diem Expenses: Approximately $750
- Research Costs: N/A